

## MEDICAL REVIEW

# Management of Disorders of the Posterior Pelvic Floor

Loren Berman,<sup>a</sup> John Aversa,<sup>b</sup> Farshad Abir,<sup>a</sup> and Walter E. Longo<sup>a\*</sup>

<sup>a</sup>Departments of Surgery, Yale University School of Medicine, New Haven, Connecticut and <sup>b</sup>St. Raphael's Hospital and Medical Center, New Haven, Connecticut

**Introduction:** Constipation is a relatively common problem affecting 15 percent of adults in the Western world, and over half of these cases are related to pelvic floor disorders. This article reviews the clinical presentation and diagnostic approach to posterior pelvic floor disorders, including how to image and treat them. **Methods:** A PubMed search using keywords "rectal prolapse," "rectocele," "perineal hernia," and "anismus" was conducted, and bibliographies of the revealed articles were cross-referenced to obtain a representative cross-section of the literature, both investigational studies and reviews, that are currently available on posterior pelvic floor disorders. **Discussion:** Pelvic floor disorders can occur with or without concomitant physical anatomical defects, and there are a number of imaging modalities available to detect such abnormalities in order to decide on the appropriate course of treatment. Depending on the nature of the disorder, operative or non-operative therapy may be indicated. **Conclusion:** Correctly diagnosing pelvic floor disorders can be complex and challenging, and the various imaging modalities as well as clinical history and exam must be considered together in order to arrive at a diagnosis.

## INTRODUCTION

Disorders of the posterior pelvic floor include rectal prolapse, rectocele, and perineal hernia. All of these are associated with disturbances in the integrity of the pelvic floor musculature and disordered defecation. These disorders will be addressed individually, and various imaging modalities and therapeutic interventions will be discussed.

Patients with pelvic floor disorders usually present with constipation. Constipation occurs in 18 percent of the population and accounts for 1.2 million

doctor visits per year in the United States [1]. The chief complaint of constipation can signify a disease process that can be colonic or extracolonic in etiology. Pelvic floor dysfunction is a more likely explanation in patients with certain specific complaints. These include the following: inability to completely evacuate the rectum, feeling of persistent rectal fullness, rectal pain, a description of pelvic floor descent, and prolonged straining. When patients describe a tendency to digitally evacuate stool, apply pressure on the posterior wall of the vagina to aid defecation,

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\*To whom all correspondence should be addressed: Walter E. Longo, M.D., Yale University School of Medicine, LH 118, New Haven, CT 06510. Tel.: 203-785-2616; Fax: 203-785-2615; E-mail: walter.longo@yale.edu.

†Abbreviations: EAS, external anal sphincter; IAS, internal anal sphincter.

or manually support the perineum during straining, this is highly suggestive of pelvic floor dysfunction.

Constipation in the setting of pelvic floor dysfunction is called functional constipation. Diagnostic criteria for functional constipation are: at least 12 weeks (which need not be consecutive) in the preceding 12 months of two or more of (1) straining in more than one-quarter of defecations; (2) lumpy or hard stools in one-quarter of defecations; (3) sensation of incomplete evacuation in one-quarter of defecations; (4) sensation of anorectal obstruction/ blockage in one-quarter of defecations; (5) manual maneuvers to facilitate in one-quarter of defecations (e.g., digital evacuation, support of the pelvic floor); and/or (6) less than three defecations in a week. Loose stools are not present, and there is insufficient evidence for irritable bowel syndrome [2].

## **ANATOMY OF THE PELVIC FLOOR AND NORMAL DEFECATION**

The pelvic floor is composed of striated muscle referred to as the levator ani. The levator ani muscle is divided into four parts. Three of these are named for the component of pubic bone from which they originate: pubococcygeus, iliococcygeus, and ischiococcygeus. The fourth, the puborectalis, arises from the posterior symphysis pubis and loops around the recto-anal flexure, intermingling its fibers with the external anal sphincter (EAS)<sup>†</sup> [3]. Both the puborectalis and the EAS are activated together during voluntary contractions of the pelvic floor and during Valsalva maneuvers of any type such as coughing or straining. During normal defecation, stool enters the rectum from the sigmoid colon and is detected by stretch receptors in the pelvic floor or rectal wall. In this way the urge to defecate is produced. At first it is an intermittent sensation that gradually intensifies and becomes more permanent. The anal sampling reflex detects the difference between stool and flatus by allowing

