Chapter 5

Constipation: A Symptom of Chronic Food Intolerance?

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1. INTRODUCTION

Constipation is characterized by a recurrent difficulty to defecate, the sensation of incomplete evacuation, and/or infrequent bowel motions (once every 3–4 days or less) in the absence of secondary causes or worrying indications.\textsuperscript{1} It is common, affecting up to 3% of children.\textsuperscript{2} The etiology is thought to be multifactorial in nature, involving behavioral factors such as withholding behavior because of painful defecation, environmental factors such as a low-fiber diet, inactivity/obesity, psychological stress, and a positive family history.\textsuperscript{3}

Despite adherence to current treatment regimes, one-third of these children remain chronically constipated.\textsuperscript{1} This has generated interest in establishing new definitions for superior management strategies. We found that the Gastrointestinal tract (GIT) scintigraphic transit study or “nuclear transit study” (NTS) has been effective in characterizing a variety of dysfunctional patterns of colonic transit.\textsuperscript{3} Initially, we found there was a population of children with slow motility, whereby the radioactivity reached the descending colon only at 48 h. This was termed slow-transit constipation (STC),\textsuperscript{3–5} and a number of studies from our department have shown that colonic motility improves with transcutaneous electrical stimulation (TES).\textsuperscript{6–10} More recently, rapid-transit constipation (RTC),\textsuperscript{11} with rapid motility throughout the proximal colon and holdup in the anorectum, has been associated with food intolerance. Moreover, dietary exclusion in these children normalized stool consistency and improved abdominal pain and pain on defecation.\textsuperscript{12}

This chapter commences with a brief introduction into the complexities surrounding chronic constipation, followed by a discussion of the literature of both food intolerances and STC and RTC. It is hoped that this evolving area of research will translate to improving current clinical practice.

2. CHRONIC CONSTIPATION

2.1 Definition

Constipation has been difficult to define in both adult and pediatric populations in the absence of a validated biomarker. In adults, previous definitions were based on defecation frequency and explicit diagnostic criteria. Currently, the emphasis is on difficulty with passing bowel motions, in whichever way this manifests.\textsuperscript{1} The Rome III criteria are the most widely used criteria at present (Table 5.1).\textsuperscript{1,13}

2.2 Epidemiology

Constipation affects about 3% of children, with a third developing chronic constipation that usually persists into adulthood.\textsuperscript{2} It accounts for 3%–5% of visits to pediatricians and 10%–35% of pediatric gastroenterology consultations.\textsuperscript{14} Fifty percent of patients develop constipation within the first year of life. The highest prevalence occurs in preschool-aged children, 35% at 5–6 years of age. In adults, incidence increases with age\textsuperscript{1}. In adults, chronic constipation is more prevalent in females than males (2.2:1), whereas in children, prevalence between genders is equal.\textsuperscript{6}
2.3 Etiology

Chronic constipation is not a disease but a symptom and is one of the most frequent presenting complaints encountered by both adult and pediatric physicians. Currently, constipation is classified as being either functional or organic in origin.1

2.3.1 Functional Constipation

Functional constipation, also known as primary or idiopathic constipation, has no apparent underlying disease process at its root. In pediatric populations, 63% of abnormal fecal retention is caused by withholding behavior because of painful defecation, which is the consequence of three factors: behavioral, environmental, and a family history.1

Behavioral factors mainly arise from bad habits. These include failure to defecate in the morning before school, poor breakfast habits, delaying defecation (for example, being preoccupied with games), and school toilet phobia.

The environmental factors that are believed to be important, on the other hand, are quite variable. Low-fiber (fruits and vegetables) and low-liquid diets, inactivity and obesity, and psychological stress (bullying, exam stress, and problematic parental relationships) can contribute to constipation. In addition, extended periods of illness can contribute because of prolonged bed rest in conjunction with loss of appetite.

