Section A-Research paper

An Overview about Anorectal Biofeedback among Children with persistent encopresis

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Article History: Received 10th June, Accepted 5th July, published online 10th July 2023

Abstract

Background: Constipation is defined as infrequent passage of stools or difficulty with evacuation of stools. It is associated with various symptoms including hard stools, straining, sensation of anorectal blockage, incomplete evacuation, abdominal discomfort and bloating. Functional constipation includes three types of constipation ,normal transit constipation ,slow transit constipation and functional defecatory disorders. Dyssynergia, probably the most common presentation of functional defecatory disorders, which is an acquired behavioural defecatory disorder. In most subjects, dyssynergia is a result of poor toileting habits, painful defecation, or brain-gut dysfunction. Some patients have a history of sexual or physical abuse, or an eating disorder. In children, fecal retention may result in encopresis due to leakage of liquid stool around impacted stool. Patients with dyssynergia are unable to coordinate the abdominal, rectoanal and pelvic floor muscles during defecation, and may also demonstrate rectal hyposensitivity. Encopresis or fecal incontinence is defined as the involuntary passing of stool into inappropriate places such as the underwear in children older than four years of age,Which is the age of control . It represents severe psychological distress on children and their families. Anorectal biofeedback Therapy acts as a rehabilitation program by means muscle contraction and relaxation exercises with the aid of verbal, visual and auditory guidance.

Keywords: Anorectal Biofeedback, persistent encopresis

DOI: 10.53555/ecb/2023.12.Si12.307

Introduction

Constipation is defined as infrequent passage of stools or difficulty with evacuation of stools. It is associated with various symptoms including hard stools, straining, sensation of anorectal blockage, incomplete evacuation, abdominal discomfort and bloating **(1).**

Constipation in children is a common health problem affecting 0.7% to 29.6% children across the world**. (2)** Dyssynergic defecation (DD) is a type of defecatory disorder. In 1985, **Preston and Lennard-Jones** first ascribed the symptoms of some constipated patients to the failure of pelvic floor muscles relaxation, which resulted in the sustained contraction of the external anal sphincter on attempted defecation and called it "Anismus," meaning the spasm of the anus. Since then, many terms have been substituted synonymously for this entity, namely, anal sphincter dyssynergia, pelvic floor dyssynergia, paradoxical pelvic floor contraction, spastic pelvic floor syndrome, paradoxical puborectalis contraction, dyskinetic or non-relaxing puborectalis muscle syndrome, obstructive defecation, and pelvic outlet obstruction. However, some of these terms may seem inappropriate, e.g. the "anismus" mostly implies psychogenic aspects of a disease, or the phrase "pelvic

floor" incorporates the functions of micturition and sexual activity in addition to defecation, which are often intact in this disorder. Finally, in 2006, this condition was named "dyssynergic defecation." Dyssynergic defecation (etymology: "dys" = abnormal and "synergia" = coordination) refers to any disturbance of the neuromuscular coordination between abdominal, rectoanal, and pelvic floor muscles, leading to inadequate rectal propulsive forces and/or increased resistance to defecation **(3).**

Pathophysiology:

Normally, when a subject bears down or attempts to defecate, there is a rise in rectal pressure, which is synchronized with a relaxation of the external anal sphincter . This maneuver is under voluntary control and is primarily a learned response. The inability to perform this coordinated movement represents the key pathophysiologic abnormality in dyssynergic defecation. This may be due to inadequate pushing force, paradoxical anal sphincter contraction, impaired anal sphincter relaxation, or a combination of these mechanisms. **(4)**

Stool withholding behaviour "retentive posture" is a major cause for development of dyssynergic defecation .When the retentive toddler experiences the urge to defecate,he assumes an erect posture and holds the legs stiffly together to forcefully contract the pelvic and gluteal muscles.This aberrant behaviour may lead to unconscious contraction of the external sphincter during defecation (also known as anal sphincter dyssynergia) **.(4)**

triggering event is most likely the universal instinct to avoid painful defecation. Children need only once to touch a hot stove to learn not to repeat that experience ever in their life. Similarly, after experiencing a painful defecation, a toddler who has a cognitive style in the preoperational stage or a school age child who is in the concrete operational stage of development will make a subconscious decision to avoid repeating the act of defecation at all cost. Consequently, the child begins to withhold stools by contracting the sphincter and gluteal muscles. The retained stools become larger and harder and more unpleasant to evacuate, reinforcing the withholding behaviour and creating a vicious cycle **(5).**

