

Continuing Medical Education

Constipation in Children and Adolescents

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Summary

Background: According to a population-based study, approximately 6.8% of children and adolescents in Germany suffer from acute or chronic constipation. It can be of organic or functional origin and may be associated with comorbid disturbances, particularly fecal incontinence.

Methods: We selectively searched the PubMed and Google Scholar databases for articles with the keywords “constipation,” “children and adolescents,” and “incontinence”. Recommendations are based on the AWMF guideline on constipation and fecal incontinence and on international guidelines and reviews.

Results: More than 90% of cases of chronic constipation are of functional origin. Organic causes vary with age and call for targeted differential diagnosis. Invasive tests are only rarely necessary. Functional constipation may be associated with fecal and urinary incontinence, and the relative risk of urinary tract infections is 2.2 to 6.5. There may be associated psychological symptoms and mental disorders in 30–50% of cases. The cornerstone of treatment is patient and parent education, along with laxative medication and toilet training. Instructional programs have been found effective in otherwise refractory cases.

Conclusion: The treatment of constipation in childhood should begin as soon as the differential diagnostic evaluation is completed. The education of parents, follow-up at close intervals, and drug treatment and behavioral therapy that are adapted to the symptoms can improve quality of life.

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Acute and chronic constipation are among the more common abdominal disorders in childhood and adolescence and are an important element of the differential diagnosis of acute and chronic abdominal pain as well as of chronic diarrhea, fecal incontinence, daytime urinary incontinence, and nocturnal enuresis. Its pathogenesis and clinical features are very different from those of constipation in adults.

Daily activity and quality of life of children and parents might be impaired due to not taking the constipation problem seriously and lacking attention to treatment. The development of fecal continence can be delayed, impairing the child's self-esteem and quality of life.

Frequency

Constipation is one of the more common abdominal disorders in childhood and adolescence and is an important element of the differential diagnosis of acute and chronic abdominal pain as well as of chronic diarrhea, fecal incontinence, daytime urinary incontinence, and nocturnal enuresis.

Learning objectives

This article provides an overview of the causes of constipation and practical recommendations for its targeted diagnosis and treatment. It is intended to enable the reader to know the specific requirements of different age groups, and to:

- distinguish constipation as a symptom from functional constipation as a nosological entity, and recognize red flags and typical differential diagnoses and comorbid disorders;
- carry out a structured evaluation, from medical history-taking to laboratory testing and (rarely) ancillary studies;
- know the approaches to treatment in acute and chronic cases, and carry out long-term treatment.

High level of suffering and its consequences

Constipation can cause a great deal of suffering, particularly because it is often regarded as a harmless feature of day-to-day life and is thus not treated with the proper attention. The development of fecal continence can be delayed, impairing the child's self-esteem and quality of life.

BOX 1

ROME-IV criteria for functional constipation* (2)

- 2 or fewer defecations in the toilet per week in a child of a developmental age of at least 4 years
- At least 1 episode of fecal incontinence per week
- History of retentive posturing or excessive volitional stool retention
- History of painful or hard bowel movements
- Presence of a large fecal mass in the rectum
- History of large diameter stools that can obstruct the toilet

Additionally:

After appropriate evaluation, the symptoms cannot be fully explained by another medical cause.

Two or more of the following criteria in children with a developmental age of at least 4 years, for a duration of at least one month

Methods

The recommendations in this nonsystematic review are based on the European and international guidelines, the AWMF interdisciplinary guideline, and Cochrane analyses and reviews (1).

Definitions and epidemiology

Constipation is generally defined according to the ROME-IV conference criteria for functional constipation (Box 1) (2).

Epidemiology

A population-based study of 1206 children in Germany with a mean age of 5.7 years revealed that 6.8% suffered from constipation (95% confidence interval for the age of the children, [5.5; 8.4]) (3). Constipation and its associated symptoms accounted for 3% of outpatient visits to pediatricians and 25% of visits to pediatric gastroenterologists (4). Estimates of the pooled prevalence of functional constipation around the world range widely, from 0.5% to 32.2%, with mean values of 8.6% in boys and 8.9% in girls (5). The prevalence appears to have risen in recent decades, possibly because of changes in lifestyle and dietary habits (6). Constipation often begins in early childhood (7). There is a high risk of chronification into adulthood (8).

Epidemiology

A population-based study of 1206 children in Germany with a mean age of 5.7 years revealed that 6.8% suffered from constipation.

Organic causes of constipation

It is rare for chronic constipation to have an organic cause in toddlers, school-age children, and adolescents (circa 5%) (9), but more common in infants ([10], Box 2). Slow-transit constipation with a prolonged colonic transit time is much less common than retentive constipation in childhood and adolescence (in a ratio of ca. 1 : 300–1 : 650); it is found mainly in the context of an underlying disease or of refractory chronic functional constipation (9, 10).

Functional constipation

Functional constipation (ca. 95% of cases) must be present for at least one month, by definition. Acute constipation calls for prompt, appropriate treatment, so that it does not become chronic and lead to marked additional morbidity (11).

The pathophysiology of functional chronic constipation is multifactorial: constitutional and genetic factors, exercise, diet, and psychological factors all play a role. A low-fiber diet and low fluid intake are often included, without evidence, among the causes of chronic constipation (12, 13). Nor is there any clear association of defecation disturbances with obesity. Changes of the gut microbiome have been considered both a cause and an effect of constipation (13).

