Current Practice

Constipation in children: diagnosis and management

Shaman Rajindrajith[1], **Niranga Manjuri Devanarayana**[2]

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Constipation is a common gastrointestinal disorder in children and adolescents accounting for a significant healthcare burden. Clinical spectrum ranges from mild constipation that resolves spontaneously to chronic treatment resistant constipation with devastating physical and psychosocial consequences. This article provides clinicians with a current concise review of diagnostic and management strategies of constipation.

Definitions

Constipation had been a difficult condition to diagnose due to a lack of uniform diagnostic criteria. It was often perceived as a symptom rather than a disorder. Therefore many researchers and clinicians have defined constipation using a single symptom, such as infrequent passage of stools, hard stools or difficulty in passing stools[1]. Formulating uniform diagnostic criteria acceptable to both clinicians and researchers was the main aim of the experts in paediatric gastroenterology who developed the Rome II criteria for defaecation disorders in 1999[2]. However, these criteria were found to be too restrictive in diagnosis of constipation as they excluded a significant percentage of affected children[3]. This led to revision of Rome II criteria and the new Rome III criteria for childhood constipation were released in 2006[4]. These criteria use multiple symptoms and signs and are therefore useful in diagnosis of constipation in both clinical and research fields (Box 1). They concentrate on characteristics of stool (frequency, consistency, and volume), pain during defaecation, faecal incontinence, withholding behaviour and presence of faecal mass during examination.

Box 1 - Rome III diagnostic criteria for functional constipation in children

Must include 2 or more of the following in a child with a developmental age of at least 4 years with insufficient criteria to diagnose irritable bowel syndrome:

1. Two or fewer defaecations in the toilet per week
2. At least one episode of faecal incontinence per week
3. History of retentive posturing or excessive volitional stool retention
4. History of painful or hard bowel movements
5. Presence of a large faecal mass in the rectum
6. History of large diameter stools that may obstruct the toilet

** Criteria fulfilled at least once per week for at least 2 months before diagnosis*

Epidemiology

There is a wide variation in prevalence (0.7% - 28.9%) of constipation around the world[5] mostly due to variations in definitions used and age groups of study participants recruited. Due to lack of epidemiological data from third world countries, constipation was perceived to be a disorder of the Western hemisphere. However, a recent epidemiological study from Sri Lanka reported constipation in 10.4% children and adolescents[6]. This implies that it had been an overlooked problem in developing countries. Furthermore, longitudinal data from the USA demonstrated nearly 4 fold rise in rates of constipation during the last decade and the majority of ambulatory care visits for constipation were in children under 15 years[7]. Therefore constipation is a growing public health problem among the paediatric population.

[1]*Senior Lecturer in Paediatrics,* [2]*Senior Lecturer in Physiology, Faculty of Medicine, University of Kelaniya, Ragama, Sri Lanka*

Pathophysiology

The human colon is a complex organ which serves a multitude of functions including absorption of water and electrolytes from the ileal effluent to storing faecal material in the rectosigmoid area before elimination. These functions of the colon are strictly controlled by the enteric nervous system. Constipation can stem from organic disorders such as structural abnormalities of the colon, metabolic and endocrine problems and functional abnormalities (Box 2). Over 90% of children with constipation have no identifiable organic cause for their symptoms and are suffering from functional constipation[8].

Box 2 – Common organic causes for paediatric constipation

Hirschsprung disease
Anorectal malformations
Coeliac disease
Neuronal intestinal dysplasia
Anorexia nervosa
Sexual abuse
Drugs
opiates
anticholinergics
antidepressants
Hypothyroidism
Hypercalcaemia
Diabetes mellitus
Renal tubular acidosis
Scleroderma
Amyloidosis
Cystic fibrosis

The exact mechanism of symptoms is unclear in those with functional constipation. Previous studies have demonstrated a close relationship between constipation and psychological factors including emotional stress[9,10,11]. Furthermore, there was a significant negative correlation between mean bowel frequency and number of stressful life events faced by affected children[9]. It is possible that psychological distress, via brain gut axis, impair colonic motility and anorectal function leading to slow colonic transit and stool withholding[12,13]. Stool withholding leads to formation of large faecal masses which are difficult and painful to eliminate, further aggravating the withholding behaviour. This vicious cycle of stool retention ultimately ends up in developing constipation.