the contents of the rectum to come into contact with the more sensitive anal canal lining by relaxing the internal anal sphincter (the recto-anal inhibitory reflex). Continence at this time is preserved because there is simultaneous contraction of the EAS. If defecation is not convenient, contraction of the EAS and puborectalis propels the stool proximally into the sigmoid colon, the internal anal sphincter regains its resting tone, and defecation is deferred. In order to defecate, rectal pressure must exceed the pressure in the anal canal, which can be accomplished by a Valsalva maneuver. Then there is simultaneous relaxation of internal and external anal sphincters, and stool is passed. Defecation is completed by a closing reflex, which involves contraction of EAS.

In disorders of the posterior pelvic floor, anatomical defects of the rectum and pelvic floor musculature interfere with normal defecation as described above.

## **RECTAL PROLAPSE**

Rectal prolapse occurs when the full thickness of the rectal wall protrudes through the anal canal.

### *Clinical presentation*

It is most common in elderly females (80 to 90 percent of rectal prolapse patients) [4], but it can occur at any age. Patients are immediately aware of a prolapse event when it occurs, except of course in infants or the senile elderly. It may present with constipation or incontinence, and patients also may have bleeding, tenesmus, or mucus discharge. Early in the disease process, prolapse happens only during bowel movements or while straining but may progress as tissues become more lax over time. Patients with rectal prolapse have an impaired ability to adapt to rectal distention and maintain EAS and puborectalis contraction during distention. This can contribute to incontinence, which occurs in over half of all rec-

tal prolapse patients [5]. Constipation has been shown to be associated with prolapse in 15 to 65 percent of patients [6]. Patients may experience prolapse when they simply stand up or with very mild straining. Occasionally the prolapsed rectum can become incarcerated. In this situation, hypertonic sugar can be applied to the rectum to shrink it and enable reduction.

### *Physical exam*

The anus may appear patulous. A definitive diagnosis can be made when bowel is visualized protruding from the anus. It may be difficult to elicit the prolapse with the patient in a lateral decubitus position. In this case, it may be appropriate to examine the patient while straining in a squatting position. Small prolapses may be difficult to distinguish from hemorrhoids. It is possible to make this distinction by using the index finger to display the layers of prolapsed bowel. If layers of prolapsed bowel can be identified, this clarifies the diagnosis as prolapse rather than hemorrhoids.

### *Diagnosis*

This is usually a simple diagnosis to make, as the patient gives a specific history describing the prolapse occurring during bowel movements. The differential diagnosis should include hemorrhoids, prolapsing polyps, and anorectal neoplasia. The presence of prolapse is confirmed on physical exam.

### *Pathophysiology*

Patients with rectal prolapse have been observed to have low internal anal sphincter resting pressures. This can be seen as an etiological factor that predisposes patients to the development of prolapse or as result of chronic prolapse. When prolapse occurs, a sensation of rectal distention is created, which sets off the recto-anal inhibitory reflex, leading to decreased internal anal sphincter tone. It is difficult to establish a time-frame for the development of this

characteristic and the onset of prolapse in order to distinguish whether the low tone is etiological or a reaction to the chronic stretching of the rectum and pelvic floor that occurs in this disease. Some argue that the initial event is increased internal anal sphincter tone that causes a cycle of outlet obstruction, constipation, and straining. Chronic straining can initiate a midrectal intussusception, which eventually leads to prolapse. It is also possible to have internal intussusception without prolapse beyond the anal orifice or mucosal prolapse. Mucosal prolapse occurs when just the lining of the bowel lumen protrudes from the rectum. It can be repaired with simple excision or rubber band ligation [7].