In children in the toilet-training phase, kindergarten, and primary school, fecal retention is often triggered by unpleasant experiences associated with defecation (here, the unacceptable condition of toilets may play a role, as well as painful defecation). Fear of pain during defecation causes paradoxical tension of the voluntary sphincters during defecation; a vicious cycle arises that can lead to chronification (14).

Parents also describe typical postures in constipated young children with constipation that impede relaxation of the pelvic floor („retentive posturing,“ hyperextension, crouching, holding the abdomen, gluteal muscle contraction) (15). Dilatation of the rectum and sigmoid colon develops. Incontinence may result from leakage of liquid stool between scybala (lumps of stool thickened by dehydration).

Symptoms and signs of constipation

Constipation is characterized by painful defecation, fecal retention with decreased frequency of defecation, large and hard stool masses, and unusual behaviors, e.g., writhing and other movements that tend to close the sphincter muscles; often, it is associated

Prevalence

Constipation often begins in early childhood. There is a high risk of chronification into adulthood.

BOX 2

Organic causes of constipation in children (1, 11)

- **Neurological and neuromuscular disorders**
 - cerebral palsy, especially with lower limb spasticity
 - muscular atrophy or dystrophy with generalized hypotonia
 - collagenous disorders such as Ehlers-Danlos syndrome
 - diseases of the spine and spinal cord
 - spina bifida with or without myelomeningocele
 - anterior sacral meningocele (Currarino syndrome)
 - spinal tumors
 - paraplegia, trauma
 - tethered cord
 - myelodysplasia
- **Diseases of the anorectum**
 - Hirschsprung's disease (also after surgical correction)
 - intestinal neuronal dysplasia
 - anorectal malformation (also after surgery)
 - anal stenosis
 - ventrally displaced anus (anal dystopia)
 - anal achalasia (lack of sphincter relaxation with normal parasympathetic ganglion cells)
 - Crohn's disease of the anus with inflammatory rectal or anal stenosis
 - anal fissures, perianal dermatitis (due to streptococcal infection, lichen sclerosus, psoriasis)
- **Gastrointestinal and abdominal disorders**
 - Hirschsprung's disease (also after surgical correction)
 - chronic pediatric intestinal pseudo-obstruction (PIPO)
 - visceral/autonomous neuropathy
 - smooth-muscle myopathies
 - mesenchymopathies
 - abnormal abdominal musculature (e.g., "prune belly")
 - myotonic dystrophy
- **Constipation due to endocrine, metabolic or allergic diseases**
 - celiac disease
 - food allergy, especially cow's milk allergy
 - cystic fibrosis with pancreatic insufficiency
 - hypothyroidism
 - hypokalemia, hypercalcemia
 - severe dehydration
 - diabetes insipidus
 - diabetes mellitus
 - porphyria
 - uremia
 - multiple endocrine neoplasia type 2B
- **Constipation due to drugs and toxins**
 - opiates, including codeine
 - anticholinergic drugs
 - calcium-channel blockers
 - phenytoin
 - methylphenidate
 - antidepressants, antipsychotic drugs
 - chemotherapeutic agents
 - lead poisoning
 - vitamin D intoxication
 - aluminum-containing antacids
 - botulism
- **Constipation due to lifestyle factors**
 - excessive consumption of cow's milk
 - excessive exclusive consumption of low-fiber, highly processed foods
 - absolute lack of exercise

with fecal incontinence (encopresis) and/or phases of paradoxical diarrhea. 75% of children with functional constipation also have abdominal pain; functional constipation with abdominal pain is not always clearly distinguishable from irritable bowel syndrome with constipation (15).

Constipation and comorbid urinary manifestations

Constipation with or without fecal incontinence frequently is associated with functional urinary incontinence, nocturnal enuresis, and recurrent urinary tract infections is common and is designated internationally

by the term "bladder and bowel dysfunction" (16, 17). In a study of 63 children aged 4 to 18 years, a subgroup was found to have functional constipation; among these children, 9 (28.1%) had fecal incontinence and 14 (43.8%) had daytime urinary incontinence (18). Conversely, for children with constipation, the relative risk of urinary tract infections is 2.18–6.55, and that of lower urinary tract symptoms is 1.24–6.73 (19).

In children with "bladder and bowel dysfunction," the primary treatment of constipation leads to the improvement or resolution of the bladder symptoms in 96% of cases (20, 21).

Organic causes

It is rare for chronic constipation to have an organic cause in toddlers, school-age children, and adolescents, but more common in infants.

Symptoms and signs of constipation

Constipation is characterized by painful defecation, fecal retention with decreased stool frequency, large and hard stool masses, and unusual behavior.

