Methods of Evaluation of Anorectal Causes of Obstructed Defecation

Anne C. Fabrizio, MD¹ Yewande Alimi, MD¹ Anjali S. Kumar, MD, MPH, FACS, FASCRS²

¹Department of Surgery, Medstar Georgetown University Hospital, District of Columbia, Washington

²Colorectal Surgery Program, Virginia Mason Medical Center, Seattle, Washington

Address for correspondence Anjali S. Kumar, MD, MPH, Colorectal Surgery Program, Virginia Mason Medical Center, Seattle, WA 98101 (e-mail: askumarmd@gmail.com).

Clin Colon Rectal Surg 2017;30:46–56.

Abstract

Keywords

- ▶ obstructed defecation
- ▶ functional constipation
- ▶ diagnosis
- ▶ diagnostics
- ▶ digital rectal examination
- ▶ proctoscopy
- ▶ colonic transit time
- ▶ anorectal manometry
- ▶ rectal balloon expulsion
- ▶ defecography
- ▶ electromyography
- ▶ ultrasound

Obstructed defecation is a complex disorder that results in impaired propagation of stool from the rectum. It is one of the major subtypes of functional constipation and can be secondary to either functional or anatomic etiologies. Patients with obstructed defecation typically present with symptoms of abdominal discomfort, a sensation of incomplete evacuation and rectal obstruction, passage of hard stools, the need for rectal or vaginal digitation, excessive straining, and reduced stool frequency. Evaluation of obstructed defecation is multimodal, starting with a thorough history and physical examination with focus on the abdominal, perineal, and rectal examination. Additional modalities to elicit the diagnosis of obstructed defecation include proctoscopy, colonic transit time studies, anorectal manometry, a rectal balloon expulsion test, defecography, electromyography, and ultrasound. The results from these studies should be taken in the context of each patient's clinical situation, as there is no single criterion standard for the diagnosis of obstructed defecation. Surgery is typically a last resort for these patients and the majority of patients will have good symptomatic management with diet and lifestyle changes. Patients who are found to have functional mechanisms behind their obstructed defecation also benefit from pelvic floor exercises and biofeedback therapy.

Functional constipation is a disorder of the bowel that presents as persistently difficult, infrequent, or seemingly incomplete defecation. It is a common medical complaint frequently addressed by primary care physicians, gastroenterologists, and colorectal surgeons. It has an estimated prevalence of 16% for all adults worldwide and 33.5% in adults aged 60 to 101 years.^{1,2} Because of its high prevalence, constipation accounts for a substantial use of health care resources, including over 2 million outpatient physician visits in the United States alone.³ Furthermore, constipation is associated with higher psychological stress and decreased quality of life.⁴

Defecation is a complex process involving synchronization of several elements including motility of the gastrointestinal tract, anorectal sensation, contraction of the rectum, coordi-

nation of pelvic floor musculature, and relaxation of the anal sphincter mechanism. Constipation, defined according to the Rome III criteria (► **Table 1**),⁵ results from an impairment in this process of defecation that can be attributed to slow colonic transit or outlet delay. It is important to note, however, that constipation can result from a combination of these etiologies and both categories should be considered during evaluation of a patient with constipation.

Obstructed defecation is a subtype of functional constipation characterized by the inability to propagate stool out of the rectum. It occurs in approximately 7% of the adult population and often in concert with other causes of constipation.^{6,7} Due to its complex nature, it is necessary to utilize multiple modalities in the diagnosis of obstructed defecation.

Issue Theme Approaches and Treatment of Intussusception, Volvulus, Rectal Prolapse, and Functional Disorders of the Colon, Rectum, and Anus; Guest Editor: Jason S. Mizell, MD, FACS, FASCRS

Copyright © 2017 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA.
Tel: +1(212) 584-4662.

DOI <http://dx.doi.org/10.1055/s-0036-1593427>.
ISSN 1531-0043.

Table 1 Rome III diagnostic criteria for functional constipation

Rome III Diagnostic Criteria* for Functional Constipation	
1.	Must include <i>two or more</i> of the following:
a.	Straining during at least 25% of defecations
b.	Lumpy or hard stools in at least 25% of defecations
c.	Sensation of incomplete evacuation for at least 25% of defecations
d.	Sensation of anorectal obstruction/blockage for at least 25% of defecations
e.	Manual maneuvers to facilitate at least 25% of defecations (e.g., digital evacuation, support of the pelvic floor)
2.	Loose stools are rarely present without the use of laxatives
3.	There are insufficient criteria for IBS
* Criteria fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis	

To understand how best to evaluate an obstructed defecation patient using the appropriate tests, we must first appreciate the many causes of the disorder. Outlet delay and the failure to propagate stool can be due to several pathophysiologies. First, decreased rectal filling sensation can lead to impaired expulsion of stool. Decreased rectal sensation is a common finding in patients with obstructed defecation and is associated with or a result of a megarectum.^{8,9} Second, functional outlet obstruction may result from abnormal coordination of the muscles involved in defecation (dyssynergia). The two main functional abnormalities are loss of the rectoanal inhibitory reflex (RAIR) and diminished relaxation of the pelvic floor. Third, mechanical outlet obstruction from anatomic abnormalities such as rectal intussusception and prolapse, enterocele, rectocele, and rectal prolapse can lead to difficulties in evacuation of stool. Additionally, descending perineum syndrome can lead to diminished force generation during elimination of stool. Broadly, all these etiologies can be categorized into either mechanical (anatomic) or functional (physiologic) disorders (→Table 2).

