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Childhood constipation

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Constipation is common in children, affecting between 5% (longer duration) and 30% (duration less than six months) of school aged children in the United Kingdom.[1 2] It accounts for 3% of general paediatric consultations and 25-30% of consultations with paediatric gastroenterologists.[1 2] Symptoms at presentation are variable, and the condition has often progressed to cause substantial discomfort, pain, and secondary effects, which require efficient and prolonged treatment.

Successful management depends on recognising common causes and excluding rare ones; explaining the functional causes, clinical diagnosis, and treatment principles to the patient and family; individual tailoring of treatment; achieving adherence; and providing personalised continuity of care. Because evidence for pathogenesis and treatment is limited, this review summarises current evidence and aims to provide practical advice in primary care.

What is childhood constipation?

The term constipation describes a collection of symptoms rather than a specific disease in childhood. Diagnosis therefore relies on the reported symptoms, accurate description of bowel habits, interpretation, and examination.[2] An international group has classified constipation among the spectrum of functional bowel disorders and provided a diagnostic definition.[3] The definition includes reduced frequency of defecation, occurrence of faecal incontinence (soiling, encopresis), stool retention (faecal impaction), painful or hard bowel movements, or large diameter stools (box 1).

How common is the problem and who gets it?

A systematic review showed a worldwide prevalence of childhood constipation of 0.7-29.6% (median 12%). Prevalence was 10-20% in the United States and UK and 20-30% in Australia, South Africa, and China.[4] Constipation can affect just one child in a family, but in some families several family members from one or different generations can be affected.[1 3-5]

What causes constipation?

Systematic reviews conclude that the underlying causes are functional and multifactorial in 90% of children with constipation.[1-3 5] Causes include problems with the autonomic and somatic nervous system, motility of the colon, muscles of the pelvic floor and anal sphincters, and the child's behaviour.[2]

Observational studies have shown that constipation may follow a change in diet, episodes of pain, febrile infections, and dehydration.[6] Observational studies found a genetic predisposition in a proportion of patients.[2] Constipation was also associated with problems with toilet training, psychological problems, major life events (parental divorce, grievance, bullying, sexual abuse), neurodevelopmental disorders and autistic spectrum, and with drugs (opiates).[2 7]

Prospective cohort studies using transit studies and manometry indicated that a proportion of children showed a delayed colonic transit time[8]; others were unable to relax the pelvic floor when attempting to defecate.[9]

Box 2 summarises the most common organic and non-organic causes of constipation, but for most children the causes are unknown.[10]

A systematic review reported that causes of stool withholding included previous passage of large, hard, or painful stools; anal fissures; serious behavioural problems; lack of time for regular toileting; and distaste for toilets other than the child's own. The review highlighted that these factors play a pivotal role in perpetuating chronic constipation (box 2).[10-12]

How do children with constipation present?

Systematic reviews indicate that children with constipation present with one or more symptoms (box 3). Large prospective trials have shown that only 75% have reduced frequency of defecation.[2] Case series from large studies showed that impaction—a large faecal mass in the abdomen or pelvis—was found in 40-100%,[2 5 9] but they also indicated that occasionally hard faeces had never been passed.[13]

SUMMARY POINTS

- Childhood constipation is common and often associated with faecal incontinence
- An essential aim is to prevent pain associated with defecation
- Invasive investigations are not routinely needed for diagnosis
- Indications for referral are signs of organic disease and review of treatment
- Chronicity can be debilitating and has behavioural and social consequences
- The lack of evidence on causes and treatment suggests that more research is needed

SOURCES AND SELECTION CRITERIA

We searched the Clinical Evidence Database and Cochrane Database of Systematic Reviews. We also consulted National Institute for Health and Clinical Excellence (NICE) clinical guidance 99 (updated June 2012). PubMed was used to identify peer reviewed original articles, meta-analyses, and reviews written in English, mainly published during the past 15 years, or earlier pioneering works. Empirical data are provided when evidence is lacking.