Differential diagnosis

Constipation predominant irritable bowel syndrome is the commonest differential diagnosis for constipation. In those with irritable bowel syndrome, abdominal pain or discomfort is the predominant symptom and they are likely to have pain relief after defaecation and changing stool consistency and frequency

Evaluation of a child with constipation

History

Clinical history should start from the neonatal period to assess the timing of passage of meconium. Meconium is passed within 48 hours after birth in a normal neonate and delayed passage is often associated with Hirschsprung disease which is an important organic cause for constipation. Two retrospective cohort studies have shown newborns with Hirschsprung disease had significant delay in passing meconium compared to children with functional constipation[14,15].

Time of onset of symptoms is another cardinal point to elicit in the history. The majority develop functional constipation around 2-4 years of age[16] and development of significant symptoms before the age of 1 year is highly suggestive of organic pathology. Some report exposure to stressful life events (e.g. birth of a sibling, death of a close family member, sexual abuse) just before the onset of constipation[8].

Symptoms included in the current Rome III diagnostic criteria for constipation are concentrating on characteristic of stool (frequency, consistency and volume), painful defaecation, faecal incontinence and withholding behaviour (Box 1). However there are other clinical features that are not included in the diagnostic criteria, but often seen in clinical practice. Straining on passing stools is a common symptom and its prevalence among children with constipation ranges from 35%-75%[6,8]. Other symptoms often seen in affected children include abdominal pain and distension, anorexia, vomiting, blood stained stools and urinary symptoms[1,6,8,17,18]. Some of these problems are incapacitating and associate with poor quality of life and therefore need to be recognized early in the evaluation.

General medical history, social details and the developmental and psychological history are also integral components in assessing the constipated child. During history, it is important to inquire about stool withholding behaviour which is identified as one of the commonest causes for constipation in older children and adolescents. The poor condition of school toilets has been identified as the commonest reason for withholding behaviour[19] and some children resist using toilets other than ones at home. Furthermore, a careful dietary history is useful to assess the amount of fibre intake. Box 3 lists the possible risk factors for constipation.

Box 3 – Common risk factors for development of constipation in children

Low fibre diet
Psychological factors
- emotional stress
- anxiety
- depression

Cows milk protein allergy
History of constipation in first degree relatives
Prematurity
Painful defaecation
Living in urban area

Physical examination

Physical examination should be meticulous and should include assessment of growth and nutritional status. Poor growth (faltering of height and weight) is a good indicator of the presence of an organic disease. Thyroid swelling, though not common, raises the possibility of underlying hypothyroidism.

During physical examination of a child with constipation, abdominal and perianal examination should not be overlooked. Presence of palpable faecal masses in the abdominal and rectal examination is an important clinical feature indicating faecal impaction. In addition, thorough examination of the perianal region may show abnormally placed anus, fistulae and perianal fissures. It has been noted that the rate of digital examination of rectum is unacceptably low in children with constipation[20].

Neurological assessment is also an integral part in the evaluation of a child with constipation. Delayed milestones, spasticity, or hypotonia may indicate underlying cerebral palsy. Spinal dysraphism will be obvious if there are features such as repaired myelomeningocele, tuft of hair or haemangioma. Asymmetry of buttocks, patulous anus and abnormal neurological signs of lower limb neurological examination also indicate the possibility of associated organic disorder for the constipation.

Investigations

Constipation is a symptom based diagnosis and there are no biological markers to confirm it. Even so, when faced with a child suffering from constipation, some clinicians tend to order a battery of investigations in order to find an organic cause. However, it is important to realize that without clinical evidence suggestive of an organic disease (history and physical examination) such tests would rarely give abnormal results of clinical importance. However, chronic treatment resistant constipation warrants investigations to find a possible aetiology. Common investigations performed in children with constipation are discussed below.

Plain x-ray of abdomen

Plain abdominal x-ray has been frequently used to assess the degree of faecal impaction, but is reported to have lower sensitivity and specificity[21]. Furthermore, a recent systematic review failed to reveal a definite association between clinical and radiological diagnosis[22]. Therefore it is difficult to justify a plain abdominal radiograph in routine assessment of constipation.

Colonic transit studies

Colonic transit is assessed by scintigraphy and radio-opaque marker techniques. Colonic transit is reported to be slow in the majority of children with constipation[23-26]. Those with slow transit constipation have significantly more faecal soiling and palpable abdominal and rectal masses, which indicate severe and long-term constipation[23]. Furthermore, patients with slow transit constipation often do not respond to standard medical management. Therefore, colonic transit studies are beneficial for identifying and managing children with chronic treatment resistant constipation.