Typically, the mechanical disorders are associated with an anatomic abnormality that can be appreciated on physical examination and radiographic imaging. Alternatively, the functional disorders require additional testing focused on assessing coordination of the muscles of defecation. However, it is important to keep in mind that these etiologies are not mutually exclusive.

Due to the complex nature of obstructed defecation, distinguishing obstructed defecation from the numerous other etiologies of constipation is best done using a multimodal approach. No single test is capable of definitively diagnosing constipation secondary to obstructed defecation, and all results should be considered within the context of the individual patient's symptoms.

Clinical Presentation and Patient History

Evaluation of a patient with slow colonic transit and possible obstructed defecation should begin with a thorough history. Patients will often present to the physician's office with complaints of abdominal discomfort associated with altered bowel habits that are consistent with constipation. They may

describe the sensation of incomplete evacuation and rectal obstruction, passage of hard stools, the need for rectal or vaginal digitation, excessive straining, and reduced stool frequency. It is necessary to clarify specific symptoms and severity of constipation due to the subjective nature of the complaint. It is important to also determine duration of the symptoms and any previously attempted treatments for relief of constipation such as stool softeners, laxatives, and fiber supplementation. A full medical history including medications, other medical conditions, obstetric history, and surgical history are the essential components of clinical evaluation, as they may reveal potential explanations for the patient's constipation.

Physical Examination

Physical examination is essential in the diagnosis of obstructed constipation. The abdomen should be carefully evaluated making note of abnormal stool burden in the left quadrant, abdominal distention, and any obvious masses present throughout the abdomen. The examination should be completed in the supine and lithotomy or left lateral position to assure adequate visualization of the abdomen and perineum. The perineum should be inspected for any obvious protrusion of rectal mucosa, surgical scars, masses, or other associated abnormalities.

A digital rectal examination (DRE) is essential and most comfortably completed in the dorsal lithotomy or left lateral position. The essential components of the DRE include inspection of the anus and surrounding tissue, testing of perineal sensation and the anocutaneous reflex with a cotton tip applicator, digital palpation, and maneuvers to assess anorectal function (digital palpation, resting tone assessment and squeeze, and the pushing and bearing maneuver).¹⁰ While the patient is straining, the bulging of the posterior wall of the vagina can often be palpated. Rectoceles can often be diagnosed using this maneuver, while enteroceles and sigmoidoceles may be difficult to ascertain¹¹ as they are often difficult to distinguish from rectocele or vaginal vault prolapse.¹² If there is concern for rectal prolapse or intussusception and prolapse of the rectum is not visualized on the examination table, the patient may be asked to attempt

Table 2 Pathophysiology of obstructed defecation

Pathophysiology of Obstructed Defecation	
Mechanical	Megarectum
	Rectoanal intussusception
	Rectal prolapse
	Rectocele
	Sigmoidocele
	Enterocoele
	Neoplasm
	Stenosis
	Solitary rectal ulcer syndrome
Functional	Neurological disorder
	Internal sphincter myopathy
	Rectal hyposensitivity
	Dysfunction of the pelvic floor muscles (anismus) or anorectal muscles
	Nutcracker anus
	Paradoxical puborectalis contraction

defecation in the restroom or in the upright position. Privacy can often be found to be helpful. While an intussusception may be diagnosed during DRE, it is noted only to be apparent and accurately diagnosed in only up to 42% of patients.^{11,13}

Specialized Investigations

If a conclusive diagnosis cannot be obtained following a thorough history and physical examination, additional examinations can be performed to further work up a patient with possible obstructed defecation. These examinations aim to address either mechanical or functional etiologies of the disorder.

Proctoscopy

Proctoscopic examination should be performed on a majority of patients unless there are significant contraindications, for example, severe pain. The proctoscopic examination may reveal anal fissures and hemorrhoid prolapse of the rectal mucosa associated with intussusception or rectal prolapse, or several other anal lesions. Many patients with occult rectal prolapse may have hyperemia and edema seen in the anterior rectal wall, colitis cystica profunda, or a solitary rectal ulcer.¹⁴ This was noted to be seen in up to 49% of patients.¹³ Solitary rectal ulcers are characterized by blood and mucus associated with chronic straining, with an area of erythema and ulceration at the time of proctoscopy.¹⁵

Colonic Transit Time

In patients with constipation, obstructed defecation must be distinguished from slow colonic transit constipation. Colonic transit studies are a means of objectively documenting colonic motility and thus distinguish the two etiologies. However, it must be noted that colonic inertia exists concomitantly with obstructed defecation in 15 to 20% of cases.¹⁶

Sitzmark Study

First described in 1969 by Hinton et al, the Sitzmark test is still widely used today for the workup of functional constipa-

tion.¹⁷ Prior to undergoing the test, the patient must refrain from taking all laxatives, enemas, suppositories, and stimulants. The patient ingests a gelatin capsule containing 24 radiopaque polyvinyl chloride markers. Following ingestion, a radiograph is taken on postingestion day 5 to determine motility.