Box 1 | Definition of functional constipation[3 5]

Presence of two or more of the following criteria in the previous one to two months:

- Two or fewer defecations in the toilet each week
- At least one episode of faecal incontinence each week
- History of retentive posturing or excessive volitional stool retention
- History of painful or hard bowel movements
- Presence of a large faecal mass in the rectum
- History of large diameter stools that may obstruct the toilet

According to data from several prospective studies, 75-90% of children with constipation present with faecal incontinence, which describes the involuntary passage of stools and staining in nappies (after having been toilet trained), in the underwear, or in pyjamas. The anal overflow of faeces results from retained, impacted faeces leading to loss of rectal sensitivity, which can occur in smaller amounts (soiling) or larger amounts (encopresis).[2] If impaction is severe, faecal and, potentially, urinary incontinence may occur at night-time.[2] It is rare for neurological problems or anomalies of the anal sphincter to present with childhood constipation or faecal incontinence (table 1).

According to a systematic review, 35-40% of children present with retentive posturing (the position of a child attempting to avoid defecation). This can be seen as squeezing the buttocks together, extending the body, or rocking back and forth.[15]

How is functional constipation diagnosed?

According to National Institute for Health and Clinical Excellence (NICE) guidance, the diagnosis of functional constipation can usually be established by taking a comprehensive history and performing a thorough physical examination. When deciding whether to refer to a general paediatrician or specialist, it is important to recognise medical conditions, such as cows' milk protein intolerance or coeliac disease (box 2), that may require changes in diet or additional treatment, and surgical conditions that present with "red flag symptoms," such as spina bifida and Hirschsprung's disease (tables 1 and 2; fig 1 on bmj.com).[1-3 16]

History

The history should include general health, evidence of systemic disease, dietary habits including introduction of cows' milk, and emotional and social aspects (table 2).[15] The use of a symptom diary and the Bristol stool scale can help determine the pattern of defecation (fig 2).[17] Elucidate the age at which first meconium was passed; when constipation, soiling, or an anal fissure with blood on the stool or toilet paper was first noticed; and the presence of any possible precipitating factors (table 2).

Examination

Document whether the child is failing to thrive, which can indicate a systemic condition. It is often possible to detect an impacted faecal mass in the lower abdomen. Table 1 lists warnings signs for systemic or surgical conditions that can be detected on abdominal, perineal, lumbosacral, and

Table 1 | Findings on physical examination in childhood constipation[10]

Component of history	Features suggestive of functional constipation	"Red flag" symptoms indicating an underlying disorder
Perineum	Normal appearance of anus and surrounding area; 1-2 fissures	Fistulas, bruising, multiple fissures, tight or patulous anus, anteriorly placed anus
Abdomen	Normal; soft abdominal distension; palpable faecal masses indicating impaction	Gross abdominal distension; tenderness with guarding; pathological (high pitched or absent) bowel sounds
Spine, lumbosacral area, gluteal area	Normal	Asymmetry; sacral agenesis; discoloured skin, naevi, or sinus; hairy patch; lipomas; or central pit
Lower limb	Normal gait, tone, strength, and reflex	Deformity; abnormal gait, tone, strength, or reflexes

Box 2 | Causes of constipation by age group[2]

For most children the causes of constipation are unknown.[10] Common organic and non-organic causes (which may coexist) include:

For infants and toddlers

From history
Genetic predisposition
Nutritional change—for example, from human milk (breast feeding) to cows' milk (bottle feeding)
Cows' milk protein allergy
Lack of fibre in the diet
Stool withholding behaviour
Retentive posturing
Coeliac disease

From examination
Anal fissure(s)
Spina bifida
Anorectal malformations
Hirschsprung's disease

For schoolchildren and adolescents

From history
Inadequate food intake
Toilet training coerced
Attention-deficit disorders
Developmental handicaps
Toilet phobia, school bathroom avoidance
Excessive anal interventions

From examination
Anorexia nervosa
Depression
Slow transit constipation

Box 3 | Common symptoms and associated signs of functional constipation in childhood[2 5 10 14]

Faecal impaction (frequency 40-100%)[2]
Soiling or encopresis (faecal incontinence) (75-90%)[2]
Infrequent bowel activity (less than 3 stools/week (75%)[2]
Large stools (75%)[2]
Painful defecation (69%)[5]
Withholding or straining to stop passage of stools (58%)[5]
Abdominal mass (30-50%)[2]
Retentive behaviour (35-45%)[2]
Abdominal and distension (20-40%)
Enuresis or urinary tract infection (30%)[2 6]
Poor appetite (25%)[2]
Anorexia (10-25%)[2]
Fissures or haemorrhoids (5-25%)[2]
Vomiting (10%)[2]
Rectal bleeding (7%)[5]
Anal prolapse (3%)[2]
Foul smelling wind and stools (empirical symptom)
Excessive flatulence (empirical symptom)
Occasional enormous stools or frequent small pellets (empirical symptom)
Lack of energy, "feeling not well" (empirical symptom)
Unhappy, angry, or irritable mood (empirical symptom)