Ano-rectal manometry

Anorectal manometry assesses the pressure changes, anorectal sensation and myoelectrical activity of external anal sphincter and puborectalis muscle during defaecation. Traditionally, manometry was used to rule out Hirschsprung disease in infants, and has shown very high sensitivity and specificity[27,28]. In addition, anorectal manometry has reported several physiological abnormalities of defaecation in children with functional constipation. Children with constipation have increased threshold for rectal sensation[29,30] and abnormally high resting anal tones[31,32] compared to normal children. Furthermore, balloon expulsion test combined with surface electromyography has demonstrated abnormal contraction of the puborectalis muscle during defaecation, leading to pelvic flow dyssynergia in functional constipation[33-35].

Other investigations

Colonic manometry is used to identify abnormal colonic motor activity and elicit the presence of gastro-colic response. Research using colonic manometry has shown that children with intractable constipation had varying percentages of neuromuscular impairment of the colon[36,37].

Faeco-flowmetry evaluates pressure changes in rectum and the anal canal while infusing saline and

evacuation rates of saline by using an uroflow meter. Recent study has shown abnormalities in pressure curves and faecoflowmetry curves in children with chronic constipation[38].

Management

Management of chronic constipation needs good rapport between the patient, parents and clinician. It is important to build a trustworthy relationship at the first consultation without downplaying the difficulty that patient and family are experiencing. As mentioned earlier, a thorough history and physical examination would help to rule out organic pathologies and to direct the pathway of management. The key steps in management include education and demystification, treatment of faecal impaction, maintenance therapy and close follow up.

Education and demystification

The first step in management is educating parents and the child regarding constipation. Some parents tend to accuse the child for withholding stools purposely. This derailed family relationship often interferes with compliance of medical management. Some parents have certain beliefs that often stem from cultural roots which may hamper management decisions and it is of paramount importance to educate them thoroughly on risk factors for constipation, management and follow up. Some children with chronic constipation simply improve with non accusatory education and toilet training[39].

Behavioural modifications

Mass movements of colon move faeces towards the rectum and increase rectal pressure stimulating the defaecation reflex. Mass movements are maximal after waking up and after a meal[40,41]. Therefore, children need to be trained to evacuate their bowel in relationship to these physiological phenomena[42]. Behavioural protocols with emphasis on toilet training, reward systems for positive reinforcement, maintenance of a stool diary, avoidance of punitive behaviour and play therapy had been used with variable success[43,44]. Aims of these protocols are to regularise the toilet habits to minimize faecal withholding. According to randomized controlled trials, enhanced toilet training plus medical management are more effective than both intensive medical treatment and biofeedback training[45]. Regular exercise in healthy adults has been shown to increase colonic high amplitude propagatory contractions[46] but its therapeutic value in childhood constipation has not been established.

Dietary interventions

Increasing water and dietary fibre intake is probably the commonest advice given by clinicians regarding childhood constipation. Low consumption of dietary fibre had been identified as a risk factor to chronic constipation[47-49], but exact therapeutic value of high fibre diet in childhood constipation has not been established. Several previous randomized controlled trials in children with constipation failed to show a significant resolution of symptoms following high fibre diet[50,51]. Another recent trial failed to demonstrate any significant advantage of fibre supplement over conventional lactulose therapy[52]. Therefore, further trials are clearly needed before recommending dietary supplements as a treatment modality for constipation in children. Similarly, two studies performed to assess the value of water intake in constipation failed to demonstrate a significant effect on stool output or consistency[53,54].

Disimpaction

Traditionally rectal faecal impaction is treated with enemas and suppositories. However, there is a growing body of evidence that oral drugs can be used effectively in faecal disimpaction.

Polyethylene glycol (PEG) 3350 given orally was proven to be the best pharmacological agent in disimpaction of faeces in children[55]. In a multicentre retrospective study, PEG 3350 plus electrolytes given for 5 day were reported to be more successful in disimpaction in children with intractable constipation than enemas, suppositories or manual evacuation under anaesthesia[56]. Similarly, another study involving children with intractable constipation showed successful clearance of impacted faeces in 92% following treatment with PEG plus electrolytes[57].

Phosphate enemas are still useful in children who do not respond to oral medications. It is necessary to use a sedative before administrating enemas to minimize discomfort and psychological effects. Phosphate enemas should be administered under medical supervision in a hospital because if phosphate is retained without passing stools there is a risk of hyperphosphataemia and hypocalcaemia which need emergency medical care.

Maintenance therapy

Laxatives

Several groups of laxative are being used in maintenance therapy (e.g. osmotic laxatives, stimulant laxatives and faecal softeners). Research evidences are scanty for most of the laxatives. However some laxatives are extensively studied in randomized controlled trials.