### *Treatment*

Rectal prolapse can be repaired by an abdominal or perineal approach. Abdominal approaches tend to have fewer recurrences but are more invasive and less ideal for patients with comorbid disease. Abdominal repairs involve fixation of the rectum to the sacral promontory. This can be performed laparoscopically with similarly low rates of recurrence. Perineal resections can be performed under conscious sedation using local or spinal anesthesia. These include the Altmeier and the Delorme perineal rectosigmoidectomy. In the Altmeier, the prolapsing segment is removed, and the subsequent fibrosis fixes the rectum in position in the pelvis. The Delorme is less invasive, involving stripping of the rectal mucosa starting 1 cm above the dentate line and continuing to above the prolapsing segment, then anastomosing the proximal mucosa to the distal cuff of mucosa that was left above the dentate line. Although these approaches may have higher recurrence rates in some series, they cause less morbidity in the post-operative period [8, 9].

If patients are experiencing constipation preoperatively, sigmoidectomy is favored in addition to prolapse repair. Constipated patients often have a redun-

dant loop of sigmoid colon that flops over the sacral promontory and is responsible for their symptoms. This problem can be prevented by performing sigmoidectomy at the time of prolapse repair. Overall, surgery for rectal prolapse can prevent recurrence, and improve bowel function and continence [10].

When prolapse does recur after surgical repair, repeat repair can lead to improvement in the prolapse itself but often not in incontinence or constipation. Any factors predisposing towards recurrence should be thoroughly investigated and if possible, intervened upon, before a repeat repair is attempted. When it comes to the repair itself, some advocate a perineal approach for a failed abdominal repair and an abdominal approach for a failed perineal repair [11].

## PERINEAL HERNIA

Perineal hernias develop in patients after undergoing abdominal perineal resection and pelvic exenteration for advanced rectal cancer. A large portion of the pelvic floor is removed during these procedures, creating a defect that allows the small bowel to descend through the pelvis into the perineum.

### *Clinical presentation*

Perineal hernias occur commonly in the post-operative period but usually are not symptomatic. When they are symptomatic, they may present with pain, partial small bowel obstruction, urinary retention or recurrent urinary tract infections, or perineal skin breakdown. On physical exam, there is a bulge in the perineal region. Although there is a significant incidence of perineal hernia after the pelvic operations mentioned above, most of these probably go unnoticed without becoming symptomatic. The incidence of patients requiring repair of perineal hernia is about 1 percent after abdominal perineal resections and 3 to 10 percent after pelvic exenterations [12]. The condition is more common in

women. An interesting phenomenon is the development of phantom sensations in patients with perineal hernias and the sense of the need to defecate or pass flatus may continue in the absence of a rectum. Rarely, these perineal hernias may be associated with intractable perineal pain.

### *Treatment*

In deciding who is an operative candidate for repair of a perineal hernia, the severity of symptoms must be weighed against the risk of operative repair. Recurrence of tumors must also be excluded by imaging the patient with CT or ultrasound and/or performing endoscopy. Small bowel follow-through studies may reveal loops of small bowel herniating into the pelvis.

Operative repair involves exploration of the pelvis through a low midline incision to rule out recurrence of tumor and dissect the loops of small bowel free from the hernia sac by lysing adhesions. The pelvic floor is then reconstructed with synthetic mesh. An abdominal approach is favored over a perineal approach because of the relative ease of freeing the small bowel from the hernia sac and discovering cancer recurrence and the lower risk of recurrence of the hernia after abdominal repair. Recurrence is possible, however, and may necessitate more urgent repair because the defect around the mesh is small and more prone to incarceration and strangulation than a pre-operative perineal hernia. Pelvic infection is a serious complication and may occur if there are enterotomies during the dissection leading to contamination of the mesh and necessitating its removal [13].

## RECTOCELE

A rectocele occurs when there is thinning of the anterior rectal wall and posterior vaginal wall, resulting in herniation of the rectovaginal septum anteriorly into the lumen of the vagina. This is an acquired con-

dition, and risk factors include vaginal delivery and constipation with chronic straining.

### *Clinical presentation*

Patients with rectocele complain of constipation like many other patients, but eliciting certain characteristics of this constipation can help to make the diagnosis. Patients often describe a sensation of perineal or vaginal fullness and an inability to empty the rectum during defecation. They may even notice a protrusion of tissue through the vagina during straining to have a bowel movement. Sometimes patients describe a history of needing to push upward on the perineal body or apply backward pressure on the posterior wall of the vagina to enable defecation. Chronic straining may lead to bleeding from hemorrhoids or rectal prolapse. Patients may also experience fecal incontinence related to incomplete emptying or pruritis.

