Current Treatment of Childhood Constipation

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Key Words

Constipation • Treatment • Children

Abstract

Childhood constipation is a worldwide problem. It is one of the more common complaints presented to both general pediatricians and pediatric gastroenterologists. Treatment for chronic constipation is challenging and often requires long-term follow-up and medication use. Despite its high prevalence, few randomized trials have been performed to investigate the efficacy of different interventions used to treat this condition. In this review we will discuss current treatment options for childhood constipation and address some of the most frequently asked questions and misconceptions among parents and physicians.

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Introduction

Constipation is a common problem and affects millions of children around the world. A recent systemic review of the literature shows a prevalence of constipation ranging from 7 to 29.6% both in Western and non-West-

ern countries [1]. In approximately 95% of children with constipation, no obvious anatomic, biochemical or physiologic abnormalities can be identified [2]. Many of these children have functional constipation probably resulting from stool withholding after having experienced a painful or frightening bowel movement.

Long-term management is needed in most children and approximately 30% of children beyond puberty continue to struggle with symptoms of constipation, such as infrequent and painful stool evacuation and fecal incontinence [3]. Not surprisingly, the chronicity of these bowel complaints may have significant and permanent effects on the child's self-esteem and emotional growth and development. Thus, it is important to treat constipation early and effectively in order to prevent its significant morbidity [4].

The lack of randomized controlled studies in children has made the treatment of constipation largely based on clinical experience rather than on evidence-based clinical trials. Acute simple constipation is traditionally treated with a high fiber diet and sufficient fluid intake, filling out a bowel diary and toilet training. The recently updated NAPSOGHAN recommendations include 4 important phases in the treatment of chronic constipation: (1) education; (2) disimpaction; (3) prevention of re-accu-

mulation of feces, and (4) follow-up [5]. In this review all 4 steps will be discussed together with some of the most frequently asked questions and misconceptions about childhood constipation.

Education and Counseling

Education and support for parents and children is an important component of treatment of functional constipation. The parents need to be reassured and counseled regarding the normal range of frequency of bowel movements within the population, the etiology of constipation, and its prevalence in childhood. If fecal incontinence is present, it is important for caretakers to understand that this bothersome symptom is caused by overflow diarrhea and is not an act of willful and defiant behavior. Parents should have a non-accusatory approach and use positive reinforcement to motivate their children. Before treatment is started, parents and children should be reassured that recovery is possible with adequate, often prolonged, treatment. It should also be stressed that the time point of success of treatment is often unpredictable and 50% of treated patients experience a relapse within 1 year and the duration of maintenance therapy usually is 6–24 months [3].

Since laxatives usually constitute an important part of the treatment, it is essential to educate parents on the medications given because there are often misconceptions concerning these medications which could interfere with adherence. While medications used for the treatment of other conditions, such as gastroesophageal reflux, asthma, hypertension, and other chronic problems, are usually accepted and at times even sought by families of affected children, the prescription of laxatives usually encounters resistance by caretakers who find it disheartening that such a young child may already need laxatives! One of the most frequently asked questions by worried parents is whether the long-term use of laxatives is harmful and can give rise to 'lazy bowels' leading to physical dependence. Each of these concerns has recently been addressed in a thorough review of the existing literature [6]. The arguments in favor of laxative-induced (especially stimulant laxatives) damage to the autonomous nervous system of the colon were derived from data gathered by poorly documented experiments, while the investigations that did not support such damage were well done and performed using a variety of techniques [6]. Osmotic laxatives do not seem to have any long-term side effects. Although a proportion of patients with chronic constipa-

tion require long-term use of laxatives to achieve normal bowel movements, no evidence exists that this is the result of prior laxative intake, nor is there any indication of 'rebound' symptoms after stopping laxative intake. Therefore, parents should be reassured of the safety of the medications when taken in the prescribed dosage and encouraged to adhere to the treatment with medications to achieve success.

Diet

Although it is a widespread concept that lack of fiber is a common cause of constipation, only a few pediatric trials have been performed to evaluate the efficacy of fiber therapy. Conflicting reports exist about constipated children having a lower, equivalent or higher intake of dietary fiber compared to non-constipated children [7–9]. The recommended minimum daily fiber intake for children older than 2 years is age in years plus 5 g [10].