The presence of withholding behaviour is very common and is one of the criteria for diagnosis of functional constipation.Holding stools rather than emptying the colon leads to stool accumulation. The colon removes water from stool, making it harder and more challenging to pass. As stool continues to accumulate, the smooth muscles in the intestinal walls are stretched and become less effective. The cycle of stool holding, removal of water from the stool, and stretching of the smooth muscles in the intestine, results in hard stools that are large and painful to pass, causing further stool holding. If this becomes a more chronic condition, a patient's rectum fills with a hard stool on an ongoing basis, and they begin to lose the sensation of having a bowel movement. Soft stool often leaks around the harder "plug," resulting in encopresis **(6).**

Patients may present with a variety of signs and symptoms, suggestive of dyssynergic defecation including chronic constipation, affecting the defecation frequency, stool consistency, and amount of force needed for an evacuation, as follows: less than 3 bowel movements per week, lengthy excessive straining, hard or lumpy stools, a feeling of incomplete evacuation, digital facilitation , perianal heaviness, and obstruction sensation. The occurrence of infrequent defecation (62%), which is an important physicians' point of view in dyssynergic defecation , was shown to be less inclusive than excessive straining (85%), incomplete defecation (75%), and anal digitalization (65%) **(3).**

Dyssynergic defecation may also be accompanied by some annoying symptoms like anorectal pain, abdominal discomfort, and bloating. It is important to notify that these symptoms alone do not consistently differentiate dyssynergic defecation from the other possible diagnoses **(7)** .

Furthermore, talking about defecation-related matters is usually complicated for patients and they may misrepresent their experiences. In this regard, few clinical tools, such as the Wexner constipation questionnaire, the 2-week stool diary, and Bristol stool form scales have been utilized to overcome misconceptions and adequately illustrate the nature of chronic constipation **(8) .**

Diagnostic Approach:

The first step in making a diagnosis of dyssynergic defecation is to exclude any underlying abnormalities. It must always be borne in mind that chronic constipation can arise from inadequate fiber and liquid

consumption, immobility, medications, and metabolic, neurological, or structural disorders. These conditions could be readily identified through careful history, physical examinations, and appropriate investigations. The presenting complaint should elicit the duration and nature of constipation as well as the presence of other gastrointestinal (e.g., abdominal pain, bloating, and vomiting) or alarm symptoms (e.g., unintentional weight loss of ≥4.5 kg over 6 to 12 months, rectal bleeding, a family history of colorectal cancer or inflammatory bowel disease, iron deficiency anemia or positive fecal occult blood test, recent onset of constipation, and severe persistent constipation that is unresponsive to treatment) **(9) .**

Diagnosis of dyssynergic defecation requires 3 components: **first**, the occurrence of constipation symptoms according to **The Rome IV diagnostic criteria** requires ≥ 2 of the following, occurring at least once a week for a minimum of one month: ≤ 2 defecations per week; ≥ 1 episode of faecal incontinence a week; retentive posturing; painful or hard bowel movements; large faecal mass in the rectum; and/or large-diameter stools that can obstruct the toilet ***(10*)** .

Second, manometric or electromyography (EMG) evidence of dyssynergic pattern during attempted defecation; and **third,** one other abnormal colorectal test such as the balloon expulsion test, defecography, or markers retention with colonic transit study **(11).**

Encopresis or fecal incontinence is defined as the involuntary passing of stool into inappropriate places such as the underwear in children older than four years of age,Which is the age of control . It represents severe psychological distress on children and their families. It can be either voluntarily or involuntarily. These encopretic events should occur for at least three months. The diagnosis cannot be made below the age of four. The constipation related encopresis also called soiling or fecal overflow incontinence ***(12*)** .

Etiology:

Encopresis can be divided into constipation-associated encopresis or overflow encopresis, and non-retentive encopresis. More than 80% of the children with encopresis have retentive fecal incontinence. Other organic non-functional causes for encopresis include repaired anorectal malformation, postsurgical Hirschsprung disease, spinal dysraphism, spinal cord trauma, spinal cord tumor, cerebral palsy, and myopathies affecting the pelvic floor and external anal sphincter **(13) .**

The etiology of anal incontinence can be classified into four basic categories: sphincteric, neurologic, stool characteristics;diarrhea and constipation , and rectal compliance and sensation**(13) .**

The anal sphincter mechanism is composed of the internal and external anal sphincter and the puborectalis muscle, and this mechanism is one of the most important factors in maintaining anal continence**(14).**

Stool consistency is another important etiologic factor in anal incontinence that must be considered. Incontinence to diarrhea may be a result of rapid transit of liquid stool to the rectum, which overloads the normal continence mechanisms that include capacity of the rectum, pelvic floor muscles, and anal sphincter complex. **(15).**