Psychological and social problems associated with childhood constipation (20%)[2]

Moodiness
Disobedience, disruptive behaviour
Attention-deficit/hyperactivity disorder
Poor social competence and learning disabilities
Anxiety or symptoms of depression
Less expressive and poorly organised family environments
Poor school performance

Table 2 | History taking in childhood constipation[10]

Component of history	Features suggestive of idiopathic constipation	"Red flag" symptoms indicating an underlying disorder
Onset and precipitating factors	Starts after a few weeks of life; fissure, change of diet, infections, timing of potty or toilet training, moving house, starting nursery or school, fears and phobias, major change in family, taking drugs	From birth
Passage of meconium	First stool passed with 48 hours of birth	First stool passed more than 48 hours after birth in term infants
Stool patterns	Overflow soiling—frequent loose stools alternating with infrequent hard stools; "rabbit droppings;" large, infrequent stools that can block the toilet; retentive behaviour; previous or current anal fissure	Ribbon-like stools; explosive offensive stool associated with gross abdominal distension or severe vomiting (particularly bilious)
Growth and general wellbeing	Generally well; weight and height within normal limits	Failure to thrive; evidence of maltreatment
Locomotor development	Normal neurological or locomotor development	Undiagnosed weakness in legs; locomotor delay
Diet and fluid	Changes in infant formula, poor diet, insufficient fluid intake	

lower limb examination.[4] As part of the neurological examination, touching the perianal and gluteal region using a Q-tip (cotton swab), the persistent lack of any perineal sensation (tickle or gluteal contraction) may indicate spinal or other neurological pathology.[15]

Rectal digital examination

NICE specifically recommends against routine digital rectal examination, unless performed by someone with expertise to interpret anatomical abnormalities or Hirschsprung's disease.[10]

Imaging

NICE recommends that abdominal imaging (radiography or ultrasound) is not indicated if the history and physical examination clearly indicate constipation.[10 11] Although imaging may help clarify uncertainty about an abdominal mass—for example, in obese children,[2 15] a systematic review found that sensitivity and specificity in diagnosing functional constipation are poor.[18]

Blood tests

Blood tests are not needed to confirm the diagnosis. However, blood tests are need to exclude hypothyroid disease, coeliac disease, and electrolyte disturbances in children with constipation that is resistant to treatment or is associated with other clinical symptoms.[10] Single centre reviews indicate that the prevalence of coeliac disease (1.9%) and hypothyroidism (1%) is increased in constipated children.[19 20]

Do invasive investigations have a role?

Inform parents that small retrospective studies and systematic reviews show that it is rarely necessary to perform gastrointestinal endoscopy, anorectal manometry, or transit studies to discriminate functional constipation from other causes.[1 16 18] Referral for endoscopic investigation may be indicated to clarify the cause of rectal bleeding (for example, uncertainty or unresponsiveness to treatment for an anal fissure) or in chronic severe abdominal pain that does not respond to optimised treatment.

Treatment of constipation

The aims are to establish normal frequency and consistency of stools, to enable complete painless faecal evacuation, and to resolve any rectal bleeding or faecal incontinence. Treatment regimens should minimise invasive procedures, allow normal social interactions, and prevent relapse. The treatment principles are education, disimpaction, prevention of reaccumulation of faecal loading, and continued follow-up.[2]

Education of children and parents or guardians

Systematic reviews of four large prospective studies showed that education about constipation and toilet training, the use of a bowel habit diary (with a reward system for younger children), assessment of adherence with regular review of drugs for disimpaction and maintenance, and clear information on expected treatment duration are important for success.[1 2 10 16] It is essential that stool type is understood and recorded using the Bristol stool chart, and that the child is aware of the correlation between impacted stool and involuntary overflow. Encourage children to attempt defecation daily after each meal for five minutes, if necessary supported by a footrest to allow for active straining.[2]

Medical treatment

Oral treatment with an osmotic laxative (such as polyethylene glycol or lactulose), alone or combined with a stimulant laxative (such as bisacodyl), is indicated for all age groups of children (table 3).[21]

On the basis of systematic reviews and a meta-analysis of four well conducted trials, NICE guidance recommends polyethylene glycol (PEG) as first line treatment.[10] PEG promotes disimpaction, improves stool frequency and consistency, reduces pain at defecation and straining, and has fewer side effects than lactulose (table 3).[10] PEG increases water content in the large bowel, whereas lactulose works by promoting fermentation, which results in faecal volume expansion and accelerated transit. In contrast, stimulant laxatives increase bowel motility, whereas rectal suppositories and enemas exert their effect by local stimulation.