Recent standardized trials in children have shown the beneficial effects of fiber supplementation in children with chronic constipation. Compared to a placebo group, Castillejo et al. [11] found a decrease in colonic transit time in children who had a basal prolonged colonic transit time and received cocoa husk. They also observed a reduction in the percentage of patients who reported hard stools. It has to be noted that these constipated children had a mean fiber intake near the recommended amount of total fiber for the specific age groups. Glucomannan supplement also led to more frequent and softer stools with an improved response to laxative treatment [12, 13]. One of the main factors that has limited the long-term efficacy of dietary fibers in children has been the poor adherence to treatment due to the fact that most fiber agents like cellulose fiber, guar gum and pectin fiber have to be consumed in large quantities to be effective and that they are unpalatable. The fibers used in the previously mentioned trials had a good acceptance rate and did not have any notable side effects.

While lack of fibers is probably not the cause of chronic constipation in general, it may be a contributory factor in a subgroup. Therefore, a balanced diet containing whole grains, fruits, and vegetables is recommended as part of the treatment of constipation, without forceful implementation of fiber in the diet [5].

Increased fluid intake is another widely recommended therapy and is based on the assumption that additional oral intake of fluids leads to an increased contribution to colonic fluids, which would enhance increased stool

output. A study looking at 108 constipated children who were randomized to a control group and 2 interventional groups, where 1 group was instructed to increase their daily water intake by 50%, did not show any changes regarding stool frequency, consistency or ease of defecation [14]. The reason that the increased fluid did not result in a change in bowel habits might have to do with the large adaptive absorptive capacity of the small and large bowel in response to acute or chronic challenges [15, 16]. The solutes, not water, contribute to ileal effluents. Consequently minor modifications in liquid intake will not significantly alter stool consistency. There is no evidence that constipation can be successfully treated by increasing fluid intake; unless there is evidence of dehydration, constipated children should not be forced to drink more than normal.

Disimpaction

Rectal disimpaction of the usually present large fecal mass before initiation of maintenance therapy is recommended to prevent increases in abdominal pain and fecal incontinence due to overflow diarrhea once treatment has started [5]. Uncontrolled clinical trials have shown successful disimpaction by the oral route, rectal route, or a combination of the two methods [17–20]. There are no randomized controlled studies that have compared methods of disimpaction. A double-blind, different-doses, randomized trial showed polyethylene glycol (PEG) at doses of 1–1.5 g/kg/day to be effective for disimpacting children, with good acceptance by children and parents [19–21]. No abnormalities in the serum osmolality and electrolytes or renal function tests were reported. Other agents that have been used successfully, but for which controlled trials are lacking, include magnesium hydroxide, magnesium citrate, lactulose, sorbitol, senna and bisacodyl.

Rectal disimpaction is widely performed with phosphate soda enemas, saline enemas, or mineral oil enemas followed by a phosphate enema. Both ways of disimpaction, either orally or rectally, have their advantages and disadvantages, with the first method being less invasive but requiring more time than the latter. Attention should be paid to the expulsion of phosphate-containing enemas in order to prevent the absorption of excessive quantities of phosphates [22]. The choice of treatment is best determined after discussing the options with the family and child.

Maintenance Therapy

Once disimpaction has been accomplished, the goal is to produce soft, painless bowel movements once or twice per day. Regularity for a longer period of time is important to prevent recurrent impaction and recurrence of stool withholding behavior. This usually requires use of laxatives in combination with behavioral therapy over an extended period which may last for months or years. Despite the high prevalence and the chronicity of constipation, only a small number of randomized controlled trials have been performed to evaluate the effect of any laxative treatment in children [23–25].

Osmotic laxatives include milk of magnesia, lactulose and PEG. Their mechanism is derived either by salts of poorly absorbable cations and anions (magnesium, phosphate), molecules that are not absorbed but to some extent metabolized in the colon (lactulose), or metabolically inert compounds. Magnesium hydroxide/sulfate or ‘milk of magnesia’, as it is known in the United States, is an osmotic laxative that has a long history. Both magnesium hydroxide and magnesium sulfate are two poorly absorbed salts that act either by osmosis or by a secretory effect on prostaglandins or cholecystokinin thereby enhancing colonic motility [26, 27]. Lactulose, another widely used laxative, is a disaccharide derived from lactose and is effective in increasing defecation frequency and normalizing stool consistency [28, 29].