Despite a positive maternal family history in 28%–50% of cases, the association with gene mutations is unknown.1

2.3.2 Organic Constipation

Organic constipation represents 5%–10% of cases in children and its causes are summarized in Table 5.2.1

2.4 Clinical Assessment

Because of the variety of potential organic causes, a detailed history and physical examination is essential in determining appropriate investigations and management. Laboratory and radiological investigations are used to exclude organic pathology, and in the absence of any discerning features, motility studies may be used to investigate for functional impairment.1 The colonic transit study is the gold standard test for dysmotility and will be discussed later on in this review.

2.5 Current Management Practices

Management is multifaceted, taking into account the range of contributing factors. In the acute setting, disimpaction may be necessary for symptomatic relief.1 Medical maintenance involves both laxatives and educating the family about dietary and behavioral modification. In severe cases, surgery may be the only option. Constipation is deemed treatment-resistant if there has been no response to therapy within 6 months.
### TABLE 5.2 Chronic Constipation With an Organic Cause

<table>
<thead>
<tr>
<th>Category</th>
<th>Conditions</th>
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| Anatomic malformations    | • Perineal, vestibular fistulae  
                            • Anal stenosis  
                            • Imperforate anus                                                        |
| Digestive disease         | • Celiac disease  
                            • Cystic fibrosis  
                            • Irritable bowel syndrome                                                |
| Motility disorders        | • Hirschsprung disease  
                            • Hypoganglionosis  
                            • Sphincter achalasia  
                            • General neuropathies/myopathies                                          |
| Neurological dysfunction  | • Spinal cord abnormalities/trauma  
                            • Sacral agenesis  
                            • Neurofibromatosis                                                      |
| Metabolic/endocrine       | • Diabetes mellitus  
                            • Hypothyroidism  
                            • Renal tubular acidosis  
                            • Hypocalcemia and hypokalemia  
                            • Growth hormone deficiency  
                            • Diabetes insipidus                                                     |
| Psychiatric               | • Anorexia  
                            • Depression  
                            • Psychosis                                                            |
| Drugs                     | • Opioids  
                            • Anticholinergics  
                            • Antidepressants  
                            • Antacids  
                            • Barium, iron, calcium, aluminum, lead                                    |
| Other                     | • Cow’s milk protein intolerance  
                            • Sexual abuse                                                            |

3. **EMERGING VIEWS OF PEDIATRIC CHRONIC CONSTIPATION**

Recent studies have shown the existence of a treatment-resistant subpopulation, with one-third of patients carrying the condition into adulthood. As a result, there has been a significant drive to look into different ways of defining constipation, as well as new investigations and therapies to reduce the associated morbidity. Motility studies have been useful in identifying where the site of holdup occurs, and subsequently, new definitions have emerged.

#### 3.1 The Nuclear Colonic Transit Study

The NTS measures the rate of transit throughout the gastrointestinal tract, from gastric emptying, small bowel, and regional colonic transit to transit through the rectum. It is also a useful determinant of the site of holdup. The Surgical Research Group (SRG) at the Murdoch Children’s Research Institute, Melbourne, Australia, started using the technique in 1997, with the first paper being described in 2005. They have one of the largest collections of patients in the world, with well-defined information about colonic transit.

The technique involves giving children a milk drink containing a radioisotope, and the radioactivity emitted is tracked by a gamma camera as it moves through the gastrointestinal system. Images are taken every 30 min for the first 2 h and then at 6, 24, 30, and 48 h post ingestion.

Quantitative analysis is based on the calculation of geometric center (GC), the median point where half the radioactivity is distal and the other half proximal. The colon is divided into six regions of interest, and the site of holdup is determined by which area contains the GC (Fig. 5.1). Gastric emptying is also measured, defined at the time at which half the radioactivity is emptied from the stomach, using images taken at 0, 30, 60, and 120 min (Table 5.3).
We found that the NTS is effective because a variety of quantitative parameters can be measured; it is objective and also reproducible, enabling accurate comparisons over time. Despite its many advantages, the test is lengthy (48 h) and requires that patients stay near the hospital for two nights, which may be particularly problematic for rural patients. In addition, laxatives must be ceased 5 days prior and causes significant constipation prior to testing, and the need for a protocol to empty the bowel by high-dose laxatives immediately after the test is completed.