BOX 3

Red flags suggesting an organic cause of constipation (1)

- **History**
 - late first meconium discharge (> 48 hours after birth)
 - onset of constipation soon after birth or in infancy
 - pencil-like caliber of stool
 - primary, persistent urinary incontinence
 - lack of appetite, vomiting (especially bilious vomiting), failure to thrive
 - fever, ileus
 - concomitant developmental disorder
 - polyuria/polydipsia
 - familial history of Hirschsprung’s disease
 - bloody stools in the absence of anal rhagades/fissures
- **Physical examination**
 - extreme anxiety or inappropriate extreme openness on anal inspection (also occurs in traumatized children with functional constipation)
 - abdominal protrusion (distension)
 - thyroid abnormalities
 - empty rectum on digital examination (so-called glove phenomenon)
 - conspicuous anus (position, stenosis), asymmetry of anal folds
 - absent anal, abdominal skin, or cremasteric reflex
 - lumbosacral dimples, hair tufts, lipomas
 - anal scars, perianal dermatitis; perianal psoriasis; lichen sclerosus et atrophicans
- **Course**
 - Intractability despite consistent, appropriate treatment

Constipation and comorbid mental disorders

The rate of comorbid mental disorders is markedly increased in children with constipation (30–50%) (22). These disorders are heterogeneous; they can be of either the internalizing or the externalizing type (e.g., depression and anxiety disorders, vs. social behavior disorder) (23). Children with neurodevelopmental disorders (which are mainly of genetic origin, begin early in life, and tend to persist) are at special risk for constipation and fecal incontinence (24, 25). These disorders include attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorders (ASD), and intellectual disability, among others, and tend to have an unfavorable prognosis. Children with these problems who suffer from constipation require special attention in diagnosis and treatment.

Bladder and bowel dysfunction

Constipation with or without fecal incontinence frequently is associated with functional urinary incontinence, nocturnal enuresis, and recurrent urinary tract infections is common and is designated internationally by the term “bladder and bowel dysfunction”

These comorbid mental disorders need to be recognized, and to be treated concomitantly, in order to improve patient cooperation and optimize the outcome of treatment. Comorbidity does not imply that constipation is necessarily of psychological origin, or that psychotherapy is the appropriate treatment for it. Psychotherapy alone has been shown to be ineffective, unlike the well-established combined approach including counseling, toilet training, and laxatives (26). Many children with functional constipation display distressing mental symptoms that do not reach the level of a defined mental disorder and that resolve once the constipation has been successfully treated. For example, children with constipation may suffer from low self-esteem (e.g., after stigmatization by peers), especially if they are incontinent of stool (25). Psychosocial stress and stressful life events are more common as well (26, 27), and the affected children and their parents have a markedly impaired quality of life (28). A study from Sri Lanka (29) revealed that children with constipation may also suffer from physical abuse (41.6%), emotional neglect (40.9%), and, less frequently, sexual abuse (5.8%). In a recent study from the Netherlands by Vriesman et al. 2022 (30), children with constipation were not abused any more frequently than the controls; social factors may play a role for the different prevalences.

The diagnostic evaluation of constipation in children and adolescents

The diagnostic evaluation of constipation (with or without fecal incontinence) should be clinically oriented and primarily noninvasive. Except in infants and in complicated cases, it can be performed on an outpatient or day-hospitalization basis (1,31).

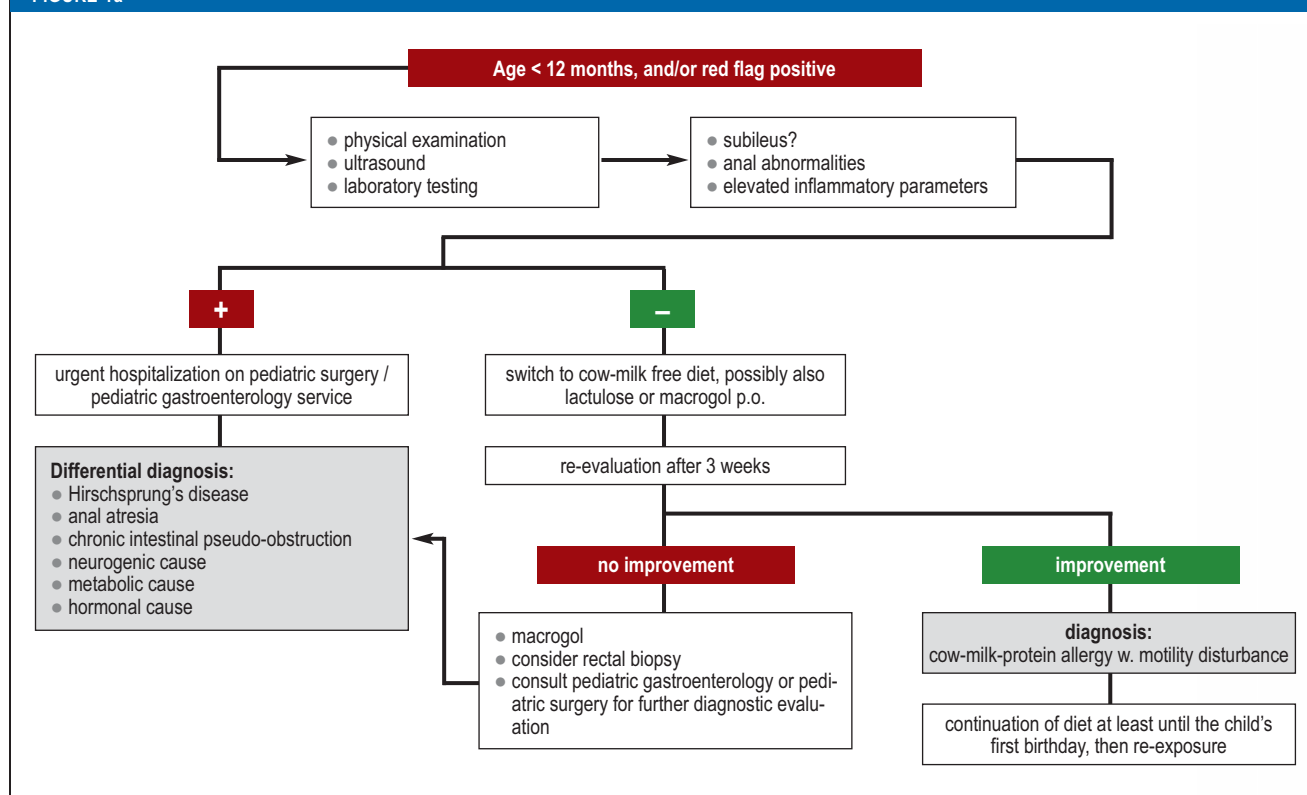
Constipation beginning in the neonatal period or in early infancy