In patients with normal colonic motility, 80% of the markers have been expelled from the colon. Retention of five or more markers is determined to be a positive study. If the markers are scattered throughout the colon, the study is consistent with slow transit constipation or colonic inertia (**Fig. 1**).

However, accumulation of markers in the rectosigmoid instead points to an etiology of functional outlet obstruction.¹⁸ This test has been shown to be reproducible in 70% of the patients being evaluated for constipation.¹⁹

Nuclear Scintigraphic Defecography

Another modality available to study colonic transit is radionuclide scanning or scintigraphy. Radionuclide scintigraphy is a noninvasive nuclear medicine test that provides information on regional as well as overall colonic transit motility, using the radionuclide 111-diethylenetriamine pentaacetic acid (¹¹¹In-DTPA). When the study was first introduced in the 1980s, the ¹¹¹In-DTPA was introduced into the cecum antegrade by placing a tube orally to intubate the cecum or retrograde via a tube placed during colonoscopy.²⁰ Now, the ability to use radiolabeled elements in oral preparations has made the test simpler to utilize.

After ingestion of the radionuclide, the patient is placed under a gamma probe and colonic motility is analyzed by scintigraphic scans of the patient at 24 and 48 hours. It is also possible to combine the colonic motility study with a technetium-99 (Tc⁹⁹) scan to obtain motility studies of the stomach and small bowel in addition to the colon. This is known as whole-gut transit scintigraphy. This allows the clinician to rule out diffuse gastrointestinal dysmotility as a cause of a patient's slow transit constipation.²¹

Fig. 1 Sitzmark test at day 10 in a patient with colonic inertia. Retained markers are distributed throughout the colon. In a normal patient, greater than 80% of markers are evacuated prior to imaging. An abnormal study is defined as retention of 20% or more markers beyond day 4, corresponding to 5 markers in a typical test. In obstructed defecation, retained markers will collect in the rectum or rectosigmoid. (Photo credit: A. S. Kumar, MD.)

Wireless Motility Capsule

A wireless motility capsule can also be used to measure colon transit.²² The colon transit time is measured from the time from entry of the capsule in to the cecum, determined by a sudden drop in pH, to the time the capsule passes out of the colon, determined by a sudden drop in temperature accompanied by a loss of pressure recording. In a multicenter study

of constipated patients that compared the wireless motility capsule to radiopaque markers, overall agreement in classifying patients as having either slow or normal colon transit was 87%.²³

Anorectal Manometry

Anorectal manometry can be very useful in the diagnosis of obstructed defecation. It measures anal sphincter muscle tone and the anorectal sensory response to different stimuli. Manometry is used to evaluate anal resting pressure, squeeze pressure, length of the high-pressure zone (HPZ), compliance of the rectum, the RAIR, and the ability of the internal and external anal sphincter to relax with straining.¹⁶

When traditional manometry is performed, a station pull-through maneuver is used to measure pressures at several levels in the anal canal. The patient is placed in the left lateral decubitus position or lithotomy and the manometry catheter is introduced into the rectum. It is then pulled back through the anal canal with measurements taken at intervals to determine the HPZ, and subsequently, the rest, squeeze, and push pressures of the anal sphincter in the HPZ (→ Fig. 2). Normal ranges differ by age and gender and patients should be compared with matched normal individuals.²⁴ As a general rule, all manometric amplitudes decrease with age.²⁵

Development of high-resolution catheters using closely spaced solid-state sensors to simultaneously measure circumferential pressures in the rectum and anal canal have obviated the need to perform a station pull-through maneuver.^{26,27} These high-definition catheters provide greater definition of sphincter morphology and defects, and provide better resolution compared with the traditional systems.²⁸ However, only the highest pressure recorded by the catheter at any instant is used to calculate the average or maximum resting or squeeze pressure, which is why normal values are higher than for traditional systems.²⁷ Anal pressures measured by high-resolution manometry have been significantly correlated with traditional manometry.²⁹

Anal sphincter pressures can be monitored during distention of the rectum with a rectal balloon. This simulates distention of the rectum by feces.³⁰ In normal individuals,

Fig. 2 Anorectal manometry. Normal tracing of resting tone during a pull-through maneuver. Note that the pressure measurement progressively increases from the 4 cm level to 2 cm level and that a small decrease in pressure occurs at the 1-cm level as well as a precipitous drop to zero as the probe exits the anal canal. (Photo credit: Lee E. Smith.)

this distention of the rectum causes the internal anal sphincter to relax. The amplitude and duration of relaxation is proportional to the amount of rectal distention.³¹ If a clinician is unable to illicit a RAIR with the initial attempt, a larger volume of air should be used to distend the rectum before registering the RAIR as missing.²¹ In Hirschsprung disease, the RAIR is absent on manometry (►Fig. 3). Patients with constipation have an impaired RAIR in comparison with healthy subjects, requiring higher volumes of distention to achieve 50% relaxation.³²