**TABLE 5.3** Criteria for Normal Rates of Transit in the Nuclear Transit Study at Royal Children's Hospital, Melbourne, Australia

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Normal Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric emptying</td>
<td>( t_{1/2} \leq 50 \text{ min} )</td>
</tr>
<tr>
<td></td>
<td>Gastric emptying at 120 min ( \leq 15% ) of counts still in the stomach at 2 h</td>
</tr>
<tr>
<td>Small bowel transit</td>
<td>( \leq 25% ) of radioisotope retained in the small bowel at 6 h</td>
</tr>
<tr>
<td>Colonic transit</td>
<td>( &lt;40% ) of radioisotope retained in transverse colon at 24 h</td>
</tr>
<tr>
<td></td>
<td>( &lt;30% ) of radioisotope retained in transverse colon at 48 h</td>
</tr>
<tr>
<td></td>
<td>Geometric center ( &gt;3.0 ) at 24 h and/or ( &gt;4.2 ) at 48 h</td>
</tr>
<tr>
<td>Anorectal transit</td>
<td>( &gt;40% ) of radioisotope excreted at 48 h</td>
</tr>
</tbody>
</table>
3.2 Colonic Dysmotility Subtypes

The NTS has defined two constipation subtypes based on their rate of transit. STC occurs when there is poor motility throughout the whole colon. RTC has more recently been determined, which, counterintuitively, displays fast transit in the small intestine and/or the proximal colon, with anorectal retention. It is thought that RTC is associated with food allergy and will be discussed in greater detail later on.

3.3 Slow-Transit Constipation

Since the 1990s, 90% of treatment-resistant chronic constipation in children was classed as idiopathic in the setting of Hirschsprung-negative rectal biopsies. It was thought that these cases were associated with behavioral problems, however, the fact that withholding behavior resolves after standard modes of treatment are implemented suggests that some forms of constipation must be secondary to a pathological cause.

Hutson and colleagues hypothesized that constipation was associated with pathological dysmotility and, in 1993, were the first to confirm its relationship to abnormalities in the enteric nervous system. Seromuscular biopsies from the cecum, transverse colon, and sigmoid colon of children whose rectal biopsies were negative for Hirschsprung disease and showed a marked deficit in the excitatory transmitter substance P using immunofluorescence staining in 7 of 10 patients. In each specimen, substance P was virtually absent in the muscularis propria but not in the mucosa, further establishing an inherent recognizable histological anomaly.

Our department has been using radioisotope colonic transit studies since 1997 to characterize colonic transit patterns. Between September 1995 and December 2003, the transit patterns of 64 treatment-resistant children were analyzed (as described earlier). A significant proportion of these children (46/64) had STC and delayed radioactive transit only reaching the descending colon at 48 h. This was statistically different from controls (P < .001). Transit characteristics in the slow-transit group showed three possible subtypes: pancolonic slowing (28/46), holdup in the transverse colon (10/46), and abnormal small and large bowel transit (8/46).

Further investigation of STC has led to a greater insight into its underlying pathology, both physiological and histological. Pancolonic 24-h manometry studies were performed on 18 children with scintigraphically proven STC. This novel technique involves inserting a catheter through previously formed appendicostomies, allowing several parameters to be analyzed at any one time. In addition, it was well tolerated by patients, avoiding using a colonoscope and the risks associated with general anesthesia. Results showed decreased antegrade contractions (P < .01) but normal amplitude, speed of contractions, mixing, and retrograde peristalsis. The speed of contractions was not responsive to waking or meals.

We also examined if we could recognize STC clinically. In a retrospective study conducted in 2002, Shin and colleagues correlated signs and symptoms with children who displayed STC on NTS. On history, up to 50% suffered from soiling, over 20% had delayed meconium (greater than 24 h), and a family history of constipation was in 10%. No endocrine or neurological anomalies were noted. On abdominal examination, abdominal distention and a full colon with soft stools were observed. Hard fecal masses in the rectosigmoid were, counterintuitively, only noted in some patients. Interestingly, it was not possible to determine the anatomical site of defect on clinical examination.