If an infant is not showing any distress and displays no clinical abnormalities despite infrequent defecation (up to once in 14 days in breastfed infants), with a flat and soft abdomen, normal drinking behavior, and appropriate thriving for age, the diagnosis of constipation should not be made. Some infants cry persistently for ten minutes or more and then stop after passing a soft stool; this clinical presentation is called dyschezia, or defecation disorder, according to the ROME-IV (10) and is not termed constipation unless it is accompanied by abnormal clinical findings or stool retention. Anorectal manipulations should be avoided in such children in

Special risk group for constipation

Children with neurodevelopmental disorders (which are mainly of genetic origin, begin early in life, and tend to persist) are at special risk for constipation and fecal incontinence.

FIGURE 1a



The management of chronic constipation in infants in the first year of life who suffer from stool retention, pain on defecation, and infrequent bowel movements.

order not to promote the development of conditioned defecation, e.g., after the insertion of a rectal thermometer. If an infant with delayed meconium evacuation and/or infrequent defecation has a bulging abdomen, is vomiting, or is not thriving and seems impaired, a targeted evaluation should be performed promptly (1, 31). Hirschsprung's disease, in particular, carries a risk of enterocolitis (18.3% preoperatively, 18.2% postoperatively, regardless of surgical technique) and toxic megacolon, with high morbidity and mortality (32).

An important differential diagnosis of constipation in the first two years of life is a non-IgE-mediated cow's milk protein allergy (33). This can only be diagnosed by giving the child a cow's milk exclusion diet (diagnostic diet), followed by re-exposure. Laboratory tests for IgE antibodies have no diagnostic value (34).

Diagnostic evaluation

The evaluation of constipation (with or without fecal incontinence) should be clinically oriented and primarily noninvasive. Except in infants and in complicated cases, it can be performed on an outpatient or day-hospitalization basis.

Warning signs of an organic cause

If any warning signs are present (Box 3), there should be further evaluation for potential organic causes. The procedure depends on the age when bowel-emptying problems began and is shown in detail in Figures 1a and 1b.

The diagnostic evaluation of children aged 1 year and older

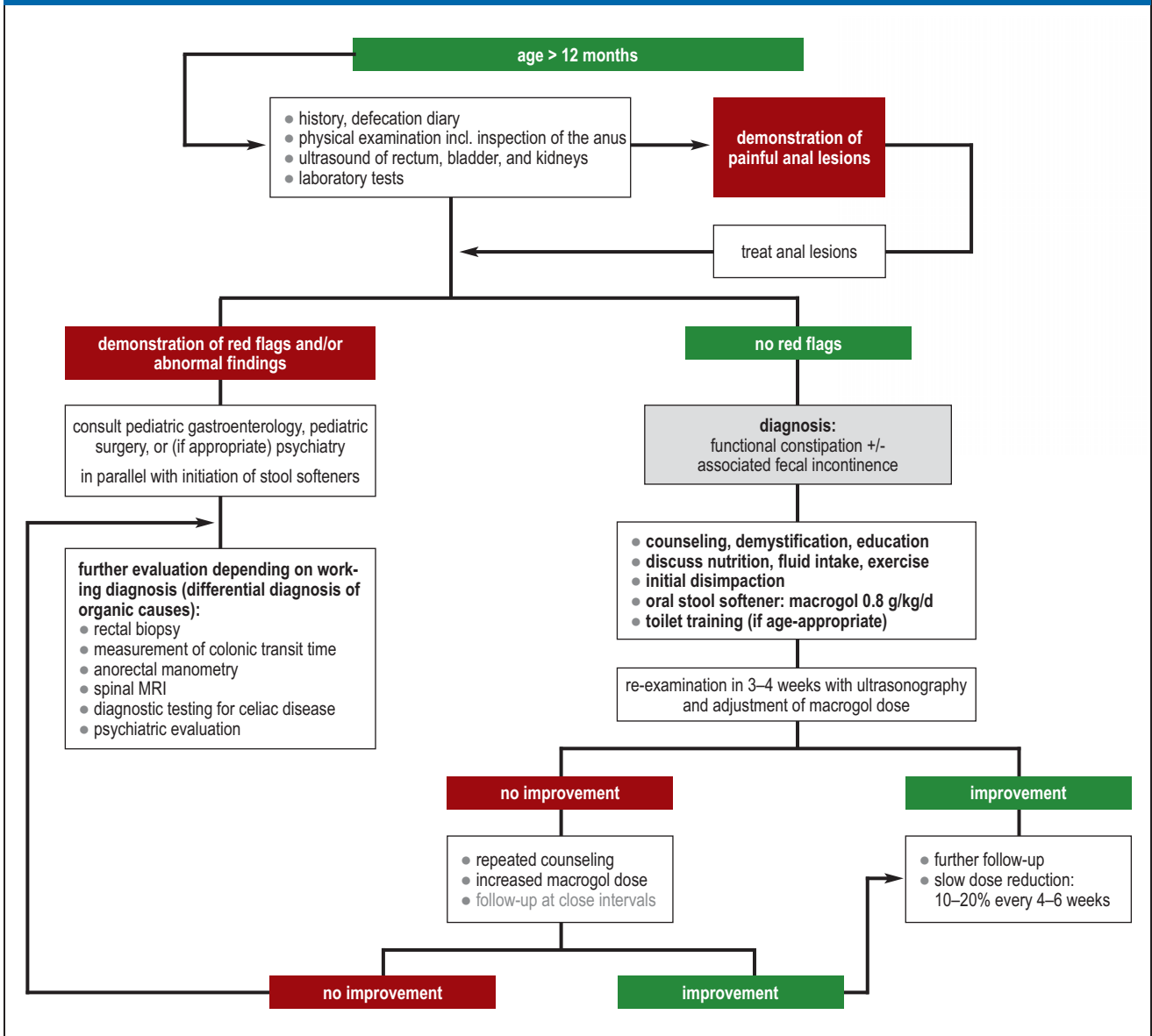
The first step of the standard or baseline diagnostic evaluation is detailed history-taking with regard to the duration and severity of the symptoms and stool behavior, including stool frequency and consistency. Questions should also be asked about pain and signs of voluntary retention, typically associated illnesses, a developmental and family history, and warning signs of an organic cause (1).