A medium sized randomised trial found that lactulose was more effective than senna in regulating normal stool configuration.[1 10] There is no evidence for the use of stimulant laxatives. On the basis of three systematic reviews, senna is recommended as second line combination treatment in the UK, whereas prospective data about other stimulant laxatives are lacking.[1 10 21] A systematic review found no evidence for clinical effectiveness of bulk forming laxatives in children.[10]

A recent systematic review from 14 high quality studies found that, in general, osmotic laxatives, stimulant laxatives, and faecal softeners had infrequent and mild adverse effects.[10] The side effects of PEG included abdominal pain (39%), continued (20%) or transient diarrhoea that resolved after dose adjustment (10-15%), flatulence,

and vomiting. For lactulose, side effects included abdominal and rectal pain, diarrhoea, bloating, flatulence (10% each), and colic (5%). For senna they included colic (52%), diarrhoea (10%), and abdominal distension (5%).

Disimpaction

NICE concluded that faecal retention or impaction can be diagnosed by taking an appropriate history, asking the parents about the presence of overflow soiling and bowel habits, and by the detection of palpable faeces on abdominal examination.[10]

According to systematic reviews effective disimpaction is a prerequisite for successful maintenance treatment.[1 2 6 10 21] Without disimpaction, osmotic laxatives for maintenance treatment increase overflow diarrhoea.[2 10 16] One small well conducted prospective trial assessing the dose effects of PEG 3350 suggested that a dosage of 1-1.5 g/kg/day over three days resulted in efficient and safe evacuation of the impacted faeces.[10 16] NICE recommends the use of PEG 3350 plus electrolytes for all age groups in an escalating dose regimen as first line treatment, with the addition of a stimulant laxative (senna, sodium picosulfate, bisacodyl, or docusate sodium) after two weeks if disimpaction is not achieved (table 3).[10] The osmotic (PEG *v* lactulose) or stimulant laxative may need to be changed if problems persist. When appropriate prolonged medical treatment fails, a randomised controlled trial has shown that rectal applications can prevent complications of a megarectum by improving colonic transit time and reducing rectal distension.[12] In the UK, sodium citrate enema is usually prescribed by paediatricians and specialists when oral treatment has failed.[10]

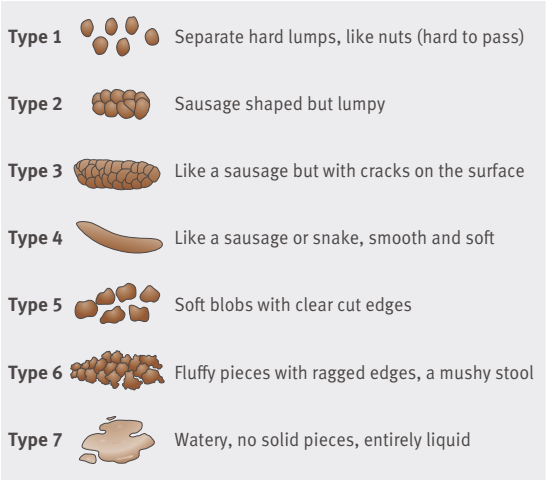

Fig 2 | Bristol stool chart[17]

Table 3 | Recommended laxatives[2 10 21]