3.3.1 Transcutaneous Electrical Stimulation

The discovery of dysmotility in STC from pancolonic manometry studies, together with the desire to search for less invasive alternatives to management, has led to trials of TES as an alternative therapy. Interferential current has been used by physiotherapists for over 20 years to treat detrusor overactivity in urinary incontinence and to strengthen the pelvic floor. A known side effect of the therapy is fecal incontinence, so the SRG performed a pilot study to investigate its effect in STC.

Interferential stimulation is a special form of TES that utilizes two abdominal electrodes, placed at the level of the umbilicus, and two paraspinal electrodes, placed at T9–L2. The leads are connected diagonally, so when the currents cross within the abdomen, interference current is produced. Currents > 100 Hz penetrate deeper into the abdomen, without stimulating superficial structures (abdominal muscle contraction and pain fibers). The pilot study, conducted in 2005, demonstrated that TES is effective for chronic constipation. Transcutaneous stimulation using interferential current was applied three times per week for 3–4 weeks to eight children who had been treatment-resistant for at least 4 years. Seven of eight children ceased soiling and five of eight children experienced an increase in the frequency of spontaneous defecations. One year prior to the study, all children underwent extensive behavioral treatment to improve defecation, so we thought that it was unlikely that the improvements were because of a behavioral change. Positive effects in this pilot study lasted for at least 3 months in three of five responders, and in a more recent trial, long-term improvements lasted for 6 months in one-fourth to one-third of patients and to up to 2 years in one-third of patients. This suggests that the neuronal anomaly in STC is reversible.
TES has also been shown to improve colonic motility in STC in a randomized double-blind control trial. Colonic transit time decreased with respect to pretreatment values at 24 ($P \leq .0001$), 30 ($P \leq .0039$), and 48 h ($P = .0001$). Values were compared 6–8 weeks after a 4-week course of treatment. A review of the long-term outcomes established that one-third of children had an improvement that lasted 2 years and one-fourth to one-third for 6 months. Furthermore, manometry studies after 12 sessions ($20 \text{min} \times 3 \text{ weekly}$) increased total ($P = .008$), anterograde ($P = .01$), and high amplitude ($P = .04$) propagating sequences at 2 and 7 months post treatment. Increased activity on waking was also noted, and four of eight children ceased using continence enemas. TES has also improved quality of life, as denoted on improved scores on the Pediatric Quality of Life Inventory post treatment. Finally, the introduction of TES in 2006 coincided with a significant reduction in the rate of appendicostomy formation as established on retrospective audit.

The potential in utilizing TES as an effective therapy has been elucidated through various home-based trials. A pilot study reported similar improvements to that of TES, with 9 of 11 children noting a defecation increase, and an increase in the total number of defecations per week ($P = .008$) over a 1-month period. Parents were instructed on how to use the device by a Pediatrician prior to participation. In a larger study of 32 patients, 38%–69% achieved some treatment success, and nearly all benefited in one symptom (defecation, urge-initiated defecation, soiling, abdominal pain, stool consistency).

More recently, an extended 6-month course of home-based stimulation in 62 children produced statistically significant improvement in chronic STC. This was most notable in defecation frequency ($57/62, P < .0001$), soiling ($4.8–1.1 \text{ days/week}$, $P < .001$), and abdominal pain ($1.7–0.3 \text{ days/week}$, $P < .0001$), as well as quality of life score using PEDSQL Core QOL questionnaire ($P < .01$) and gastric emptying ($P < .005$). Similar findings occurred in a smaller study of 10 patients with the anorectal retention subtype; after 3 months of daily stimulation, nine patients had improvement in defecation frequency, soiling, and reduction in laxative use. Quality of life also improved using PedsQL questionnaire. The development of a battery-operated machine that is safe and effective could be considered in the future as an option before surgery in children with chronic treatment-resistant constipation.