The warning signs of an organic cause include, in particular, defecation problems in the first weeks of

Onset in the neonatal period or in early infancy

If an infant is not showing any distress and displays no clinical abnormalities despite infrequent defecation (up to once in 14 days in breastfed infants), with a flat and soft abdomen, normal drinking behavior, and appropriate thriving for age, the diagnosis of constipation should not be made.

FIGURE 1B



The management of chronic constipation in children and adolescents over the age of 12 months who suffer from stool retention, pain on defecation, and infrequent bowel movements, or from constipation-associated fecal incontinence. MRI, magnetic resonance imaging

Taking the medical history

A first step of the standard or baseline diagnostic evaluation is detailed history-taking with regard to the duration and severity of the symptoms and stool behavior, including stool frequency and consistency.

Extended history-taking

Questions should also be asked about pain and signs of voluntary retention, typically associated illnesses, a developmental and family history, and warning signs of an organic cause.

life, delayed meconium evacuation (> 24–48 h after birth), and onset of constipation in the first year of life, especially while the infant is still being breastfed or nourished with formula. A likely functional origin is suggested by onset of constipation simultaneously with toilet training or after irritation of the anus, or if the child is observed to be performing stool-retaining maneuvers.

The following typical triggers of functional constipation should be asked about:

- acute constipation with pain during defecation because of stool hardness (e.g., due to fever, dehydration, or improper toilet training)
- voluntary stool retention because no acceptable (!) toilet is available; toilet phobia
- perianal inflammation, fissures, perianal streptococcal infection (*Figure 3*)
- regular anal manipulation (thermometry, suppositories, enemas)
- improper management of acute fecal impaction
- sexual abuse

Patients of the appropriate age should be asked, in an age-appropriate manner, about inappropriate or sexual touching (1).

In view of the high rate of comorbid mental disorders, all children aged 4 years or older with functional constipation should be screened with validated parent questionnaires for mental symptoms and disorders (1). If the questionnaire reveals any abnormalities, further child psychiatric or child psychological evaluation and treatment are recommended.

The affected children should undergo a thorough pediatric examination, including neurologic assessment and anal inspection; particular attention should be paid to the warning signs (*Box 2*). During rectal examination or inspection, the anal reflex should be checked. Rectal digital examination is not indicated in every case, and may cause further trauma in traumatized infants; it should, therefore, be performed only after appropriate explanation, with consent, or under sedation. A person whom the child trusts should be present, and the child's privacy should be respected in an age-appropriate manner (35).

Laboratory tests

A few organic causes may present with constipation as the only clinical sign (in particular, celiac disease). Thus, in chronic constipation, it is reasonable to carry out initial laboratory testing, including TSH, fT4, Ca, K, creatinine, tissue transglutaminase IgA Ab, and total IgA [and endomysium IgA AK, if appropriate], urinalysis, and fecal pancreatic elastase (1).

The goal of treatment

The goal of treatment for constipation and associated fecal incontinence is regular, uncomplicated, complete, and painless defecation.

FIGURE 2



The vicious circle of encopresis, according to Levine (1991). This diagram is used in the USA for parent education and training.

1. Normal colon: moderately filled, normal peristalsis and sensation; 2. Beginning accumulation of stool; 3. Rectum dilated, decreased peristalsis and sensation; hard, "old" lumps of stool are found in the lumen; "fresh," thin stool emerges between the gaps; 4. Treatment: after initial disimpaction and maintenance therapy, there is a smaller lumen, with increased peristalsis and sensation; 5. Successful treatment: return to normal.