Constipation-related fecal incontinence ;Young toddlers experiencing painful defecation, such as from hard stools, have a natural instinct to retain their feces. These kids constrict their anal sphincters and gluteal muscles to withhold feces, which triggers a series of physiological changes that increase stool retention and cause both rectum and sigmoid colon dilation as well as the production of a big fecal mass in the rectum. Retained fecal matter finally becomes excessively stiff and difficult to be pushed by the high amplitude propagatory contractions as the water is absorbed *via* the intestinal mucosa. Due to bacterial activity, the stools in the upper portion of the fecal mass become liquid, seep over the distal hard fecal mass, and exit the anal sphincter, which results in fecal incontinence. **(16).**

The pudendal nerve plays a critical role in maintenance of integrity and function of the anal sphincter. Neurologic compromise of the anal sphincter complex can result in incontinence**(16).**

The rectum functions as a reservoir for the storage of stool. Loss of rectal compliance can lead to anal incontinence. Inflammatory changes and scarring to the rectal wall resulting from processes such as radiation proctitis and inflammatory bowel disease result in decreased rectal compliance, reduction in reservoir capacity, and alterations in anorectal sensation, which collectively lead to incontinence**(15).**

In the absence of organic causes, encopresis is secondary to overflow, and therefore results from the presence of constipation. Withholding of stool creates a vicious circle of accumulation of feces and hardening of the fecal mass in the rectosigmoid colon. Finally, feces leak between the solid fecal mass and rectal wall and come out through the anal canal when the sphincter muscles are relaxed. The volume of fecal matter that leaks out is usually small and, most of the time, just stain the underwear. ***(12)*** .

There are different reasons why a child may withhold stool or avoid defecation.Stool withholding may be an intentional behavior to avoid unpleasant sensations associated with defecation. It may be due to a painful bowel movement that is caused by a stool that was larger or harder than normal, an anal fissure, or a perianal infection. The child may be reluctant to use the toilet at school due to limited time, lack of privacy, or concern about restroom cleanliness, choosing instead to withhold stool until coming home. A child may not want to have an interruption in an enjoyable activity to have a bowel movement. Finally, stool withholding may be a learned avoidance behavior ,when first acquired may be intentional and then become less intentional or even unconscious.**(17)**

Encopresis is mainly a clinical diagnosis, and the majority of patients do not need any further testing. North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) included in their recommendations that routine laboratory testing to screen for hypothyroidism, celiac disease, and hypercalcemia in the absence of alarm symptoms is not recommended for constipation, which leads to the majority of encopresis cases in children***(18)*** .

Radiography is helpful only for determining the presence of a fecal mass in rectum when there is uncertainty as to whether the patient is constipated and rectal examination is not possible because of obesity, refusal, or psychological factors (sexual abuse) that make a rectal examination too traumatic ***(18)*** .

Due to the majority of the children having a diagnosis of retentive fecal incontinence, the treatment for encopresis relies on treating the root cause, which is chronic constipation.

The recently published North America sosciety for Pediatric Gastroenterology ,Hepatology and Nutrition " NASPGHAN" guidelines include four important phases in the treatment of chronic constipation: (1) education, (2) disimpaction, (3) prevention of reaccumulation of feces, and (4) follow-up ***(18)*** .

Providers must explain that constipation often leads to a vicious cycle that results in stool withholding, fecal retention, and eventually encopresis. It is essential to clarify to the family that fecal incontinence is caused by rectal impaction and is beyond the child's control. It should also be stressed that maintenance therapy usually takes 6 to 24 months. In most cases, a detailed plan eliminates the frustration of parents and children and improves compliance necessary for the prolonged treatment **(19).**

Behavioral interventions:

Due to the noninvasive nature, behavioral interventions can facilitate active participation from the child, lower the child's anxiety, and give the child positive reinforcement for achievements.

A primary behavioral modification is the implementation and maintenance of a bowel and bladder-voiding schedule. A bowel and bladder-voiding schedule involves having the child sit on the toilet for up to 5 minutes after meals when the child is most likely to have a bowel movement. A bowel and bladder-voiding schedule after eating can be effective due to the gastrocolic reflex, which triggers colon peristalsis in response to stretching of the stomach from eating **(20)** .