Abnormal findings on anorectal manometry suggestive of obstructed defecation include inadequate pushing force, paradoxical increase in anal sphincter pressure, and an absent or incomplete sphincter relaxation. Paradoxical anal sphincter contraction (►Fig. 4) is defined as an increase in sphincter pressure greater than 40 mm Hg during simulated defecation.³³ Normal propulsive force is defined as a rise in the intrarectal pressure of greater than or equal to 40 mm Hg during simulated defecation. The Rao classification of dyssynergic defecation utilizes these abnormal anorectal manometry findings to distinguish different types of dyssynergia³⁴ (►Table 3).

The diagnostic agreement between anorectal high-resolution anorectal manometry and magnetic resonance (MR) defecography is high and pressure measurements accurately identify rectoanal dyssynergia and intra-anal outlet obstruction by structural pathology as causes of obstructed defecation.³³ However, recent studies have begun to question the utility of anorectal manometry in the diagnosis of dyssynergic defecation.^{35,36}

Rectal Balloon Expulsion Test

The balloon expulsion test is another modality that can be used to assess rectoanal coordination and can be performed in conjunction with manometry. The test was first described by Barnes in the 1980s.³⁷ A balloon is placed into the rectum and expanded with air or water to 50 cm³. The patient is then asked to evacuate the balloon.

Normal subjects with a normal RAIR are able to expel the balloon in a median of 50 seconds.³⁸ Failure to expel the balloon after five attempts is suggestive of an outlet obstruction and should trigger further anorectal testing (i.e., cinedefecography).³⁹

Fig. 3 Anorectal manometry—Rectoanal inhibitory reflex (RAIR). Each spike (thin arrow) corresponds with insufflation of the rectal balloon. (A) Normal RAIR waveform. Relaxation of the internal sphincter occurs following balloon insufflation (thick arrow). (B) Absence of RAIR in Hirschsprung disease. No RAIR follows insufflation of the rectal balloon. (Photo credit: Adapted with permission from Dr. Lee E. Smith).

Fig. 4 Anorectal manometry—strain maneuver. (A) Normal. Relaxation of the sphincter during the strain maneuver. (B) Anismus. Paradoxical increase (arrow) in sphincter pressure during the strain maneuver (Photo credit: Adapted with permission from Dr. Lee E. Smith).

A simplified balloon expulsion test was described by Beck in 1992.⁴⁰ In this study, a latex balloon attached to a 60-cm³ catheter-tipped syringe with hemorrhoid rubber bands is inserted into the patient's rectum. The syringe is used to inflate the balloon and subsequently removed from the rectum. The hemorrhoid rubber bands seal the balloon upon removal of the catheter-tipped syringe. The patient attempts to pass the balloon on a commode, allowing for a more physiologic position, which more closely mimics normal evacuation. Again, failure to pass the balloon suggests outlet obstruction and merits additional evaluation.

Electromyography

Electromyography (EMG) is a technique that can be used to evaluate anal sphincter and pelvic floor musculature by measuring the motor unit action potentials (MUAP) of the muscles.⁴¹ EMG tracings measure the duration, amplitude, and recruitment of motor units during voluntary squeeze and push maneuvers, providing helpful information to complement other anorectal tests performed (►Fig. 5). At rest, the muscles of the external anal sphincter are continuously and spontaneously active with the activity normally increasing during voluntary contraction and decreasing during straining.^{42,43}

Table 3 Rao classification of dyssynergic defecation

Classification	Paradoxical Contraction	No sphincter relaxation
Adequate propulsive force (rise in intrarectal pressure ≥ 40mmHg)	I	III
Inadequate propulsive force (rise in intrarectal pressure < 40mmHg)	II	IV

Fig. 5 Electromyography. (A) Normal activity of the puborectalis muscle at rest and during coughing, squeezing, and straining. (B) Paradoxical increase of activity during straining in a patient with paradoxical puborectalis contraction (arrow). (Photo credit: Adapted with permission from Dr. Lee E. Smith).

EMG can be performed using needle or wire EMG (invasive EMG), skin electrode EMG (surface noninvasive EMG), or using EMG-equipped anal plugs. The surface EMG method has been shown to be equivalent to the concentric needle technique⁴⁴ and carries a good negative predictive value (NPV, 91%) to rule out paradoxical puborectalis contraction (PPC).^{45,46}

PPC is registered as a failure to relax the puborectalis muscle at attempted defecation and can be diagnosed on EMG when MUAP recordings from the puborectalis fail to decrease during attempted evacuation.²¹ However, positive predictive value (PPV) is low with EMG (31%) and an EMG test suggestive of PPC should trigger further definitive testing with cinedefecography.⁴⁵

Defecography/Dynamic MRI Defecography

Defecography, or fluoroscopic evacuation proctography, is now a well-established technique utilized to evaluate the dynamics of rectal emptying. It provides physiologic evaluation of evacuation of the patient under radiographic guidance. However, because of the sheer physiologic nature of the technique, evaluation is tantamount on the voluntary control of the pelvic floor and passive emptying of the rectum from the patient's point of view.¹⁵ Studies are best completed with the rectum empty.