### 3.4 Rapid-Transit Constipation

RTC was first recognized in 2011 in an index patient with a food allergy, who displayed rapid proximal colonic transit with anal retention on scintigraphic gastrointestinal transit study. At 6 h, the GC was in the cecum (which is normal); however, >25% of radioactivity was detectable within the rectum at 24 h (which is extremely fast). The pattern was deemed normal and was initially ignored.

It was not until a retrospective study reviewed all NTS from 1998 to 2009 that the possibility of a new subtype of constipation was revived. Out of the 520 children investigated over that time period, 64 (12%) were identified with RTC. A review of their clinical history was also performed, and just like in the index patient, there was an association with allergy; 43.6% had concurrent allergic conditions such as eczema and asthma, a family history of allergy (10.9%), and the symptoms associated with food allergy/intolerance such as abdominal pain (80%) and anal fissures (27.3%). Investigation results were also reviewed, and RTC was linked to markers of food allergy, rectal biopsy eosinophilia and positive serum, and/or skin testing.

Only one other report in this area exists, which found food allergy to be associated with prolonged colonic transit in children. Romanczuk and colleagues used plastic markers to demonstrate generalized slow transit using CT imaging. However, results from this study have been difficult to interpret because the article is written in Polish.

It should be noted that the criteria of RTC are completely arbitrary; however, they are based on the experience of normal and slow transit in children who are chronically constipated.

### 4. ADVERSE FOOD REACTIONS AND CHRONIC CONSTIPATION

The association between food intolerance and chronic constipation has been generating interest, particularly because of the possible role of food exclusion as a management approach for RTC. The next section of this review discusses the literature within this area of study.

#### 4.1 Adverse Food Reactions

Adverse food reactions (AFRs) are a broad term, relating to any reproducible response to food. The majority of AFRs is nonimmunological in origin and is collectively known as food intolerances, with lactose intolerance being the most common worldwide. Food allergies are the second class of AFRs, which are immune-mediated reactions.
The prevalence of AFRs has been increasing over the last few decades and is now approximately 20% in Western countries. True food allergy affects 6%–8% of children younger than 10 years of age and 1%–4% of adults. The prevalence of food intolerance varies widely, depending on the methodology used to collect the data. In adults, self-reported data range from 19% to 56% but after investigations were performed to confirm an intolerance, rates decreased to approximately 1%–3%

4.1.1 Food Allergy

The immune reactions that underpin food allergy can be immunoglobulin E (IgE)-dependent and –independent mechanisms or both and result in different clinical presentations.

IgE-mediated reactions occur when food allergens bind to IgE antibodies on the surface of mast cells, resulting in the release of histamine and other inflammatory mediators. As a result, symptoms are rapid in onset (less than 30 min in children and less than 2 h in adults). They can involve multiple organ systems and vary in severity. Mild to moderate symptoms include swelling of the lips, face and eyes, tingling of the mouth, hives, eczema, and abdominal pain or vomiting. Anaphylaxis is a severe reaction and can cause swelling of the tongue and throat, difficulty breathing, wheezing or persistent cough, or collapse. Ninety percent of food allergies in children include cow’s milk, eggs, peanuts, tree nuts, wheat, soy, sesame, and seafood. This immediate cell-mediated reaction is retained in immunological memory, causing the same response whenever triggers are consumed. Two standard investigations are performed. Skin prick testing using a standard panel of different foods has a specificity of 50%, but its high sensitivity of 95% essentially excludes the food as a trigger if negative. Measurement of food-specific IgE antibodies predicts the probability of a reaction but should be performed after a thorough clinical history has been taken.

Non–IgE-mediated food allergies are caused when proteins from food induce a delayed immune response, with symptoms occurring 2–24 h post ingestion. Reactions are normally in the skin or gastrointestinal tract, such as delayed eczema and delayed vomiting and diarrhea, and specific conditions include celiac disease and food protein–induced enteropathy. Mixed IgE and non-IgE reactions are caused by one or both mechanisms as described above and included eosinophilic esophagitis.