Another important primary behavioral modification is the child's posture on the toilet as children often slouch or sit too erect causing the pelvic floor muscles to be contracted instead of relaxed .Instruct the child to perform the defecation maneuver as leaning forward instead of erect position . The puborectalis muscle is especially important in defecation, as it creates a sling around the rectum, which sits contracted and assists in maintaining fecal continence. In normal defecation, the puborectalis relaxes and opens up the rectum to allow for easier flow of stool. Children with chronic constipation and anismus (dyssynergic defecation) have a shortened puborectalis during Valsalva (straining) than same-age controls **(20)**.

Often the medical management of these children is combined with behavioral techniques (toilet training combined with a rewards system, diminishment of toilet phobia), cognitive exercises (psychotherapy, cognitive therapy, and family therapy), or educational interventions. The aim of this combined therapeutic approach is to lower the level of physical and emotional distress associated with defecation, develop or restore

normal bowel habits by positive reinforcement, preserve self-respect, and encourage the child and parents to take an active role during the treatment **(20)**.

Biofeedback training: is a technique that can be used to teach children how to control their perianal muscles to pass bowel movement more efficiently ***(18)*** .

ANORECTAL BIOFEEDBACK THERAPHY

Definition :

It acts as a rehabilitation program by means muscle contraction and relaxation exercises with the aid of verbal, visual and auditory guidance **(21) .**

The study using biofeedback therapy in the field of gastroenterology was first reported in 1974 and focused on BFT in patients with fecal incontinence (FI).The first application of BFT for the treatment of chronic constipation due to dyssynergic defecation (DD) was in 1987. Since then, BFT has been attempted in the treatment of various gastrointestinal disorders, such as functional anorectal pain, irritable bowel syndrome and aerophagia, but the efficacy of BFT is relatively well-established in the treatment of DD and FI **(22) .**

Mechanism of action:

Dyssynergic defaecation is thought to be primarily an acquired condition, therefore, the aim of biofeedback is to relearn a normal pattern of defaecation , The mechanism by which biofeedback improves constipation symptoms and bowel function remains incompletely understood. Studies suggest that biofeedback acts locally and improves constipation by removing the mechanical barrier (acute anorectal angle) caused by paradoxical pelvic floor contraction. Appropriate relaxation of the pelvic floor muscles allow stool to be propelled forward more readily and may eliminate retrograde peristalsis caused by pelvic floor contraction during defaecation. Biofeedback may also have a role in neuromodulation of the gut. . **(23) .**

Instrument modalities:

Instruments used for biofeedback may include a manometry system, electromyography (EMG), rectal balloon, ultrasound (intrarectal ,perineal), digital guidance or visual feedback techniques. . **(23) .**

Devices and Techniques for Biofeedback:

Because neuromuscular training is an instrument-based learning technique, There are three main methods of monitoring the function of the anus and providing biofeedback to patients. These methods include electromyograph (EMG) biofeedback, manometry biofeedback and balloon sensory training **(24).**

Manometric-Biofeedback therapy uses the intuitive audiovisual assistance provided by anal canal pressure measurement , allowing patients to watch directly the screen images and visually perceive the pressure changes in their own pelvic floor muscles and rectum during defecation. After repeated training, the patient learns to relax the pelvic floor and external anal sphincter, while increasing the intra-abdominal pressure, adjusting the coordination between the abdomen and the anorectal muscles, so the constipation is cured**.** Alternatively, EMG biofeedback systems commonly include a surface electrode attached to an anal probe or a sensor, placed on the surface of the external anal sphincter, connected to a display unit to provide real time visual and auditory feedback. **(23) .**

How to Perform Biofeedback Therapy:

There is no uniform treatment protocol that has been established because a wide variety of biofeedback techniques have been employed with insufficient data to determine the most effective modality (**22)**

Biofeedback therapy is, in a narrow sense, pelvic floor muscle training based on operant conditioning. However, in a broader sense, BFT includes education, counseling, and diaphragmatic muscle training as well as exercise, sensory, and coordination training (**22)**

Manometric biofeedback-guided anorectal training consisted of three different parts or phase **(25).**

Phase 1: Assessment and Education

- Symptom assessment by patient assessment constipation quality of life score ,wexner incontinence score and stool diary or bristol stool form scale .
- Explain physiology of defecation and pathophysiology of dyssynergic defecation
- Diaphragmatic breathing exercises
- Timed toiet training **(11).**

On the initial session of the biofeedback , therapist provides the patients and parents with a package of instructions about bowel habit, daily exercise (for example, walking for 20 minutes every day), and diaphragmatic breathing exercises (daily for 15 minutes, three times a day), dietary fiber and fluid intake, toilet timinig (patients are taught to attempt having a bowel movement at least twice a day, 30 minutes after meals or walking and they were consulted to avoid straining more than 5 minutes during defecation).The patients were advised not to use digital maneuvers to facilitate defecation. If patients had no bowel movement for more than 48 hours, they are guided to use laxatives such as polyethylene glycol . Also, the patients are trained about the correct position of defecation , the patients are supervised at least once a week over the phone **(26)**

Education and counseling should be performed during the entire BFT period. The objective of BFT and the basic concepts of the anatomy and physiology of the pelvic floor are explained to the patient during the initial session and the defecation disorders caueses and treatment. This can lead to increasing compliance by patients for BFT. Therapist plays an important role; they must communicate and interact well with the patient to establish a supportive relationship.