A normal defecogram is measured in three stages: rest, evacuation, and recovery. In the resting phase, given normal sphincter function, the anal canal should be closed. The anorectal junction (ARJ) and anorectal angle (ARA) are measured during this phase. Evacuation is characterized by an initiation of pelvic floor descent, which begins defecation. This is characterized by the descent of the ARJ from rest to opening of the anal canal, which occurs normally within seconds. When the canal is empty, it empties quickly and normally is complete within 30 seconds. Evaluation of anatomic and mechanical abnormalities is done following significant straining. Following evacuation, recovery occurs and is characterized by the return of tone to the internal sphincter and levator ani. The anal canal closes, the ARA becomes more acute, and the pelvic floor and ARJ elevate to their resting position (–Fig. 6).

In addition to normal defecation, pathology can also be seen which can contribute to obstructed defecation. During evacuation, an anterior bulge can be noted in the rectal wall measured from the anterior aspect of the distal rectum (the tip of the rectocele) to the anterior wall of the anal canal.⁴⁷ In normal individuals, this is generally less than 2 cm. An anterior bulge depth often greater than 3 cm characterizes rectoceles. Intussusceptions are characterized by an infolding of the rectal wall that begins 6 to 8 cm from the anal

Fig. 6 Defecography. R is the rectum; A is the margin of the distal anus. (1) The rectum at rest. (2) The rectum during voluntary squeeze. The arrow indicates the angle created (depicted in white) by the puborectalis muscle pull. (3) The rectum during evacuation. The anorectal angle (depicted in white) opens as the puborectalis muscle relaxes. (Photo credit: Adapted with permission from Dr. Lee E. Smith).

margin.^{15,48} On imaging, a circular infolding of the rectal wall that narrows the lumen can be appreciated (► **Fig. 7**). The intussusception is noted on both the lateral and anteroposterior views to expand the anal canal.¹⁵ The extension of this into the anal canal is usually considered abnormal. Roos et al characterize intussusceptions that remain in the rectum (intrarectal), those that extend into the anal canal, and finally those that pass the external sphincter resulting in an external prolapse.⁴⁹

Dynamic MRI is an emerging alternative to fluoroscopic evacuation proctography. In addition to its lack of radiation exposure, it provides a dynamic and three-dimensional reconstruction of images outlining the detailed anatomy of the pelvic floor.⁵⁰ MR defecography is especially useful in distinguishing small bowel and intraperitoneal contents. In the detection of enteroceles, this contrast is useful in distinguishing small bowel contents in the posterior superior portion of the rectovaginal or rectovesical region.⁴⁹ MRI is able to show the posterior compartment in great detail helping elucidate contents and making sigmoidoceles and rectoceles more distinct for identification.

Ultrasound

Traditional vaginal ultrasound can serve as an alternative to defecography/dynamic MRI. Rectocele is characterized by a semicircumferential anterior hypoechoic region between the rectum and the vagina during straining or an endoanal bulk of mixed echogenicity due to a concomitant rectal internal mucosal prolapse. Enteroceles are characterized by an oval of hypoechoic material surrounded by an hyperechoic layer representing the intestinal wall between the anorectum and the vagina, best seen while straining.⁵¹ Halligan et al found vaginal ultrasound to be 100% sensitive and 82% specific in identifying enteroceles, with a 75% PPV and 100% NPV.⁵² Vaginal ultrasound was found to be 7% sensitive and 67% specific for rectoceles.⁵¹

Dynamic translabial ultrasound (DTUS) has been shown to identify etiologies of obstructed constipation. On DTUS, a rectocele is defined as a discontinuity in the anterior ano-

rectal muscularis that results in a herniation of rectal contents into the vaginal wall by at least a depth of 10 mm. Intussusception is detected as a hyperechoic mass correlating to a full-thickness invagination of the rectal wall into the anal canal during forceful straining. DTUS was found to have a PPV of 82% for rectocele and 88% for intussusception/rectal prolapse.⁵³

On endorectal/anal ultrasound, intussusception appears as a double concentric hypoechoic ring found 5 to 7 cm from the anal verge. Although anal ultrasound is used for evaluation of the anal canal, due to its static nature of a dynamic process it is of limited use in the evaluation of obstructed defecation.⁵⁴ It can be beneficial, however, in identifying the often-present, abnormally thick internal anal sphincter associated with intussusception in patients with solitary rectal ulcer syndrome (SURS).⁵⁵ Finally, endorectal/anal ultrasound has great benefit in visualizing malignant lesions in the rectum and anus that may be contributing to obstructed constipation.⁵⁶