Laxative	Dosage	Side effects
Lactulose	1 month to 1 year: 2.5 ml twice daily[10 21]	Flatulence, abdominal pain
	1-5 years: 2.5-10 ml twice daily[10 21]	
	5-18 years: 5-20 ml twice daily[10 21]	
	European guidelines: 1-3 ml/kg twice daily[2]	
PEG 3350 for disimpaction	<1 year: Movicol paediatric plain, maximum 1 sachet daily[10]	Loose stools, bad taste (PEG + electrolytes)
	1-5 years: Movicol paediatric plain, maximum of 8 sachets daily[10]	
	5-12 years: Movicol paediatric plain, maximum of 12 sachets daily[10]	
	12-18 years: Movicol (adult), maximum 8 sachets daily	
	European guidelines: 0.26-0.84 g/kg/day[2]	
PEG 3350 for maintenance	<1 year: Movicol paediatric plain, maximum of 1 sachet daily[10]	Loose stools, bloating and flatulence, nausea, vomiting
	1-12 years: Movicol paediatric plain, maximum 4 sachets daily[10]	
	12-18 years: Movicol (adult), maximum 3 sachets daily[11]	
	European guidelines: 1-1.5 g/kg/day (3-4 days)[2]	
Bisacodyl oral	4-18 years: 5-10 mg at night[10]	Abdominal cramps, abdominal pain, diarrhoea
Bisacodyl rectal	2-18 years: 5-10 mg suppositories[10]	Abdominal cramps, anal irritation, abdominal pain
Glycerin suppositories	<1 year: 1 paediatric suppository (1 g)[21]	Anal irritation
	1-12 years: 1 suppository (2 g)[21]	
	>12 years: 2 suppositories (4 g)[21]	
Docusate sodium	6 months to 2 years: 12.5 mg three times daily[10 21]	Abdominal cramps
	2-12 years: 12.5-25 mg three times daily[10 21]	
	12-18 years: up to 500 mg in divided doses[10 21]	
Sodium acid phosphate + sodium phosphate enema (Fleet)	3-7 years: 40-60 ml once daily[21]	In patients with renal problems or Hirschsprung's disease: hyperphosphataemia, electrolyte disturbance
	7-12 years: 65-100 ml once daily[21]	
	12-18 years: 90-118 ml once daily[21]	
Sodium citrate enema	3-18 years: 5-10 ml once daily[21]	Anal irritation
Sodiumlaurylsulfoacetate enema (Micro-enema)	1 month to 18 years: 5 ml once daily[21]	Anal irritation
Senna syrup (7.5 mg/5 ml)	1 month to 4 years: 2.5-10 ml once daily[10]	Abdominal cramps, melanosis coli, yellowish brown urine
	4-18 years: 2.5-20 ml once daily[10]	
Sodium picosulfate (5 mg/5 ml)	1 month to 4 years: 2.5-10 mg once at night[10]	Abdominal cramps
	4-18 years: 2.5-20 mg once at night[10]	
Lavage PEG 3350 orally or nasogastric tube	Oral: 15.5-183 ml/kg; first stool expected after 2.8 hours[2]	Nausea, vomiting, abdominal cramps, pulmonary aspiration or oedema
	Nasogastric tube: 1-1.5 g/kg/day (3-4 days); first stool expected after 1.9 days[2]	

PEG=polyethylene glycol.

Enemas work best if the stool is at least partly formed, so oral osmotic laxatives should be stopped during rectal treatment or started thereafter.[2 10] On the basis of a small randomised controlled trial, PEG 3350 is licensed in the UK as a bowel cleansing solution or for treatment in distal intestinal obstruction syndrome.[22] However it requires hospital admission, risk assessment for administration of a nasogastric tube, and strict control of the tube position and electrolyte control.[22]

Maintenance

Start and continue maintenance treatment immediately after disimpaction. Although the dose should be adjusted to produce a daily soft stool, it is equally important to achieve complete rectal evacuation every one to two days without straining. PEG is the recommended first line treatment (with lactulose as an alternative). Start with a maintenance dose that is about half that used for disimpaction.[10]

If PEG does not work even in optimal dosage, try combining it with a stimulant laxative. After sustained improvement (at least three months), gradually reduce the dosage over months to maintain stool consistency, frequency, and complete rectal evacuation.[10]

It is important to provide advice on the expected time scale, safety, possible side effects, and signs of undertreatment or overtreatment. Parents need reassurance that the drugs do not induce dependency but will need dose adjustment, and that adherence is essential.[2 6 10 21]

Diet and lifestyle interventions

A well conducted prospective trial found that fibre has a positive effect on stool frequency and consistency and abdominal pain.[23] Ask whether the introduction of cows' milk triggered the onset of constipation. A systematic review of four prospective studies found that constipation and anal fissures were associated with a cows' milk diet and improved on elimination in a subgroup of children.[24]

A systemic review of nine prospective randomised controlled trials of limited quality that investigated non-drug based treatments of chronic childhood constipation found no significant benefits from increased fluid intake, exercise, prebiotics, probiotics, behavioural therapy, biofeedback, multidisciplinary treatment, or forms of alternative medicine.[25]

Management plan: when and where to refer

Diagnosis and management are possible within primary care services and require regular and frequent review by the general practitioner, health visitor, community nurse, or school nurse. Referral to general paediatricians is indicated for refractory constipation or to investigate secondary symptoms (such as failure to thrive) (fig 1). Hospital admission may be required to effect disimpaction.