Phase 2: Active Exercise

BFT for DD consists of improving the abdominal push effort together with biofeedback-guided pelvic floor relaxation followed by simulated defecation training and/or sensory training **(11) .**

I .Abdominal push effort (diaphragmatic muscle training):

First, the patient's posture and breathing technique are corrected. When the patient sits on a commode, the patient should lean forward slightly and keep the legs apart as opposed to keeping them together. The patient is then asked to take a deep diaphragmatic breath to induce proper abdominal pressure for defecation. The patient should repeat exhaling slowly through the mouth and then consciously expand the abdomen while inhaling deeply with the nose.The patients were taught to distend the abdomen by inhaling slowly and then to hold their breath for at least 10 to 15 s. The patients were also asked to practice these maneuvers for at least 20 min three times a day **(27) .**

II .Rectoanal coordination:

The purpose of this training is to produce a coordinated defecatory movement that consists of an adequate abdominal push effort as reflected by a rise in intrarectal pressure synchronized with anal relaxation. The patient should be seated on a commode with the sensor probe in front of the BFT equipment. The individual is instructed to take a deep breath in and push and bear down as if defecating once the patient's posture has been corrected, (for example, keeping the legs apart instead of together) and the sitting angle at which he or she will perform the defecation maneuver as leaning forward . The patient is advised to perform this maneuver while keeping an eye on the monitor.The patient's breathing and posture are continuously observed and adjusted.The visual representation of the pressure variations in the rectum and anal canal on the monitor gives the patient immediate feedback regarding their performance and aids in their ability to comprehend and pick things up quickly.The patient is then given a feeling of rectal fullness or a need to defecate by having a balloon in the rectum inflated with 50 ccs of water.

The patient is then encouraged to push and make an effort at defecation after experiencing this desire while watching the pressure fluctuations in the rectum and anal canal on the display monitor.The posture and breathing techniques are adjusted once more.The movements are repeated five to ten times in total.The patient is instructed to titrate the amount of abdominal push and anal relaxation effort during the attempted defecation, and in particular not to push excessively as this is frequently counterproductive and results in intentional withholding.The balloon is deflated and reinflated ahead of the subsequent attempt after each attempt.The balloon is entirely deflated and the probe is removed once this motion is finished. **(28)**

III .Simulated defecation training:

The patient starts to be aware of coordinated defecation through rectoanal coordination training, thereafter, simulated defecation training is performed. The goal of this training is to teach the patient to expel an artificial stool using the correct technique. A flexible tube with a 50 mL water-filled balloon attached to its tip is placed in the rectum in the left lateral position. The patient is asked to sit on a commode and attempt defecation. The patient is taught to relax the pelvic floor muscles and to adopt correct posture and use appropriate breathing

techniques. If the patient is unable to expel the balloon, gentle traction is applied to the balloon to supplement the patient's efforts. The maneuver is repeated several times for the patient to learn how to coordinate the defecation maneuver and to expel the balloon. **(29)** .

IV .Rectal sensory training:

Sensory training is applied to constipation patients with rectal hyposensitivity. The goal of this training is to decrease the thresholds of rectal sensory perception by intermittently inflating a balloon in the rectum. A rectal balloon is gradually distended with water, and the patient is asked to report the urge to defecate. Once this threshold volume is determined, the balloon is first inflated to the volume that induces an urge to defecate. Thereafter, for each successive inflation, the balloon volume is increased in a stepwise manner by about 10%. In manometry-guided BFT, the patient is instructed to observe the monitor and to associate the visual signal provided by the rise in intrarectal pressure with that of any possible rectal sensation during each inflation. Through a process of trial and error, newer thresholds for rectal perception are established**(29)** .