Osmotic laxatives

Polyethylene glycol (PEG) acts as a powerful, non-digestible osmotic laxative, in addition to faecal disimpactant. According to randomized controlled

trials PEG (PEG 3350 + Electrolytes) was more effective than lactulose as maintenance therapy and in addition, children on lactulose had significantly more re-impaction and needed stimulant laxatives[57]. In contrast, another trial found no significant difference between PEG and lactulose with regards to the stool frequency at 42 and 84 days, but similar to previous study, more hard stools and faecal impaction were noted in the children receiving lactuolse[58]. A recent systematic review has shown that PEG is as good as or better than lactulose or milk of magnesia for maintenance therapy over a wide range of ages[59].

Lactulose is another common osmotic laxative used in paediatric constipation, but its long term efficacy has not been tested properly. One randomized, controlled, cross over trial reported lactulose to be as equally effective as senna[60] while another study reported lactulose to be less effective than liquid paraffin[61]. However it is a drug that is commonly used in the initial maintenance therapy.

Stimulant laxatives

Except senna, the therapeutic value of other stimulant laxatives (e.g. bisacodyl) has not been studied. One open label trial had shown that senna was as effective as lactulose in increasing the number of stools a week[60]. Another single blind study comparing senna with mineral oil found that mineral oil was more effective than senna in increasing bowel frequency[62]. Stimulant laxatives are important in the maintenance phase when osmotic laxatives alone are not sufficient to sustain regular bowel motions.

Other treatments

Rectal enemas

According to a recent therapeutic trial, rectal enemas are successful in normalizing stool frequency in the initial period of management, but the final outcome was not different indicating that rectal enemas have no added benefit in long-term maintenance therapy[63].

Biofeedback therapy

During biofeedback, patients receive visual and auditory feedback on the functioning of their anal sphincter and pelvic floor muscles. Biofeedback is used to train patients to relax their pelvic floor muscles during straining and to coordinate this relaxation with abdominal manoeuvres to enhance the entry of stools into the rectum[64]. Adult studies had shown that biofeedback improves clinical outcome of patients with pelvic floor dyssynergia[65,66]. One randomized controlled study has assessed the therapeutic value of biofeedback in the management of constipation in children and this study failed to show significant clinical improvement over the conventional therapy[33]. Exact valued of biofeedback in management of childhood constipations has to be established later.

New therapeutic agents

New therapeutic options like Tegaserod, (a serotonin receptor agonist), Lubiprostone (a bicyclic fatty acid), and Alvimopan (a μ-opioid receptor antagonist) need further research involving children before they are used in paediatric practice.

Probiotics are live bacterial preparations used in many gastrointestinal diseases. One randomized controlled trial on effectiveness of *Lactobacillus* GG as an adjunct to lactulose for children with constipation failed to show an additional therapeutic benefit[67].

Surgery

Surgical options are reserved for children suffering from intractable constipation which does not respond to intense medical management. Sigmoid colectomy was a suggested option in severe cases. Caecostomy with antegrade colonic enemas are becoming popular. Botulinum toxin injection to anal sphincter in cases of pelvic floor dyssynergia is another therapeutic procedure employed by surgeons.

Long term prognosis

Van Ginkel et al followed up 418 children with chronic constipation and noted that 30% of these children continued to have constipation beyond puberty with several complications associated with it[68]. Furthermore, Chitkara et al noted that children who have an early (<5 years) medical visit due to constipation were approximately three times more likely to have subsequent medical visits due to the same condition and to have symptoms throughout early adulthood compared with children who present later in life[69]. Therefore contrary to popular belief that children outgrow their constipation, in some children it may become chronic treatment resistant constipation.

Summary

Constipation is a common paediatric problem affecting children and adolescents worldwide. The majority have functional constipation. Exact cause of symptoms is unclear in most patients, but emotional stress leading to alteration of the brain gut axis seems to play an important role. It is predominantly a symptom based diagnosis and investigations including anorectal manometry and colonic transit studies are reserved for treatment resistant constipation. Multifaceted management approach including education, toilet training, judicial use of laxatives both in disimpaction and

maintenance are the key steps in management. Since most treatment options are not evidence based, good quality randomized controlled trials are required to assess their efficacy in paediatric constipation. A significant percentage of children with constipation continue to have symptoms during adulthood in contrast to the common misconception that children outgrow constipation and therefore long term follow up is mandatory in management of this condition.

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