Abdominal ultrasound

Abdominal ultrasound is noninvasive, widely available, and an important adjunct to the physical examination, even in the absence of warning signs (35). Attention should also be paid to important comorbidities such as ballooning into the urinary bladder, bladder muscle hypertrophy, megaureters, or hydronephrosis.

A rectal diameter of more than 30–35 mm is an important and reliable indicator of fecal retention and can also be used as a follow-up parameter (36).

The following are not useful components of the evaluation of functional constipation when no warning signs are present (1, 31):

- x-ray and CT studies of the abdomen, because of the radiation exposure, especially if the gonads cannot be adequately protected
- laboratory tests for cow's milk protein allergy
- endoscopy
- manometry
- rectal biopsies
- colonic contrast studies (except preoperatively in Hirschsprung's disease)

Functional origin

A likely functional origin is suggested by onset of constipation simultaneously with toilet training or after irritation of the anus (e.g., rectal thermometry), or if the child performs stool-withholding maneuvers.

From: v. Gontard (2010), *Encopresis: Erscheinungsformen – Diagnostik – Therapie*. With the kind permission of W. Kohlhammer Verlag, 2022.



Figure 3: Perianal dermatitis caused by group A streptococci in a child with constipation and painful fecal retention.

- magnetic resonance imaging
- colon scintigraphy
- colon transit studies

In rectomanometry (study of the physiologic relaxation by sphincteric pressure measurement, involving insufflation of a rectally inserted balloon catheter), the confirmation of a functioning recto-anal inhibitory reflex (RAIR) suggests that the patient does not have an abnormality of innervation (Hirschsprung’s disease) (36, 37), but the sensitivity and specificity of this test are limited.

Rectal biopsies with acetylcholinesterase staining in the native specimen are the gold standard for the evaluation of suspected Hirschsprung’s disease (37). This examination is indicated in patients with constipation starting in early infancy, treatment resistance (usually understood as an inadequate response to appropriate treatment that has been continued for the appropriate period of time), a family history of Hirschsprung’s disease, and lack of a demonstrable recto-anal inhibitory reflex (RAIR) on manometry. Biopsies must contain muscularis propria and be close enough to the anocutaneous junction to capture a short aganglionic segment.

MRI of the lumbosacral distal spine is indicated if the patient displays abnormalities in the lumbo-

sacral region, neurological dysfunction of the legs, or combined, refractory incontinence of the bladder and bowel (38).

Colon transit time determination with radiopaque pellets, in order to exclude a transit delay (“slow-transit constipation”), is helpful in rare cases of intractable constipation (39).

The treatment of functional constipation

The treatment of acute constipation

The pain on defecation that goes along with acute constipation can trigger chronic, functional constipation and must therefore be treated rapidly and effectively (1).

In particular, orally administered stool softeners/laxatives serve this purpose. Patients with fissures should have additional local analgesic and anti-inflammatory treatment (sitz baths, black tea, topical analgesics).

The treatment of chronic functional constipation

The goal of treatment for constipation and associated fecal incontinence is regular, uncomplicated, complete, and painless defecation. For functional constipation, staged multimodal treatment combined with drug therapy has proven effective (1, 31, e1, e3, e4):

- counseling, psychoeducation, and supportive guidance, e.g., illustrated informative material and videos
- active cooperation of parents and children
- insistence on, and promotion of, clean toilets for children
- monitoring of progress, possibly over a longer period of time, to encourage families to implement the treatment suggestions and, if necessary, take corrective measures
- The most important measure is regular, stress-free toilet training under the guidance of the parents (or other main caregivers). This includes sitting on the toilet after the main meals (i.e., 2 to 3 times per day) for 5–10 minutes each time.
- Toilet sessions should be positive experiences. Care should be taken to ensure a comfortable sitting position, so that the child can relax the pelvic floor muscles (e.g., footstools for the feet to rest on, in front of the toilet). The goal is to coordinate defecation according to the time of day. Progress should be documented (to provide an objective record of the results of treatment) and can be effectively reinforced through behavioral therapy by means of reward schedules.

Dietary measures

Dietary measures alone are an insufficient treatment for functional constipation.

Therapeutic success of the maintenance phase

In functional constipation, the necessary initial goal of treatment is evacuation of the retained stool masses (so-called disimpaction). This is very important for the therapeutic success of the maintenance phase.

Dietary measures and lifestyle changes

Dietary measures, prebiotics, or probiotics alone do not constitute sufficient treatment for functional constipation. In a meta-analysis of four pediatric double-blind randomized trials, high-fiber diets did not increase stool frequency any more than placebo (the difference was statistically insignificant) (e6). Probiotics, particularly *Lactobacillus reuteri* and *rhamnosus*, as well as *Bifidobacteria* were studied in multiple randomized controlled trials, either alone or in combination with osmotically active laxatives, and no statistically significant differences were found compared to placebo (e7-e9). Sufficient age-appropriate intake of fluids and fiber, as well as age-appropriate exercise, should be ensured, and children beyond infancy should not drink more than 250 mL of milk per day.

Drug therapy

Drug therapy for functional constipation is divided into an initial disimpaction phase and a maintenance phase. The drug of first choice for this purpose is macrogol (PEG). Preparations with a molecular weight of 3350 with electrolytes, and 4000 without electrolytes, are equivalent (e11).