V .Visual feedback :

Considering that feedback is critically important during the biofeedback training, multiple media were used to provide the patient as much relevant feedback information as possible. Visually, a carton figure was created to represent the rectal pressure, in which the height and length of the wall were set as training targets to climb. Another carton figure was generated to represent the anal sphincter pressure that passes through the tunnel ***(30*) .**

Phase 3: Weaning and Reinforcement:

As the patient starts to confidently control the muscles related to defecation, the frequency of BFT is gradually reduced. There has been considerable variation in BFT protocols, regarding the number, frequency, intensity, and duration of sessions. BFT should be customized for each patient depending on their individual needs. Typically, 1hour per session, bi-weekly training, and a total of four to six training sessions are performed in several randomized controlled trials **(11).**After completion of intensive training, periodic reinforcements at 6 weeks, 3 months, 6 months and 12 months may provide additional benefit and also improve the long-term outcome in patients with DD **(22) .**

Number of sessions: total of six biofeedback sessions resulted in a durable treatment response for dyssynergia, with benefits lasting for 2 years **(31)**

Outcome measures :

Outcomes included changes in anorectal physiology measures, symptom scores and quality-of-life measures and changes in stool shape (Bristol classification) to provide a reliable basis for recovery **(32).**

- **The anorectal physiologic outcome measures:** include the presence of dyssynergia during attempted defecation, balloon expulsion time, anal residual pressure which is the lowest maximum pressure (mmHg) recorded within the anal canal over the duration of the 5 s push maneuver ,percentage of anal relaxation which is maximum relaxation percentage achieved over the duration of the 5-second push maneuver, intrarectal pressure and defecation index which is defined as a ratio of intrarectal pressure/anal residual pressure;The defecation index may serve as a simple and useful quantitative measure of the rectoanal coordination during attempted defecation , thresholds for first perception and urge to defecate **(11).**

Constipation symptoms and quality of life can be assessed by: Patient assessment constipation and quality of life questionnaire(PAC-QOL).

Patient assessment constipation and quality of life questionnaire:

Marquis and colleagues developed the PAC-QOL questionnaire to evaluate the quality of life in constipation. The PAC-QOL questionnaire is a brief but comprehensive tool which evaluates constipation through daily individual health assessment and functioning. The contents of the PAC-QOL questionnaire are directly taken from the impact of constipation on a patient according to the viewpoint of gastrointestinal specialists. The PAC-QOL questionnaire showed good validity in Europe and North America.This questionnaire consists of 28 self-reported items investigating the effects of constipation on the patient's quality of life in the recent 2 weeks. The PAC-QOL questionnaire is subcategorized to 4 items on physical discomfort, 8 items on

psychosocial discomfort, 5 items on treatment satisfaction, and finally 11 items on worries and discomfort. Response choice is a Likert scale from 0 to 4. Higher scores mean higher negative effects on quality of life. Items 18, 25, 26, 27, and 28 should be scored reversed because they are positive questions. **(26)**

Encopresis symptoms can be assessed by cleveland clinic florida fecal incontinence score

The Cleveland Clinic Florida (Wexner) fecal incontinence score: remains the most commonly employed score because of its ease of use . the summary score is derived from 5 parameters whose frequency is each ranked on a scale from 0 (= absent) to 4 (daily): incontinence to gas, to non-formed stool, or to solid stool, need to wear pad, and lifestyle changes. A score of 0 means perfect control, a score of 20 complete encopresis **(15).**

The bristol stool form scale : is an ordinal scale of stool types ranging from the hardest (type 1) to the softest (type 7) . Types 1 and 2 are considered abnormally hard stools (and in conjunction with other symptoms indicative of constipation). In contrast, types 6 and 7 are considered abnormally loose/liquid stools (and other symptoms indicative of diarrhoea). Types 3–5 are considered the most 'normal' stool form. In this scale **(33).**

Efficacy of biofeedback therapy :

Randomised controlled trials have demonstrated major symptom improvement in 70%-80% of patients undergoing biofeedback therapy for chronic constipation resistant to standard medical therapy and have determined it to be superior to polyethylene glycol laxatives, diazepam or sham therapy. Long-term studies have shown 55%-82% of patients maintain symptom improvement. **(34)**

Limitations of Biofeedback Therapy:

BFT requires proper equipment, a private and quiet space, and a well-trained therapist. In clinical practice, it may be difficult for a patient to obtain BFT because of logistical (no facility) or financial reasons. A recent study indicated that only 44-48% of patients who were recommended BFT actually underwent BFT because of the lack of insurance coverage, distance to local treatment facilities, and acute medical issues taking precedence. Moreover, BFT is time-consuming, and repeated training is required; hence, a willingness to participate is important for successful BFT **(35)**. Physicians and therapists need to continuously motivate patients through education and counseling.Another limitation is that there is no established standard protocol for BFT