PEGs are synthetic, non-absorbable compounds with a high molecular mass (3,000 and higher), and are not metabolized by colonic bacteria. They exert their action by osmosis and volume expansion in the colon. PEG is available in powder form, and is colorless and odorless. It is available in combination with or without electrolytes. PEG without electrolytes has the advantage of being tasteless, a factor which can play a great role in increasing compliance with prolonged treatment in children. In two multicentered randomized controlled trials, PEG with electrolytes compared with lactulose was shown to attain a higher short-term success rate (50 vs. 29%) with better stool consistency, increased appetite, less fecal impactions, and less enema use. PEG with electrolytes had significantly fewer adverse effects, such as abdominal pain, nausea, flatulence and diarrhea, compared to lactulose but children complained about the bad taste. A randomized trial comparing PEG *without* electrolytes with milk of magnesia in 49 children with functional constipation and fecal incontinence demonstrated similar effectiveness after follow-up at 1, 3, 6, and 12 months: increased bowel movement frequency, decreased fecal incontinence

episodes, and decreased abdominal pain [25]. It also revealed that PEG was more palatable and better tolerated than milk of magnesia (33% of children refused to take milk of magnesia, whereas none refused PEG). No side effects of PEG were reported. Parents should also be warned that after starting laxative treatment some leakage of feces may continue at first or, even worsen, especially if the child fears or continues to resist having a bowel movement.

Stimulant laxatives, such as senna and bisacodyl, were developed decades ago and the studies investigating these drugs do not meet the current criteria for good quality therapeutic clinical trials making a review for comparison analysis not possible [30]. In contrast to previously mentioned osmotic laxatives, these stimulant laxatives are generally not encouraged for long-term daily treatment. One of their common side effects is cramping. Use of these medications may be necessary intermittently to avoid recurrence of impaction. It is still controversial whether anthraquinone-containing laxatives, such as senna, can lead to morphologic changes in the autonomous nervous system of the colon. Melanosis coli, an easily visible brown discoloration of the colon, may occur within months of regular use and can last for months after discontinuing the laxatives [31, 32]. This pigmentation is caused by the uptake of laxative-stained cell debris by the submucosal macrophages but this discoloration does not seem to have any functional consequences [33]. A reasonable regimen is to use stimulant laxatives when no spontaneous bowel movement has occurred for 48 or 72 h in combination with daily osmotic laxatives.

Behavioral Therapy

The combination of behavioral intervention combined with laxative treatment has the goal of lowering the level of distress associated with bowel movements and developing or restoring normal bowel habits by positive reinforcement. A commonly used practice is encouraging regular toilet training with the child being instructed to sit on the toilet for 5–10 min after each meal (to take advantage of the gastrocolonic reflex) in an attempt to defecate. The patient is stimulated to strain actively while placing his feet on a footrest. The child needs to understand that responding to the defecatory urge and not holding back is the key to success of the treatment. Another frequently used aid is to let the child keep a bowel diary to record complaints, quantify therapeutic progress and to enhance motivation. Small, age-appropriate

reward systems are established for successful compliance.

Behavioral modification has been studied for constipation-related fecal incontinence. A randomized controlled trial of 87 children compared three treatment modalities: intensive medical therapy; intensive medical therapy with enhanced toilet training, or intensive medical therapy with enhanced toilet training and biofeedback therapy. After 12 months, no statistically significant difference was found in the success rate among the three methods [34]. No study has yet studied the added effect of behavioral modification to medical treatment with laxatives.

Psychological referral is indicated in children who fail intensive medical treatment and in those with severe emotional problems or serious family problems.

Biofeedback

The role of biofeedback in the treatment of childhood constipation seems to be limited [35]. This habit training, which is based on reinforcement and is derived from a psychological learning theory, has been employed to teach children how to control their sphincter muscles using biofeedback devices, like anorectal monitoring instruments that allow the muscle tone of the external anal sphincter to be displayed on a screen or presented as sound modulations [36]. The rationale for this treatment lies in the fact that in more than 50% of children with defecation disorders the external anal sphincter and puborectalis muscles contract instead of relax during defecation (the physiologic manifestation of a withholding behavior) [37]. Biofeedback has also been thought to be useful to educate children about the sensations experienced with rectal distension. Some children are unaware that this sensation indicates the need to defecate.