In maintenance-phase trials, macrogol has been shown to be associated with better treatment responses and tolerability than alternative treatments (e2, e5). For example, in one trial, children taking PEG had a higher stool frequency than children taking lactulose (7.9 ± 0.6 versus 5.7 ± 0.5 stools per week, $p = 0.008$) (e11). A multicenter trial conducted in 2008 on 103 children, with improved stool frequency as the primary endpoint, revealed a better effect with PEG at any of three different doses (PEG 0.2 g/kg, 0.4 g/kg, and 0.8 g/kg) than with placebo (77%, 74%, 73% vs. 42%; $p < 0.001$) (e12). On the other hand, there is still no good evidence for the use of stimulants to treat constipation in children, because of retrospective study designs, small numbers of study subjects, and an insufficient number of randomized controlled trials (e13, e14).

Disimpaction

In functional constipation, the necessary initial goal of treatment is evacuation of the retained stool masses (so-called disimpaction). This is very important for the therapeutic success of the maintenance phase.

The method of first choice is oral disimpaction with macrogol; if there are massive fecal masses in the rectum, rectal disimpaction (usually under sedation) may be necessary, either on an outpatient basis or during a partial hospitalization. A macrogol

BOX 4

Considerations in intractable cases*

- insufficient initial disimpaction
- drug inadequately dosed, or not regularly taken
- inadequate treatment monitoring
- overlooked underlying disease
- concomitant psychological symptoms or psychiatric comorbidities
- sexual abuse/physical abuse/emotional neglect
- punitive parenting style, parent-child interaction disorder

*In very severe, intractable cases, further interventions, including invasive ones, may be discussed in centers with the appropriate experience (1). Repeated anal irrigation, particularly for patients with severe incontinence and those with congenital malformations (e16), and, for very rare indications, botulinum toxin injections into the sphincter (e17) may be considered. Surgical interventions are reserved for special cases (e18).

dose of 1.5 g/kg body weight per day, or even higher, may be used for 3–4 days, followed by a period of dose reduction (1, 31).

Phosphate-containing enemas are strictly contraindicated in young children. They are also dangerous and, therefore, obsolete in older children with other underlying diseases and active avoidance of bowel movements. Sorbitol-containing enemas are an alternative.

Maintenance therapy

Maintenance therapy is based on counseling (e.g., with respect to toilet training, drinking and eating habits, daily routine, and other matters), psychoeducation, motivation enhancement, documentation, and simple behavioral interventions; it should by no means be limited to drug therapy alone (e3, e4). Its duration is usually at least 2–6 months (1, 31). Children who are still in diapers usually need to be treated with stool softeners/laxatives until they are toilet-trained. The success of therapy (regular voiding, soft, creamy stool consistency, no pain during defecation) should be monitored by the treating physician, at close intervals at first, and at longer, but regular intervals thereafter.

Immediately after disimpaction, long-term drug therapy is initiated. In the maintenance phase, the reaccumulation of stool must be avoided, and defecation behavior should be normalized.

The macrogol dose (approved for children over the age of 6 months as a first-line drug) should be

The treatment of functional constipation

For functional constipation, staged multimodal treatment combined with drug therapy has proven effective.

Drug therapy

Drug therapy for functional constipation is divided into an initial disimpaction phase and a maintenance phase. The drug of first choice for this purpose is macrogol.

individually titrated; it should be circa 0.2–0.8 g/kg in two doses, or higher in individual cases, with the exact dose depending on factors such as daily fluid intake (e2). The second-line drug (first-line in infants) is lactulose at a dose of 1–3 mL/kg/d in 1–3 single doses, but with markedly lower efficacy than macrogol (e2, e12). Lactulose is a nonresorbable sugar. It may cause flatulence, meteorism, and increased abdominal pain. Liquid paraffin can also be used at a daily dosage of 1–2 mL/kg body weight, but it carries the risks of serious aspiration and of the concomitant malabsorption of fat-soluble vitamins; it is not approved for children under two years of age, and it is approved between the ages of two and six years only under certain conditions. Stimulant laxatives such as senna leaf alkaloids, sodium picosulfate, bisacodyl, and prucalopride should generally not be used in long-term therapy because of inadequate supporting evidence, but they may be considered in individual cases.

In maintenance therapy, suppositories (stimulant or CO₂-releasing), microenemas, or enemas are rarely considered. In appropriately informed and guided children who accept these measures, they can help improve social continence, e.g., at school. Social continence means adequate participation in daily life despite incontinence problems. On the other hand, for young children with functional constipation, ongoing anal applications may aggravate the fear of defecation.

Non-drug therapies

Limited evidence is available overall for non-pharmacological methods. Many methods, e.g., biofeedback, are not effective in the treatment of functional constipation, and studies on (often very heterogeneous) exercise programs in the field of pelvic floor physiotherapy have yielded inconsistent findings. Neurostimulation for constipation is a promising new approach (e15). In a systematic review, transcutaneous electrical nerve stimulation (TENS) improved the symptoms of constipation in 79–85.7% of the children who were treated (e10). See *Box 4* for considerations relating to an inadequate response or resistance to treatment.