In conclusion, a series of controlled studies have now shown that functional defecation disorder, one of the most frequent and disabling subtypes of children constipation, can be treated effectively with biofeedback training. This form of treatment is more effective than laxatives, and it has no known adverse effects. Although this training is relatively expensive to provide, it produces improvements that are sustained for up to two years

References

1. Jani B, Marsicano E. Constipation: Evaluation and Management. Mo Med. 2018 May-Jun;115(3):236-240.
2. Rajindrajith S, Devanarayana NM. Constipation in children: novel insight into epidemiology, pathophysiology and management. J Neurogastroenterol Motil. 2011 Jan;17(1):35-47.
3. Sadeghi A, Akbarpour E, Majidirad F, Bor S, Forootan M, Hadian MR, Adibi P. Dyssynergic Defecation: A Comprehensive Review on Diagnosis and Management. Turk J Gastroenterol. 2023 Mar;34(3):182-195.
4. Patcharatrakul T, Rao SSC. Update on the Pathophysiology and Management of Anorectal Disorders. Gut Liver. 2018 Jul 15;12(4):375-384.
5. Whitehead WE, di Lorenzo C, Leroi AM, Porrett T, Rao SS. Conservative and behavioural management of constipation. Neurogastroenterol Motil. 2009 Dec;21 Suppl 2:55-61.
6. Allen P, Setya A, Lawrence VN. Pediatric Functional Constipation. 2022 Aug 19. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 30725722
7. Ratuapli SK, Bharucha AE, Noelting J, Harvey DM, Zinsmeister AR. Phenotypic identification and

classification of functional defecatory disorders using high-resolution anorectal manometry. Gastroenterology. 2013 Feb;144(2):314-322.e2.

8. Majidirad F, Hadian MR, Asl Soleimani H, Jalaie S, Ahadi T, Bazaz Bebahani R, Bagheri H. Cross-cultural adaptation, validity, and reliability of the Wexner questionnaire in patients with functional constipation in an Iranian population. Gastroenterol Hepatol Bed Bench. 2021 Summer;14(3):243-249.
9. Lindberg G, Hamid SS, Malfertheiner P, Thomsen OO, Fernandez LB, Garisch J, Thomson A, Goh KL, Tandon R, Fedail S, Wong BC, Khan AG, Krabshuis JH, LeMair A; World Gastroenterology Organisation. World Gastroenterology Organisation global guideline: Constipation--a global perspective. J Clin Gastroenterol. 2011 Jul;45(6):483-7. doi: 10.1097/MCG.0b013e31820fb914. Erratum in: J Clin Gastroenterol. 2011 Oct;45(9):838. Erratum in: J Clin Gastroenterol. 2012 Jan;46(1):90. multiple author names added. PMID: 21666546.
10. Ho JMD, How CH. Chronic constipation in infants and children. Singapore Med J. 2020 Feb;61(2):63-68.
11. Rao SS. Advances in diagnostic assessment of fecal incontinence and dyssynergic defecation. Clin Gastroenterol Hepatol. 2010 Nov;8(11):910-9.
12. Yilanli M, Gokarakonda SB. Encopresis. 2022 Jul 25. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 32809395.
13. Rajindrajith S, Devanarayana NM, Benninga MA. Review article: faecal incontinence in children: epidemiology, pathophysiology, clinical evaluation and management. Aliment Pharmacol Ther. 2013 Jan;37(1):37-48.
14. Costilla VC, Foxx-Orenstein AE, Mayer AP, Crowell MD. Office-based management of fecal incontinence. Gastroenterol Hepatol (N Y). 2013 Jul;9(7):423-33.
15. Saldana Ruiz N, Kaiser AM. Fecal incontinence - Challenges and solutions. World J Gastroenterol. 2017 Jan 7;23(1):11-24.
16. Shen ZY, Zhang J, Bai YZ, Zhang SC. Diagnosis and management of fecal incontinence in children and adolescents. Front Pediatr. 2022 Oct 18;10:1034240.
17. Colombo JM, Wassom MC, Rosen JM. Constipation and Encopresis in Childhood. Pediatr Rev. 2015 Sep;36(9):392-401; quiz 402.
18. Tabbers MM, DiLorenzo C, Berger MY, Faure C, Langendam MW, Nurko S, Staiano A, Vandenplas Y, Benninga MA; European Society for Pediatric Gastroenterology, Hepatology, and Nutrition; North American Society for Pediatric Gastroenterology. Evaluation and treatment of functional constipation in infants and children: evidence-based recommendations from ESPGHAN and NASPGHAN. J Pediatr Gastroenterol Nutr. 2014 Feb;58(2):258-74.
19. Tran DL, Sintusek P. Functional constipation in children: What physicians should know. World J Gastroenterol. 2023 Feb 28;29(8):1261-1288.
20. Anderson, Brittany PT, DPT. Physical Therapy for a Child With Encopresis: A Case Report. Pediatric Physical Therapy 31(3):p E1-E7, July 2019.
21. Sahid S, Bin Kamarulzaman MY, Mustafa JB, Sahid NA, Bin Mohamed Kamil NA. Biofeedback therapy for anorectal functional disorder: Malaysian colorectal tertiary centre experience. Ann Med Surg (Lond). 2022 May 25;79:103848.
22. Lee HJ, Jung KW, Myung SJ. Technique of functional and motility test: how to perform biofeedback for constipation and fecal incontinence. J Neurogastroenterol Motil. 2013 Oct;19(4):532-7.
23. Skardoon GR, Khera AJ, Emmanuel AV, Burgell RE. Review article: dyssynergic defaecation and biofeedback therapy in the pathophysiology and management of functional constipation. Aliment Pharmacol Ther. 2017 Aug;46(4):410-423.