4.1.2 Food Intolerance

Food intolerance is a reaction to foods or additives producing a variety of symptoms, some of which resemble those of a food allergy as listed above, such as abdominal pain, diarrhea, eczema, and migraines. Food intolerance is not a true allergy because it neither involves the immune system nor causes anaphylaxis. It may be metabolic in origin, such as a lactose or fructose intolerance (which is the most common); pharmacological reactions to food components such as caffeine and monosodium glutamate, toxic reactions, or the mechanisms may be unknown. Other known triggers include cheese, eggs, nuts, fish/shellfish, onions, garlic, citrus or other fruits, and fried foods. Initial tests include hydrogen/methane breath tests for metabolic problems, stool cultures, serum analysis, and tests to exclude enzyme disorders, followed by dietary challenge. Skin prick testing and IgE measures are only performed to exclude other allergies. Dietary elimination is the most effective treatment option.

4.2 Adverse Food Reactions (AFR’s) and Chronic Constipation

AFRs present primarily with gastrointestinal symptoms in up to 50% of patients. Traditionally, abdominal pain, diarrhea, bloating, and flatulence have been attributed to food allergy or intolerance. This association has yet to be confirmed with larger multicentre or even international studies and thus represents a growing area of interest.

Cow’s milk protein allergy/intolerance has been the focus of the literature in relation to chronic constipation because it is common in children. Buisseret and colleagues in 1978 were the first to report its association with constipation and its reversibility on elimination. Seventy-nine patients (range 11 months–17 years) with known cow’s milk protein allergy were surveyed, and chronic constipation was found to be one of the clinical features, alongside difficulties with infant feeding, vomiting, diarrhea, eczema, and asthma. In addition, symptoms were reversible with elimination of dairy for 6 weeks. Ianconno and colleagues further evaluated Buisseret’s pilot study by investigating the pathophysiological processes through histology and manometry. Stool frequency (stools per day) and other symptoms were observed in 27 infants (mean age 20.6 months) with a history of cow’s milk protein allergy and chronic constipation (as defined by frequency of stools being lower than the third percentile of the values observed in a large population of healthy subjects participating in an Italian multicentre study). After dairy exclusion for 1 month, improvements were seen in 21 of 27 patients; stool frequency
significantly increased ($P<.0005$), and a resolution of abdominal pain, perianal fissures, and edema and erythema of the anus and perianal area was observed. On rechallenge with the trigger, constipation and symptoms reappeared within 48–72 h. Here, constipation was defined as one evacuation every 3–7 days.26

The sample size of the above study, although displaying promising results, needed to be confirmed by a double-blind crossover study. Here, 65 children (range 11–72 months) with chronic constipation, defined as having one bowel movement every 3–15 days, received a cow’s milk or soy milk diet for 2 weeks, and after a 1-week washout, the feedings were reversed. Improvements in symptoms were seen with soy milk but none with cow’s milk; there was a statistically significant reduction in constipation ($P<.001$) and fecal score ($P<.001$) with soy milk, as well as resolution of anal fissures and pain with defecation. Interestingly, children who had a response had a higher frequency of coexistent rhinitis, dermatitis, and bronchospasm on history than those with no response (11/44 vs. 1/21, $P=.05$). In addition, those who responded had significantly higher levels of IgE antibodies to cow’s milk antigens than those who did not respond (31/44 vs. 4/21, $P<.001$).27

The involvement of cell-mediated hypersensitivity mechanisms contributing to chronic constipation was supported by rectal biopsy and anorectal manometry.28 The procedures were performed while on an elimination diet and double-blind food challenge in 36 children (range 9 months–10 years). Those with a food intolerance (17/36) had significantly higher frequency of erosions in the mucosa ($P<.001$) and higher numbers of intraepithelial lymphocytes ($P=.02$) and eosinophils ($P<.001$), with these cell-mediated hypersensitivity mechanisms disappearing on elimination diet (same $P$ values for each). The rectal mucus gel layer was thinner in those who were food intolerant than the other subjects studied ($P<.001$). Similarly, higher anal sphincter resting pressures on manometry were noted and also disappeared on elimination ($P<.01$).