### *Physical exam*

A palpable defect in the anterior wall of the rectum can be identified on digital rectal exam. Pelvic exam may reveal tissue bulging into the posterior wall of the vagina.

### *Diagnosis*

The above features on physical exam are convincing for the diagnosis, but other causes of defecation difficulty such as occult intussusception or nonrelaxing puborectalis syndrome should be ruled out. These may occur along with the rectocele and would alter the approach to repair. Videodefecography is a useful imaging modality since it can detect the presence of a rectocele and quantify its size and the degree of rectal emptying as well as identify associated prolapse or non-relaxing puborectalis muscle [14]. Dynamic MRI can also aid in the diagnosis, and this will be discussed later in greater detail.

### *Treatment*

Approach to treatment depends on the severity of symptomatology and associat-

ed diagnoses. Conservative management is almost always attempted before surgical repair. If there are associated hemorrhoids that could be contributing to symptoms, rubber band ligation may be helpful. If there is paradoxical contraction of the puborectalis muscle or EAS as determined by defecography or anal manometry, biofeedback therapy may improve symptoms without surgical intervention. Increasing bulk and frequency of stool passage with fiber and laxatives can also improve symptoms. If conservative management fails, surgery can have up to a 90 percent success rate [15].

The surgical approach can be transvaginal or transanal. The transvaginal approach is traditionally used by gynecologists and the transanal by colorectal surgeons. In the transrectal approach, a vertical incision is made from the dentate line to the apex of the palpable septal defect. The mucosa and submucosa of the rectum are dissected off the rectovaginal septum, and then the fascial defect is vertically imbricated and closed. Excess mucosa is excised, and the mucosal defect is closed, completing the repair. The transrectal approach has been shown to improve rectal emptying and decrease constipation [16, 17], but there are few prospective studies documenting outcomes in the transvaginal approach.

A recent randomized controlled trial compared transvaginal and transanal approaches, enrolling 30 patients and assessing them by clinical interview and examination, defecography, colon transit study, and anorectal manometry before randomization and 12 months postoperatively. This study showed that symptoms were significantly alleviated by both operative techniques. The transanal technique was associated with more clinically diagnosed recurrences of rectocele and/or enterocele, and adverse effects on sexual life were avoided by use of both techniques [18]. This was a pilot study, however, and results of transanal repair have previously

been well-validated. Either transvaginal or transanal approach is acceptable in this patient population.

Associated problems such as internal hemorrhoids, rectal prolapse, and cystocele, enterocele, or sigmoidocele can help to determine surgical approach. Transvaginal repair would be favored to concurrently repair a cystocele whereas a transabdominal approach is necessary for enterocele or sigmoidocele.

### **PELVIC FLOOR DYSSYNERGIA**

In normal defecation, the puborectalis and EAS relax in response to the stimulus of a distended rectum when it is an appropriate time to defecate. These muscles are under voluntary control. In pelvic floor dyssynergia, there is a paradoxical contraction of these muscles, which interferes with the ability to defecate.

#### *Clinical Presentation*

Patients present with complaints of difficult defecation, a sensation of incomplete evacuation, and often a history of digital emptying of the rectal vault. Patients with anxiety and psychological stress have a predisposition towards pelvic floor dyssynergia. It is also more common in women with a history of sexual abuse [19].

#### *Physical exam*

Examination has been shown to be accurate in ruling out the diagnosis of pelvic floor dyssynergia [20], but physiological testing is required in order to make a positive diagnosis.

#### *Diagnosis*

Laboratory tests that can be helpful in making the diagnosis include manometry, balloon expulsion test, and evacuation proctography. Recently, MRI defecography has replaced proctography when available. These tests can be misleading, however. For example, paradoxical sphincter contraction has been shown to be a com-

mon finding in patients with fecal incontinence or chronic constipation, but it is also quite prevalent in healthy controls during ambulatory manometry. Furthermore, ambulatory manometry has shown that nearly 80 percent of patients with suspected anismus have appropriate EAS relaxation during straining [21]. Therefore, relying too heavily on one laboratory test can lead to overdiagnosis or misdiagnosis. Because of the difficulty in relying on the result of any single test alone, a set of diagnostic criteria for pelvic floor dyssynergia have been developed. Diagnostic criteria are as follows: fulfillment of criteria for functional constipation, manometric and/or EMG and/or radiological evidence (two out of these three should be positive), evidence of adequate expulsion force during attempted evacuation (this can be confirmed by seeing adequate pelvic floor descent with substantial elevation in intra-abdominal pressure [22]), and evidence of incomplete evacuation [23]. By obtaining a combination of physiologic tests and synthesizing the results all together, one is more likely to arrive at a valid diagnosis.