24. Woodward S, Norton C, Chiarelli P. Biofeedback for treatment of chronic idiopathic constipation in adults. Cochrane Database Syst Rev.2014 Mar 26;(3):CD008486.

25. Ba-Bai-Ke-Re MM, Wen NR, Hu YL, Zhao L, Tuxun T, Husaiyin A, Sailai Y, Abulimiti A, Wang YH, Yang P. Biofeedback-guided pelvic floor exercise therapy for obstructive defecation: an effective alternative. World J Gastroenterol. 2014 Jul 21;20(27):9162-9. doi: 10.3748/wjg.v20.i27.9162.

26. Nikjooy A, Maroufi N, Ebrahimi Takamjani I, Hadizdeh Kharazi H, Mahjoubi B, Azizi R, Haghani H. MR defecography: a diagnostic test for the evaluation of pelvic floor motion in patients with dyssynergic defecation after biofeedback therapy. Med J Islam Repub Iran. 2015 Mar 9;29:188.

27. Talebi A, Alimadadi E, Akbari A, Bahardoust M, Towliat M, Eslami M, Agah S, Kashani AF. Improvement of Patient Satisfaction and Anorectal Manometry Parameters After Biofeedback Therapy in Patients with Different Types of Dyssynergic Defecation. Appl Psychophysiol Biofeedback. 2020 Dec;45(4):267-274.

28. Naniksingh Kukreja A (2024) Biofeedback in the Management of Constipation. Current Concepts in the Diagnosis and Treatment of Constipation [Working Title]. IntechOpen.

29. Norton C, Emmanuel A, Stevens N, Scott SM, Grossi U, Bannister S, Eldridge S, Mason JM, Knowles CH. Habit training versus habit training with direct visual biofeedback in adults with chronic constipation: study protocol for a randomised controlled trial. Trials. 2017 Mar 24;18(1):139.

30. Xu Y, Li X, Xia F, Xu F, Chen JDZ. Efficacy of a Modified Training Program of Adaptive Biofeedback Therapy for Dyssynergic Defecation in Patients with Chronic Constipation. Dig Dis Sci. 2022 Apr;67(4):1320-1327.

31. Sharma A, Rao S. Constipation: Pathophysiology and Current Therapeutic Approaches. Handb Exp Pharmacol. 2017;239:59-74.

32. Zhao X, Meng J, Dai J, Yin ZT. Effect of biofeedback combined with high-quality nursing in treatment of functional constipation. World J Clin Cases. 2021 Feb 6;9(4):784-791.

33. Shokouhi N, Mohammadi S, Ghanbari Z, Montazeri A. Development of a new version of the Bristol Stool Form Scale: translation, content validity, face validity, and reliability of the Persian version. BMJ Open Gastroenterol. 2022 Dec;9(1):e001017.

34. Skardoon GR, Khera AJ, Emmanuel AV, Burgell RE. Review article: dyssynergic defaecation and biofeedback therapy in the pathophysiology and management of functional constipation. Aliment Pharmacol Ther. 2017 Aug;46(4):410-423.

35. Shim LS, Jones M, Prott GM, Morris LI, Kellow JE, Malcolm A. Predictors of outcome of anorectal biofeedback therapy in patients with constipation. Aliment Pharmacol Ther. 2011 Jun;33(11):1245-51.