Psychological Examination

Psychological factors are known to play a role in the development of functional gastrointestinal disorders (FGIDs), including constipation.^{57–59} Thus, a psychological examination is useful in diagnosing constipation and psychological factors should not be ignored. Patients suffering from PPC may have an underlying psychological component and may benefit from biofeedback sessions aimed at training them to relax their pelvic floor during defecation. There is a significantly high degree of psychiatric ailments in patients with negative findings on defecation proctography who should be appropriately screened for a history of sexual abuse and symptoms of psychosocial distress.⁶⁰ Treatment of these psychological conditions has shown improvement in the quality of life of patients with refractory FGIDs.⁶¹

Medical versus Surgical Therapy

As with many patients with constipation, patients with obstructed defecation often have significant clinical

Fig. 7 Defecography. (A) Enterocoele. V marks the vagina. E marks the enterocoele as it descends between the vagina and rectum. (B) Rectocoele. R marks the rectocoele. A marks the margin of the distal anus. (C1 and C2) Intussusception of the rectum. Note the progressive infolding of the rectum. (Photo credit: Lee E. Smith and Anjali Kumar.)

improvement with dietary and lifestyle changes. Current recommendations include fiber supplementation to 30 g/day and 1 to 2 L of fluid intake per day. Use of laxatives can also elicit improvement in constipation symptoms. However, long-term use is controversial and may result in degradation of the myenteric plexus.^{62,63} Additionally, treatment of metabolic abnormalities such as hypokalemia, hypomagnesemia, hypocalcemia, and hyperglycemia can also improve symptoms.

Patients found on evaluation to have abnormal coordination of the muscles involved in defecation, such as PPC or a loss of the RAIR, often benefit from various treatments. Pelvic floor exercises and biofeedback have been shown to be helpful with success ranging between 30 and 90%.¹⁷ However, benefits may degrade over time and require retreatment with biofeedback in the future. Sacral nerve stimulation has also

been used to treat constipation. However, the response to treatment is inconsistent.⁶⁴

Surgical therapy is typically considered only after nonsurgical options have failed and following thorough workup. It can be used for the management of enterocoele, rectocoele, intussusception, but may also be indicated in patients with refractory constipation.

Conclusion

Due to its complex and multifactorial nature, the diagnosis of obstructed defecation often requires a multimodal analysis that includes both functional and anatomic investigations. Patients with obstructed defecation typically present with symptoms of abdominal discomfort, a sensation of incomplete evacuation and rectal obstruction, passage of hard stools, the

need for rectal or vaginal digitation, excessive straining, and reduced stool frequency. Evaluation of obstructed defecation should involve a combination of modalities, starting with a thorough history and physical examination with focus on the abdominal, perineal, and rectal examination. Additional modalities that should be used in the diagnosis of obstructed defecation include proctoscopy, colonic transit time studies, anorectal manometry, a rectal balloon expulsion test, defecography, electromyography, and ultrasound. Unfortunately, at this time, there is limited agreement between the tests used to diagnose obstructed defecation and there is no single criterion standard for diagnosis.²⁸ Therefore, it is essential to examine the results of each study in the context of each patient's complaints. Management of a patient's obstructed defecation is often dependent on its etiology. Surgery is typically used as a last resort.

Acknowledgments

The authors gratefully acknowledge the assistance of Dr. Lee Smith in providing original images of defecography and manometry testing that he performed. The authors also thank the ASCRS CREST committee for allowing them to present their work in this manner.