#### *Treatment*

Biofeedback training leads to success in learning to relax the anal sphincter and puborectalis muscle in at least two-thirds of patients [24]. This suggests that there is no neurological defect in this disorder. Historically, these patients were treated surgically with division of the puborectalis muscle. Surgeons who performed this procedure had a poor understanding of the pathophysiology behind the disease. The surgery was often unsuccessful and led to a high rate of incontinence [25]. Today it has been abandoned as a therapy for pelvic floor dyssynergia and biofeedback is the mainstay of treatment.

### **IMAGING OF THE PELVIC FLOOR**

Diagnostic imaging of the pelvis and pelvic floor has been the most single

advancement in the management of pelvic floor disorders. This, along with anal manometry, should be employed prior to “labeling” any patient with a specific pelvic floor disorder. Furthermore, prior to definitive treatment, imaging should be paired with the clinical presentation.

### *Defecography*

Defecography is a useful instrument in diagnosing disorders of the pelvic floor. It documents the process of rectal evacuation and can elucidate whether rectocele, rectal prolapse, or another pathology is causing dysfunctional defecation.

During defecography, the rectum is filled with thick barium paste, a radioopaque substance which approximates the consistency of fecal material. The patient sits on a radiolucent toilet chair and has video footage and plain films taken during defecation, straining, relaxation, voluntary external anal sphincter and pelvic muscle contraction, and at rest. The vagina can also be opacified to aid in the diagnosis of rectoceles and enteroceles. Oral contrast is also given 30 minutes prior to defecography so that enteroceles can be seen.

In incontinent patients with concomitant pelvic outlet obstruction, defecography is especially useful as it can demonstrate non-emptying rectoceles, spastic pelvic floor muscles, and the intussusception that occurs with rectal prolapse. Leakage of contrast at rest can be an indication of sphincter weakness if the rectum is not filled to maximum capacity. This is seen only in patients with overt incontinence. Filling the rectum to maximum capacity simulates rectal distention and the rectoanal inhibitory reflex. The healthy response to this is to increase EAS tone, and this is often impaired in incontinent patients so they will demonstrate leakage of contrast when the rectum is maximally distended.

### *Endorectal ultrasound*

This is a good study for imaging of the anal canal and can identify muscular

discontinuation of anal sphincters and distinguish this from diffuse atony. Submucosa, internal anal sphincter, and external anal sphincter can be easily identified. It is a relatively cheap and non-invasive study. A significant limitation is that the placement of the endoanal probe props up the anal canal and distorts anatomy. Also, the field of view is limited to a few centimeters from the probe, so little information is offered about surrounding support structures in the pelvis that could be contributing to disordered defecation. The role of endoanal ultrasound is limited and has been replaced by many clinicians with pelvic MRI.

### *Endoanal MRI*

To perform endoanal MRI, an endoanal surface coil is inserted with the patient rotated to the left, and then the patient is rolled supine for completion of the study. An anti-peristaltic agent is applied topically or given systemically to reduce bowel movement, and images are taken in axial, coronal, and sagittal planes. It can characterize the internal and external sphincters similar to endoanal ultrasound, and can distinguish among muscles, scars and fat tissue to be able to detect local thinning of the external sphincter. It offers a high sensitivity and specificity for the detection of external sphincter atrophy [26]; however, it has the same disadvantage of endoanal ultrasound in that there is no evaluation of dynamic function and there can also be anatomical distortion from the endoanal coil.