Small uncontrolled trials have shown that adequate contraction of the external sphincter or normalization of abnormal defecation dynamics can be achieved by biofeedback training. While a study by Loening-Baucke [38, 39] initially indicated a significant short-term effect of biofeedback, the additional benefit to laxative treatment was not seen in other controlled trials and after long-term follow-up [37, 40, 41]. Furthermore, the observed improvement in manometric parameters does not appear to translate into functional improvement as demonstrated by a large randomized controlled study of 192 constipated children in whom achievement of normal defecation dynamics was not associated with clinical success [37].

Based on these data we conclude that there is no strong evidence to support biofeedback as a useful additional treatment for defecation disorders in the majority of children.

Surgery

While most children with constipation are successfully treated with the conventional regimen described earlier, some children will continue to be symptomatic despite intensive therapy and optimal compliance with treatment. When these symptoms are severe enough to significantly impact the patient's quality of life, physicians might have to resort to surgery. Especially fecal incontinence, which frequently accompanies chronic constipation, can have a dramatic negative impact on the emotional and social development of the affected children [42]. Until recently, creation of a colostomy or performance of a partial colectomy were the only surgical options when nonoperative management failed. Such surgical interventions were deemed to be too invasive, were frequently irreversible, and often associated with an unpredictable clinical outcome, and are rarely utilized.

Novel alternatives are now available. A continent appendicostomy or a button cecostomy can be created to provide antegrade administration of enemas aimed at cleansing the entire colon and providing predictable fecal incontinence-free intervals. Cecostomy tubes can be safely placed percutaneously by interventional radiology or endoscopy instead of surgery [43]. Regular colonic lavage results in a significant increase in defecation frequency, a reduction in fecal incontinence frequency, and consequently an improvement in quality of life [43, 44]. Success rates are high in most studies (up to 80%), probably due to careful pre-cecostomy evaluation and patient selection. Older motivated children with a normal response to colonic stimulants or the presence of propagated contractions at the time of colonic manometry testing are thought to experience more success than younger children with no response to colonic stimulants [45]. Colonic manometry is used as a predictor of cecostomy success in children with defecation disorders. Potential side effects in children receiving an appendicostomy are stenosis of the cutaneous opening (11%), painful or difficult catheterization (5%), and iatrogenic perforation of the appendicostomy [46]. Dislodged tubes (26%), leakage around the cecostomy button (42%), and granulation tissue (68%) are complications known to occur with cecostomy devices [43].

Of course, surgery should only be considered in children who have had symptoms for many years, have not responded to multiple medical treatments, and have required multiple hospitalizations for treatment of their symptoms. Comprehensive motility testing including colon manometry may help guide clinical decisions about surgery [47–49].

Follow-Up and Referral to Subspecialists

The maintenance phase starts after the first steps of education and disimpaction are completed, and it may last many months to years. Van Ginkel et al. [3] found that 50% of the treated children had at least one relapse within the first 5 years after initial treatment success, and 30–50% persisted to have severe symptoms after 5 years of follow-up, even beyond the age of 18 years. These high percentages of relapse and persistence of constipation stress the importance of close and prolonged follow-up of children with constipation. Follow-up by office visits in the beginning, as often as every 3–4 weeks, to assure adherence to and the effectiveness of the treatment program is recommended. Visit intervals can be lengthened as the treatment proves to be successful, and office visits can be alternated with phone communications to keep track of progress. It might be necessary to repeat the education and demystification processes several times during treatment [50].

After 'success' is obtained, the question arises whether to continue the medication and for how long. One common strategy is to continue treatment for at least 2–3 months after complete resolution of symptoms before attempting to taper medications, considering the high relapse rates in the first years. If the child remains symptom-free, the medication dose can be decreased with instructions to the parents to pay close attention to the child's bowel habits and stool consistency to avoid painful bowel movements that could again induce withholding behavior. If symptoms reappear, not only should medications be started again but the bowel diary should be restarted and toilet training newly emphasized.

Referral or consultation with a pediatric gastroenterologist becomes necessary when therapy fails or when there is concern about an organic disease. The pediatric gastroenterologist can reevaluate the child, order specialized tests when deemed necessary and review previous therapies. Different or additional medications or higher doses of current medications are often prescribed before performing additional studies.

Key Messages

- (1) Educating children and their parents about normal bowel habits, the etiology of constipation and its treatment is an important factor to ensure adherence to the treatment program and to achieve a successful outcome.
- (2) There is good evidence to support the use of PEG as first-line drug in childhood constipation.
- (3) Close and long-term follow-up in children with chronic constipation is important considering the high prevalence of relapse and persistence of symptoms.

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