References

- Bharucha AE, Pemberton JH, Locke GR III. American Gastroenterological Association technical review on constipation. *Gastroenterology* 2013;144(1):218–238
- Mugie SM, Benninga MA, Di Lorenzo C. Epidemiology of constipation in children and adults: a systematic review. *Best Pract Res Clin Gastroenterol* 2011;25(1):3–18
- Sonnenberg A, Koch TR. Epidemiology of constipation in the United States. *Dis Colon Rectum* 1989;32(1):1–8
- Chang L, Toner BB, Fukudo S, et al. Gender, age, society, culture, and the patient's perspective in the functional gastrointestinal disorders. *Gastroenterology* 2006;130(5):1435–1446
- Longstreth GF, Thompson WG, Chey WD, Houghton LA, Mearin F, Spiller RC. Functional bowel disorders. *Gastroenterology* 2006;130(5):1480–1491
- D'Hoore A, Penninckx F. Obstructed defecation. *Colorectal Dis* 2003;5(4):280–287
- Lembo A, Camilleri M. Chronic constipation. *N Engl J Med* 2003;349(14):1360–1368
- Rotholtz NA, Efron JE, Weiss EG, Nogueras JJ, Wexner SD. Anal manometric predictors of significant rectocele in constipated patients. *Tech Coloproctol* 2002;6(2):73–76, discussion 76–77
- Sun WM, Rao SS. Manometric assessment of anorectal function. *Gastroenterol Clin North Am* 2001;30(1):15–32
- Rao SS, Meduri K. What is necessary to diagnose constipation? *Best Pract Res Clin Gastroenterol* 2011;25(1):127–140
- Felt-Bersma RJ, Cuesta MA. Rectal prolapse, rectal intussusception, rectocele, and solitary rectal ulcer syndrome. *Gastroenterol Clin North Am* 2001;30(1):199–222
- Ellis CN. Treatment of obstructed defecation. *Clin Colon Rectal Surg* 2005;18(2):85–95
- Weiss EG, McLemore EC. Functional disorders: rectoanal intussusception. *Clin Colon Rectal Surg* 2008;21(2):122–128
- Ellis CN. Stapled transanal rectal resection (STARR). *Oper Tech Gen Surg* 2008;10:198–208. Available at <http://www.sciencedirect.com/science/article/pii/S1524153X08000614>
- Maglinte DD, Bartram C. Dynamic imaging of posterior compartment pelvic floor dysfunction by evacuation proctography: techniques, indications, results and limitations. *Eur J Radiol* 2007;61(3):454–461
- Vrees MD, Weiss EG. The evaluation of constipation. *Clin Colon Rectal Surg* 2005;18(2):65–75
- Khaiakin M, Wexner SD. Treatment strategies in obstructed defecation and fecal incontinence. *World J Gastroenterol* 2006;12(20):3168–3173
- Steele SR, Mellgren A. Constipation and obstructed defecation. *Clin Colon Rectal Surg* 2007;20(2):110–117
- Nam YS, Pikarsky AJ, Wexner SD, et al. Reproducibility of colonic transit study in patients with chronic constipation. *Dis Colon Rectum* 2001;44(1):86–92
- Krevsky B, Malmud LS, D'Ercole F, Maurer AH, Fisher RS. Colonic transit scintigraphy. A physiologic approach to the quantitative measurement of colonic transit in humans. *Gastroenterology* 1986;91(5):1102–1112
- Alame AM, Bahna H. Evaluation of constipation. *Clin Colon Rectal Surg* 2012;25(1):5–11
- Maurer AH. Gastrointestinal motility, Part 2: Small-bowel and colon transit. *J Nucl Med* 2015;56(9):1395–1400
- Camilleri M, Thorne NK, Ringel Y, et al. Wireless pH-motility capsule for colonic transit: prospective comparison with radiopaque markers in chronic constipation. *Neurogastroenterol Motil* 2010;22(8):874–882, e233
- Rao SS, Hatfield R, Soffer E, Rao S, Beaty J, Conklin JL. Manometric tests of anorectal function in healthy adults. *Am J Gastroenterol* 1999;94(3):773–783
- Bannister JJ, Abouzekry L, Read NW. Effect of aging on anorectal function. *Gut* 1987;28(3):353–357
- Bharucha AE, Fletcher JG. Recent advances in assessing anorectal structure and functions. *Gastroenterology* 2007;133(4):1069–1074
- Noelting J, Ratuapli SK, Bharucha AE, Harvey DM, Ravi K, Zinsmeister AR. Normal values for high-resolution anorectal manometry in healthy women: effects of age and significance of rectoanal gradient. *Am J Gastroenterol* 2012;107(10):1530–1536
- Bharucha AE, Rao SS. An update on anorectal disorders for gastroenterologists. *Gastroenterology* 2014;146(1):37–45.e2
- Jones MP, Post J, Crowell MD. High-resolution manometry in the evaluation of anorectal disorders: a simultaneous comparison with water-perfused manometry. *Am J Gastroenterol* 2007;102(4):850–855
- Azpiroz F, Enck P, Whitehead WE. Anorectal functional testing: review of collective experience. *Am J Gastroenterol* 2002;97(2):232–240
- Thorson AG. Anorectal physiology. *Surg Clin North Am* 2002;82(6):1115–1123
- Xu X, Pasricha PJ, Sallam HS, Ma L, Chen JD. Clinical significance of quantitative assessment of rectoanal inhibitory reflex (RAIR) in patients with constipation. *J Clin Gastroenterol* 2008;42(6):692–698
- Heinrich H, Sauter M, Fox M, et al. Assessment of obstructive defecation by high-resolution anorectal manometry compared with magnetic resonance defecography. *Clin Gastroenterol Hepatol* 2015;13(7):1310–1317.e1
- Rao SS. Dyssynergic defecation and biofeedback therapy. *Gastroenterol Clin North Am* 2008;37(3):569–586, viii
- Grossi U, Carrington EV, Bharucha AE, Horrocks EJ, Scott SM, Knowles CH. Diagnostic accuracy study of anorectal manometry for diagnosis of dyssynergic defecation. *Gut* 2016;65(3):447–455
- Coss-Adame E, Rao SS, Valestin J, Ali-Azamar A, Remes-Troche JM. Accuracy and reproducibility of high-definition anorectal manometry and pressure topography analyses in healthy subjects. *Clin Gastroenterol Hepatol* 2015;13(6):1143–50.e1