### *Dynamic MRI*

MRI can also be used as a dynamic imaging medium. In MRI defecography, the rectum is filled with gadolinium-enriched ultrasound gel and images are obtained at rest, during defecation, and after defecation. The frequency at which images are recorded is about one per second. This kind of imaging can be especial-

ly useful in complex pelvic floor disorders that would normally require multiple imaging studies to fully establish a diagnosis. It provides a detailed anatomical view of the entire pelvic floor at rest and during rectal emptying. A recent study included 20 patients, most with multiple pelvic floor disorders. MRI defecography revealed diagnoses consistent with clinical results in 77.3 percent and defects in addition to clinical diagnoses in combined pelvic floor disorders in 34 percent [27].

### *Manometry*

Anorectal manometry can be used in the evaluation of constipation and incontinence. Anal canal and anal sphincter pressures can be measured with water-perfused catheters, microtransducers, or air- or water-filled balloons of various shapes and sizes. Large balloons can be used to assess the response to rectal distention. Men tend to have longer anal canals than women and higher resting pressures.

When anal manometry is performed, it can be done in the office as a snapshot assessment of ongoing sphincter function. Continuous ambulatory monitoring can be done, but there is little evidence for its clinical utility and it is used more as an investigational technique [28]. Resting pressures are obtained by transducing at various points throughout the anal canal to reflect IAS and EAS pressures, and then averaging the pressures obtained during multiple trials from each transducer. If the patient is not completely relaxed, the EAS tone will be elevated and higher pressures will be recorded. Squeeze pressures are obtained by asking the patient to contract the EAS during sequential positioning of the probe through the anal canal. Again, multiple trials are performed and averages recorded. The recto-anal inhibitory reflex can be elicited by asking the patient to expel the manometer or by distending a rectal balloon with different volumes of air. If the rectum is relatively distended to begin with, greater volumes of air will be

required to elicit the rectoanal inhibitory reflex. Sometimes simultaneous EMG recordings are obtained to ensure that increased or decreased pressures recorded are in fact caused by sphincter contraction or relaxation.

Manometry is clinically used in the diagnostic evaluation of both constipation and incontinence, but there is really no evidence to support the use of manometry in constipation. In constipated patients, manometry can detect the presence or absence of the recto-anal inhibitory reflex, and EAS pressure changes during efforts to expel the manometer or balloon. It can be especially useful in patients with pelvic floor dyssynergia. With regards to the work-up of fecal incontinence, there are two relatively large case-control studies that have validated the presence of low maximum squeeze pressures in incontinent patients. The sensitivity and specificity of these studies ranged from 60 percent and 78 percent [29] to 92 percent and 97 percent [30], respectively. The maximum squeeze pressure can be difficult to interpret because there is such a wide range of normal pressures. Additionally, other factors can cause incontinence in the absence of low pressures. Overall, manometry is a diagnostic tool that should be interpreted within the context of the clinical situation as well as other imaging modalities.

### *Biofeedback*

Surgical interventions for the various categories of posterior pelvic floor disorders have already been described. When symptoms persist after surgical repair or when surgery is not an option, biofeedback is a viable alternative.

Biofeedback has been described as a useful therapeutic intervention in patients with pelvic floor disorders, whether they present with incontinence or constipation. The concept of biofeedback is that patients with disordered defecation are unable to appropriately respond to the stimulus of rectal distention. With incontinence, con-

traction of the EAS is impaired, and with obstructive defecation, relaxation of the EAS is impaired. In order to defecate properly patients must relearn the sensation of rectal distention and how to respond appropriately. During biofeedback therapy, a rectal balloon is used to mimic the sensation of rectal filling. Electrodes on an anal plug record the motor units of the EAS contraction and convey this information to the patient in the form of visual or auditory feedback. The balloon is expanded, and the patient is trained to achieve maximal EAS contraction in response to the balloon stimulus in the case of incontinence or to relax the EAS in the case of constipation. In order for biofeedback to be successful, there must be some degree of rectal sensation and ability to voluntarily contract the EAS [31]. Patients can be taught to use the machine independently and perform sessions at home. With time, rectal sensation is heightened, external anal sphincter strength increased, and the coordination between rectal distention and EAS contraction improved. With obstructive defecation, the goal is to improve sensory perception and coordination between rectal distention and contraction, but to relax the external anal sphincter. Success rates in patients with incontinence can be as high as 70 percent [32].