4.3 Exclusion Diet as a Management Strategy for Chronic Constipation

Studies of exclusions diets in gastrointestinal conditions have been recently gaining momentum. A 6-week dietary elimination study (dairy, wheat, nuts, eggs, seafood) in 50 adults with eosinophilic esophagitis has proven to be effective.29 Dysphagia symptom scores decreased in 94% of patients ($P<.0001$), as well as frequency ($P=.04$), intensity ($P=.003$), and duration ($P=.03$). Additionally, biopsies taken at endoscopy showed that the mean peak eosinophil counts decreased after diet in the proximal and distal esophagus ($P<.0001$).29

The SRG has been one of the first groups to suggest that a specific exclusion diet may be able to improve constipation, emphasizing a predisposing food intolerance. In a small cohort study by Yik and colleagues, 9 of 18 children (50%) who were treated with dietary exclusion showed symptomatic improvement.11 Since then, the SRG has been treating patients with RTC with the above six food elimination diet (dairy, wheat, soy, nuts, eggs, seafood), which has been successful for chronic patients. A retrospective audit of patients with RTC who undertook the elimination diet of at least one food group concluded that there was a statistically significant improvement in defecation frequency, abdominal pain, and pain on defecation ($P<.01$).12 Laxative use also decreased, although this was not statistically significant. Despite being a promising pilot study, future cross-institutional randomized control trials should be performed to confirm its effectiveness.

Dietary management of irritable bowel syndrome (IBS) in adults has shown that elimination of specific sugars (especially the “FODMAPs” [fermentable oligosaccharides, disaccharides, monosaccharides and polyols] sugars) is an effective way to relieve symptoms.30 Malabsorption of FODMAPs can be demonstrated on breath tests by measuring hydrogen and/or methane in the expired air after ingestion of the specific sugar.31

Recently we began doing breath tests routinely in children with chronic constipation, especially those with RTC on scintigraphy, and using an exclusion diet of the specific sugar(s) in those with a positive result (Hutson et al. J Paediatr Child Health, submitted for publication). Our preliminary audit suggests that over 60% of patients have resolution of symptoms (Waingankar et al., submitted for publication). Oral laxative therapy and modifying toilet behavior is still necessary until the mechanical properties of the rectum have recovered, usually by 3–12 months later. Beyond that time, however, we now have many children who have completely recovered.

Some dietitians are concerned about using the FODMAP diet in children, as it may restrict important dietary sources of important vitamins and minerals.32 However, we have used the breath tests as a way of determining which part(s) of the FODMAP diet are important to eliminate. Using this simple principle, only about 10% of patients need exclusion of more than one or two sugars.

The recognition of RTC on scintigraphy, positive breath tests, and resolution of the constipation with a partial FODMAP diet suggest that many children with intractable constipation have IBS-C. The responses of food challenge are similar to those seen in adults.33,34

The positive breath tests and clinical improvement with exclusion diets of the affected sugars suggest that the GIT scintigraphy has identified a pediatric cohort with IBS-C, where anorectal retention has developed at an early age secondary to withholding of liquid stool (Hutson JM et al. J Paediatr Child Health, submitted for publication). More studies will be
required to test this hypothesis, but for the moment, the positive response of many children to a FODMAP exclusion diet is consistent with this possibility.

5. CONCLUSION

This review highlights that chronic constipation is not as simple as once thought. The NTS has been an effective tool in characterizing constipation and soiling on the quality of life, this may be an important advance if substantiated by larger studies. FODMAP diets, posing as a novel therapeutic approach. The preliminary results of symptoms resolving in response to FODMAP exclusion diets, especially in children with undiagnosed food intolerance as an etiological factor is an emerging area of interest, with food elimination, especially dietary fiber intake, required to test this hypothesis, but for the moment, the positive response of many children to a FODMAP exclusion diet is consistent with this possibility.

REFERENCES