Indications for referral to paediatric gastroenterologists or surgeons include suspected organic conditions that require a specific treatment or other problems, such as undefined rectal bleeding.

Severe chronicity of symptoms (persistent soiling) requires healthcare planning with community services, psychological services, and social services.[2]

When is surgical involvement needed in children with functional constipation?

Surgical input is needed to diagnose Hirschsprung's disease by rectal biopsy and rarely to carry out inspection and anal calibration in undiagnosed anorectal malformations. Furthermore, if examination of the spine raises suspicion of occult spinal pathology, such as tethered cord syndrome or spina bifida occulta, a surgical review is needed to correlate clinical findings and magnetic resonance imaging of the spine.[10]

One longitudinal observational study of children with faecal impaction reported the successful management of soiling in 52% of children with manual evacuation and continued enema disimpaction.[26]

When is a rectal biopsy needed?

In 80-90% of cases, Hirschsprung's disease presents in the neonatal period with bile stained vomiting and evidence of distal bowel obstruction on radiography. A large retrospective observational study indicated a low yield of positive biopsies in suspected idiopathic constipation. A rectal biopsy is always indicated for delayed passage of meconium (>48 hours), severe constipation in Down's syndrome, enterocolitic episodes, or if there is no response to an appropriate bowel management strategy.[27] Biopsy should be performed in a centre with expertise in the condition (paediatric surgeon and histopathologist).

Fissure in ano

Evidence from a randomised controlled trial indicated that anal fissures have a high spontaneous healing rate with medical treatment, so interventions such as anal stretch, lateral anal sphincterotomy, or intrasphincteric injection of botulinum toxin are rarely indicated.[28]

Indications for anal procedures in functional constipation

If faecal impaction persists despite appropriate medical treatment, manual evacuation under general anaesthesia by a paediatric surgeon may be required. A double blind randomised controlled trial found no benefit for anal dilatation.[29] A small double blind randomised controlled trial found that intrasphincteric injection of botulinum toxin was as effective as internal sphincter myectomy in the management of refractory constipation.[30 31]

Is there any evidence that functional constipation should be managed surgically?

Intervention studies suggest a role for appendicostomy or tube/button caecostomy antegrade colonic enema in cases refractory to conservative treatment after the age of 6 years.[10] Access is provided to the proximal colon via a small

TIPS FOR NON-SPECIALISTS

Children with constipation can present with a variety of symptoms, including faecal incontinence, rectal bleeding, and abdominal pain

Treatment success depends on early recognition and administration of osmotic laxatives. The dosage and duration of treatment need to be sufficient and a combination of drugs may be needed

Surgical treatment is appropriate and effective in a subgroup of patients

AREAS FOR FUTURE RESEARCH

Validation of non-invasive tools to diagnose degree of faecal impaction

Prospective studies investigating regimens for disimpaction and maintenance as monotherapy or combination treatment

Licensing of oral medicines and rectal preparations for all age groups

Prospective studies to better define the causes and outcome of early onset constipation and of refractory constipation and faecal incontinence

stoma in the lower abdomen, which is used for flushing (irrigation) the bowel with fluids using a catheter. Sizeable cohort studies show improvement in continence, soiling, quality of life scores, and management failure, as well as resolution of symptoms, albeit associated with appreciable morbidity.[31-33] Colostomy has been widely used to manage overflow soiling and megarectum with the option of eventual restoration of continuity.[34]

Transit studies are useful to distinguish between pancolonic and distal motility problems, or between functional faecal incontinence with or without constipation.[18] One large observational study demonstrated spinal cord pathology in 3% of children with idiopathic constipation and normal neurological examination using magnetic resonance imaging of the spine. All children responded to medical treatment of constipation.[35]

What is the prognosis in childhood constipation?

Two large longitudinal outcome studies reported multiple relapses after the initial treatment, particularly in boys, in children under 4 years of age, in those with a background of psychosocial or behavioural problems, or when constipation was associated with encopresis.[16 27 36] Overall, resolution of constipation occurred in 50% of children after one year and 65-70% after two years. A third of children followed up beyond puberty continued to have severe problems.[27]

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