Success is more likely in patients with pelvic floor disorders or with incontinence after rectal prolapse or anal sphincter surgery and less likely with idiopathic incontinence. With regard to constipation, there are a number of etiologies for which biofeedback therapy would not be at all helpful. If patients have obstructive defecation related to anismus, biofeedback is very likely to improve their symptoms (77 percent). However, if the problem is more related to slow colonic transit time, biofeedback is unlikely to be helpful. Some success has been reported in patients with combined pelvic floor disorders and slow transit time (50 percent improvement) [33].

Overall, biofeedback is more effective in patients who have disordered defecation related to pelvic floor dysfunction. Improvement of symptoms after biofeedback training can be sustained for several years, and can be effective regardless of the patient's age [34]. In elderly patients with limited mobility, home training has been shown to be an effective alternative option [35].

## CONCLUSIONS

Disorders of the pelvic floor are a relatively common entity plaguing mainly older women but possible in patients of any age and either gender. They may occur more in patients with a history of pelvic trauma related to childbirth, and patients with psychiatric diagnoses also have a predisposition. Patients can present with constipation, incontinence, or a combination of both. These symptoms can be etiologic factors in the development of pelvic floor disorders and/or manifestations of the disorder itself. There are a number of imaging modalities that can be useful in working up these patients, which may provide anatomical and functional information to be interpreted in light of the clinical picture as whole in order to make a diagnosis. Both conventional snapshot imaging and dynamic imaging have an important role in defining the disease process. In terms of therapy, surgery may be an option if there is an anatomical defect to be repaired, such as in rectal prolapse, rectocele, and perineal hernia. Biofeedback alone can be very successful in facilitating the process of relearning defecation in patients with pelvic floor dyssynergia and may be used as an adjunct to surgery in rectal prolapse. A combined approach, utilizing multiple diagnostic tests and approaches to therapy, is most appropriate in managing this complex and often cryptic set of disorders.