Conflict of interest statement

Dr Classen has received lecture honoraria from Danone, Abbvie, Sanofi, Falk Foundation, and Vertex. He has served as chairman of the Society of Pediatric Gastroenterology and Nutrition. Prof. de Laffolie has received research funding and honoraria from Abbvie, Takeda, and the Falk Foundation. The remaining authors declare that no conflict of interest exists.

Enemas

Phosphate-containing enemas are strictly contraindicated in young children. They are also dangerous and, therefore, obsolete in older children with other underlying diseases and active avoidance of bowel movements.

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Non-pharmacological therapies

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► **Supplementary material**

eReferences, eCase Illustration:
www.aerzteblatt-international.de/m2022.0309

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Only one answer is possible per question. Please select the answer that is most appropriate.

Question 1

Which of the following is *not* a red flag (warning sign) of a possible organic cause of constipation?

- a) pencil-shaped stool
- b) failure to thrive
- c) family history of Hirschsprung's disease
- d) onset of constipation in the setting of toilet training
- e) abdominal distention

Question 2

What aspect of the epidemiology and classification of constipation in childhood needs to be considered in routine clinical practice?

- a) Almost all children with constipation are infants.
- b) Children and adolescents in any age group can be affected.
- c) An organic cause is found in most cases.
- d) Constipation is only rarely chronic.
- e) Girls are more commonly affected than boys.

Question 3

Which of the following diagnostic tests is *not* a part of the basic evaluation of constipation in children?

- a) meticulous physical examination of the abdomen
- b) thorough history-taking
- c) a colonic contrast study
- d) neurological examination
- e) inspection of the anus

Question 4

According to the ROME-IV criteria, which of the following indicates that constipation is likely to be functional in nature?

- a) well-regulated trips to the toilet
- b) soft stools, according to the clinical history
- c) at least one episode of incontinence per week
- d) 5 or more bowel movements in the toilet per week
- e) no more than a small amount of solid stool in the rectum

Question 5

What lifestyle factor can contribute to constipation in childhood?

- a) vegetarian diet
- b) absolute lack of exercise
- c) vegan diet
- d) moderate consumption of electronic media
- e) regular aerobic stress

Question 6

What is designated as "bladder and bowel dysfunction"?

- a) the onset of constipation in a toddler
- b) frequent, repeated gastrointestinal infections
- c) a urinary tract infection provoked by environmental factors
- d) the occurrence of constipation and fecal incontinence together with functional urinary incontinence, nocturnal enuresis, and recurrent urinary tract infections
- e) constipation as a symptom of a chronic inflammatory bowel disease

Question 7

A 2-month-old girl who is still being entirely breastfed has a bowel movement only once every 14 days but is thriving normally and has no other abnormality. What is a correct conclusion?

- a) The child is suffering from Hirschsprung's disease and needs emergency surgery.
- b) The mother should give the child supplemental lactose.
- c) Rare bowel movements can be physiological in breastfed infants.
- d) The infant is suffering from functional dyschezia.
- e) A cow-milk protein allergy test should be performed.

Question 8

What study is reasonable to perform in a constipated child with functional constipation and without any warning signs?

- a) abdominal x-ray
- b) abdominal ultrasonography
- c) endoscopy
- d) manometry
- e) colon transit-time measurement

Question 9

What must be borne in mind in the treatment of chronic functional constipation in childhood?

- a) The treatment ends with disimpaction.
- b) Toilet training as a positive experience is an important, central component of treatment.
- c) Parents and other caregivers should be left out of the treatment, in order to spare the child any feelings of shame or embarrassment.
- d) As soon as stool softeners are given, it no longer matters how much the patient drinks.
- e) For many children, psychotherapy alone suffices.

Question 10

Which of the following is a warning sign of an organic cause of constipations?

- a) intense anal itching
- b) early onset of ADHD manifestations (before age 2)
- c) nocturnal enuresis
- d) first meconium evacuation more than 72 hours after birth and bowel irrigation in the neonatology unit
- e) onset of constipation when the child enters school

► Participation is possible only via the Internet:
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Supplementary material to:

Constipation in Children and Adolescents

by Martin Classen, Franziska Righini-Grunder, Stefan Schumann, Alexander von Gontard, and Jan de Laffolie

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CASE ILLUSTRATION

A five-year-old boy is presented to a pediatrician by his mother. He has “always” had problems with bowel movements, and often complains of abdominal pain. The stool consistency varies from liquid to hard. The child avoids defecation for days at a time, because it is often painful. Bloody stools have never been observed. There is often stool smearing in the underpants. The child has no other symptoms or health problems, and his development and behavior are appropriate for his age. During the history-taking, the mother states that she felt stressed by her son’s being about to start school next summer. The initial diagnostic evaluation, with a physical examination and laboratory tests, yields largely unremarkable findings. In particular, the thyroid and celiac parameters are normal. However, stool masses can be palpated in the left lower abdomen. Moreover, abdominal ultrasonography reveals a markedly dilated rectum indenting the bladder. With the aid of enema, the boy evacuates a large amount of hard stool while still in the pediatrician’s practice.

The child and his mother are given detailed information and long-term treatment is started, with macrogol and regular toilet sessions after each of the three main meals of the day. Over the course of several weeks, more regular, usually spontaneously perceived, painless defecations of soft stool are reported every one to two days. Stool smearing and abdominal pain are no longer present. The treatment is gradually tapered to off by six months after its initiation. By the time the boy starts school, he no longer has any problems with bowel movements.