- 37 Barnes PR, Lennard-Jones JE. Balloon expulsion from the rectum in constipation of different types. *Gut* 1985;26(10):1049–1052
- 38 Scott SM, Gladman MA. Manometric, sensorimotor, and neurophysiologic evaluation of anorectal function. *Gastroenterol Clin North Am* 2008;37(3):511–538, vii
- 39 Fleshman JW, Dreznik Z, Cohen E, Fry RD, Kodner IJ. Balloon expulsion test facilitates diagnosis of pelvic floor outlet obstruction due to nonrelaxing puborectalis muscle. *Dis Colon Rectum* 1992;35(11):1019–1025
- 40 Beck DE. Simplified balloon expulsion test. *Dis Colon Rectum* 1992;35(6):597–598
- 41 Lefaucheur JP. Neurophysiological testing in anorectal disorders. *Muscle Nerve* 2006;33(3):324–333
- 42 Porter NH. A physiological study of the pelvic floor in rectal prolapse. *Ann R Coll Surg Engl* 1962;31:379–404
- 43 Floyd WF, Walls EW. Electromyography of the sphincter ani externus in man. *J Physiol* 1953;122(3):599–609
- 44 Axelsson HW, Edebol Eeg-Olofsson K. Simplified evaluation of the paradoxical puborectalis contraction with surface electrodes. *Dis Colon Rectum* 2010;53(6):928–931
- 45 Yeh CY, Pikarsky A, Wexner SD, et al. Electromyographic findings of paradoxical puborectalis contraction correlate poorly with cinedefecography. *Tech Coloproctol* 2003;7(2):77–81
- 46 Podnar S. Electrodiagnosis of the anorectum: a review of techniques and clinical applications. *Tech Coloproctol* 2003;7(2):71–76
- 47 Law YM, Fielding JR. MRI of pelvic floor dysfunction: review. *AJR Am J Roentgenol* 2008;191(6, Suppl):S45–S53
- 48 Kelvin FM, Maglinte DD, Benson JT. Evacuation proctography (defecography): an aid to the investigation of pelvic floor disorders. *Obstet Gynecol* 1994;83(2):307–314
- 49 Roos JE, Weishaupt D, Wildermuth S, Willmann JK, Marincek B, Hilfiker PR. Experience of 4 years with open MR defecography: pictorial review of anorectal anatomy and disease. *Radiographics* 2002;22(4):817–832
- 50 Hall GM, Shanmugan S, Nobel T, et al. Symptomatic rectocele: what are the indications for repair? *Am J Surg* 2014;207(3):375–379, discussion 378–379
- 51 Bruscianno L, Limongelli P, Pescatori M, et al. Ultrasonographic patterns in patients with obstructed defaecation. *Int J Colorectal Dis* 2007;22(8):969–977
- 52 Halligan S, Northover J, Bartram CI. Vaginal endosonography to diagnose enterocoele. *Br J Radiol* 1996;69(827):996–999
- 53 Perniola G, Shek C, Chong CC, Chew S, Cartmill J, Dietz HP. Defecation proctography and translabial ultrasound in the investigation of defecatory disorders. *Ultrasound Obstet Gynecol* 2008;31(5):567–571
- 54 Bove A, Pucciani F, Bellini M, et al. Consensus statement AIGO/SICCR: diagnosis and treatment of chronic constipation and obstructed defecation (part I: diagnosis). *World J Gastroenterol* 2012;18(14):1555–1564
- 55 Marshall M, Halligan S, Fotheringham T, Bartram C, Nicholls RJ. Predictive value of internal anal sphincter thickness for diagnosis of rectal intussusception in patients with solitary rectal ulcer syndrome. *Br J Surg* 2002;89(10):1281–1285
- 56 Santoro GA, Fortling B. The advantages of volume rendering in three-dimensional endosonography of the anorectum. *Dis Colon Rectum* 2007;50(3):359–368
- 57 Mak AD, Wu JC, Chan Y, Chan FK, Sung JJ, Lee S. Dyspepsia is strongly associated with major depression and generalised anxiety disorder - a community study. *Aliment Pharmacol Ther* 2012;36(8):800–810
- 58 Lee SP, Sung IK, Kim JH, Lee SY, Park HS, Shim CS. The effect of emotional stress and depression on the prevalence of digestive diseases. *J Neurogastroenterol Motil* 2015;21(2):273–282
- 59 Bennett EJ, Piesse C, Palmer K, Badcock CA, Tennant CC, Kellow JE. Functional gastrointestinal disorders: psychological, social, and somatic features. *Gut* 1998;42(3):414–420
- 60 Kashyap AS, Kohli DR, Raizon A, Olden KW. A prospective study evaluating emotional disturbance in subjects undergoing defecating proctography. *World J Gastroenterol* 2013;19(25):3990–3995
- 61 Wang YT, Kwok KF, Tan SM, et al. Comprehensive psychological intervention to improve outcome in functional gastrointestinal disorder: a cohort study. *Singapore Med J* 2015;56(7):385–392
- 62 Nadal SR, Calore EE, Manzione CR, Puga FR, Perez NM. Effects of long-term administration of Senna occidentalis seeds in the large bowel of rats. *Pathol Res Pract* 2003;199(11):733–737
- 63 Beuers U, Spengler U, Pape GR. Hepatitis after chronic abuse of senna. *Lancet* 1991;337(8737):372–373
- 64 Thomas GP, Dudding TC, Rahbour G, Nicholls RJ, Vaizey CJ. Sacral nerve stimulation for constipation. *Br J Surg* 2013;100(2):174–181