## REFERENCES

1. Drossman DA, Li Z, Andruzi E, et al. United States householder survey of functional gastroin-

- testinal disorders. Prevalence, sociodemography and health impact. *Dig Dis Sci* 1993;38:1569-80.
2. Whitehead WE, Wald A, Diamant NE, Enck P, Pemberton JH, and Rao SS. Functional disorders of the anus and rectum. *Gut* 1999;45:1155-9.
  3. Pemberton J, Swash M, and Henry M. *The Pelvic Floor: Its Function and Disorders*. London: W.B. Saunders; 2002, pp. 64-5.
  4. Wassef R, Rothenberger DA, and Goldberg SM. Rectal prolapse. *Curr Probl Surg*. 1986;23:397-451.
  5. Siproudhis L, Bellissant E, Juguet F, et al. Rectal adaptation to distension in patients with overt rectal prolapse. *Br J Surg* 1998;85:1527-32.
  6. Thandinkosi L, Baig MK, and Wexner SD. Surgical management of rectal prolapse. *Arch Surg* 2005;140:63-73.
  7. Eu KW and Seow-Choen F. Functional problems in adult rectal prolapse and controversies in surgical treatment. *Br J Surg*. 1997;84:904-11.
  8. Graf W, Ejerblad S, Krog M, Pahlman L, and Gerdin B. Delorme's operation for rectal prolapse in elderly or unfit patients. *Eur J Surg* 1992;158:555-7.
  9. Johansen OB, Wexner SD, Daniel N, Noguera JJ, and Jagelman DG. Perineal rectosigmoidectomy in the elderly. *Dis Colon Rectum* 1993;36:767-72.
  10. Kim DS, Tsang CB, Wong WD, Lowry AC, Goldberg SM, and Madoff RD. Complete rectal prolapse: evolution of management and results. *Dis Colon Rectum* 1999;42:460-6.
  11. Delaney CP and Senagore AJ. Rectal prolapse. In: *Current Therapy in Colon and Rectal Surgery*, 2nd edition. Philadelphia, PA: Mosby; 2005, pp. 131-4.
  12. Gabriel WB. *The Principles and Practice of Rectal Surgery*, 5th ed. Springfield, IL: CC Thomas; 1948, p. 347.
  13. Beck D. Perineal hernia. In: *Current Therapy in Colon and Rectal Surgery*, 2nd edition. Philadelphia, PA: Mosby; 2005: 131-4.
  14. van Dam JH, Ginai AZ, Gosselink MJ, et al. Role of defecography in predicting clinical outcome of rectocele repair. *Dis Colon Rectum*. 1997;40:201-7.
  15. Evetts BK and Billingham RP. Rectocele. In: *Current Therapy in Colon and Rectal Surgery*, 2nd edition; Philadelphia, PA: Mosby; 2005, pp 139-42.
  16. Khubchandani IT, Clancy JP 3rd, Rosen L, Riether RD, and Stasik JJ Jr. Endorectal repair of rectocele revisited. *Br J Surg* 1997;84:89-91.
  17. Arnold MW, Stewart WR, and Aguilar PS. Rectocele repair: four years experience. *Dis Colon Rectum* 1990;33:684-7.
  18. Nieminen K, Hiltunen KM, Laitinen J, Oksala J, and Heinonen PK.. Transanal or vaginal approach to rectocele repair: a prospective, randomized pilot study. *Dis Colon Rectum* 2004;47:1636-42.
  19. Leroi AM, Berkelsman J, Denis P, et al. Anismus as a marker of sexual abuse. *Dig Dis Sci* 1995;40:1411-16.
  20. Chaussade S, Khyari A, Roche H, et al. Determination of total and segmental colonic transit time in constipated patients. *Dig Dis Sci* 1989;34:1168-72.
  21. Voderholzer WA, Neuhaus DA, Klausner AG, et al. Paradoxical sphincter contraction is rarely indicative of anismus. *Gut* 1997; 41:258-62.
  22. D'Hoore A and Penninckx F. Obstructed defecation. *Colorectal Dis* 2003;5:280-7.
  23. Whitehead WE, Wald A, Diamant NE, et al. Functional disorders of the anus and rectum. *Gut* 1999;45:1155-9.
  24. Rao SS, Welcher KD, and Pelsang RE. Effect of biofeedback on anorectal function in obstructive defecation. *Dig Dis Sci* 1997;42: 2197-205.
  25. Barnes PR, Hawley PR, Preston DM, and Lennard-Jones JE. Experience of the posterior division of the puborectalis muscle in the management of chronic constipation. *Br J Surg* 1985;72:475.
  26. Jorge JM and Wexner SD. Etiology and management of fecal incontinence. *Dis Colon Rectum* 1993;36:77-97.
  27. Rentsch M, Paetzel C, Lenhart M, Feuerbach S, Jauch KW, and Furst A.. Dynamic magnetic imaging defecography: a diagnostic alternative in the assessment of pelvic floor disorders in proctology. *Dis Colon Rectum*. 2001;44:999-1007.
  28. Barnett JL, Hasler WL, and Camilleri M. American Gastroenterological Association medical position statement on anorectal testing techniques. *Gastroenterology* 1999; 116:732-60.
  29. Felt-Bersma RJF, Klinkenberg-Knol EC, and Meuwissen SGM. Anorectal function investigations in incontinent and continent patients. *Dis Colon Rectum* 1990;33:479-86.
  30. Sun WM, Donnelly TC, and Read NW. Utility of a combined test of anorectal manometry, electromyography, and sensation in determining the mechanism of "idiopathic" faecal incontinence. *Gut* 1992;33:807-13.
  31. Hinninghofen H and Enck P. Fecal incontinence: evaluation and treatment. *Gastroenterol Clin N Am*. 2003;32:865-706.
  32. Enck P. Biofeedback training in disordered defecation: a critical review. *Dig Dis Sci* 1993;38:1953-60.
  33. Kairaluoma M, Raivio P, Kupila J, Aarnio M, and Kellokumpu I. The role of biofeedback therapy in functional proctologic disorders. *Scand J Surg*. 2004;93:184-90.
  34. Enck P, Däublin G, Heinrich J, Lübke HJ, and Strohmeier G. Long-term efficacy of biofeedback training in fecal incontinence. *Dis Colon Rectum* 1994;37:997-1001.
  35. Musial F, Hinninghofen H, Frieling T, and Enck P. Therapy of fecal incontinence in elderly patients: study of a home biofeedback training program. *Z Gerontol Geriatr* 2000;33:447-53.

