# The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the Management of Fecal Incontinence

Liliana G. Bordeianou, M.D., M.P.H.[1] • Amy J. Thorsen, M.D.[2]
Deborah S. Keller, M.S., M.D.[3] Alexander T. Hawkins, M.D., M.P.H.[4]
Craig Messick, M.D.[5] • Lucia Oliveira, M.D., Ph.D.[6] • Daniel L. Feingold, M.D.[7]
Amy L. Lightner, M.D.[8] • Ian M. Paquette, M.D.[9]

1 Division of Colon and Rectal Surgery, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts
2 Division of Colon and Rectal Surgery, University of Minnesota, Minneapolis, Minnesota
3 Colorectal Center, Lankenau Hospital, Philadelphia, Pennsylvania
4 Section of Colon and Rectal Surgery, Vanderbilt University Medical Center, Nashville, Tennessee
5 The University of Texas MD Anderson Cancer Center, Houston, Texas
6 Anorectal Physiology Department of Rio de Janeiro, CEPEMED, Rio de Janeiro, Brazil
7 Division of Colon and Rectal Surgery, Rutgers University, New Brunswick, New Jersey
8 Department of Colon and Rectal Surgery, Cleveland Clinic, Cleveland, Ohio
9 Division of Colon and Rectal Surgery, University of Cincinnati College of Medicine, Cincinnati, Ohio



The American Society of Colon and Rectal Surgeons (ASCRS) is dedicated to ensuring high-quality patient care by advancing the science and prevention and management of disorders and diseases of the colon, rectum, and anus. The Clinical Practice Guidelines Committee is composed of society members who are chosen because they have demonstrated expertise in the specialty of colon and rectal surgery. This committee was created to lead international efforts in defining quality care for conditions related to the colon, rectum, and anus and develop clinical practice guidelines based on the best available evidence. Although not proscriptive, these guidelines provide information on which decisions can be made and do not dictate a specific form of treatment. These guidelines are intended for the use of all practitioners, health care workers, and patients who desire information on the management of the conditions addressed by the topics covered in these guidelines. These guidelines should not be deemed inclusive of all proper methods of care nor exclusive of methods of care reasonably directed toward obtaining the same results. The ultimate judgment regarding the propriety of any specific procedure must be made by the physician considering all the circumstances presented by the individual patient.

## STATEMENT OF THE PROBLEM

Fecal incontinence (FI) is generally defined as the uncontrolled passage of feces for a duration of at least 3 months in an individual who previously had control.[1,2] The prevalence of FI varies widely depending on the specific definition used and the population surveyed, ranging between 1.4% and 18% in women.[3–8] A study of bowel function in a primary care network found the incidence of FI to be 12.5%, with many patients reporting moderate to severe FI (Vaizey score more than 8).[9] The Mature Women's Health Study administered an online survey to 5817 women aged >45 years with an 86% response rate and found that nearly 20% of women reported FI.[10] Although many women with FI have coexisting pelvic floor disorders, the most bothersome symptoms are most often related to their FI.[11] FI in men is not as common and is most commonly because of evacuatory dysfunction and rectal hyposensitivity.[12] The highest incidence of incontinence is reported in nursing home populations, in which rates of FI can reach as high as 50%; FI is the second leading cause of nursing home placement in the United States.[5]

The management of FI is challenging and needs to be individualized according to the severity of symptoms,

CME Earn Continuing Education (CME) credit online at cme.lww.com. This activity has been approved for AMA PRA Category 1 credit.

**Funding/Support:** None reported.

**Financial Disclosure:** None reported.

**Correspondence:** Ian M. Paquette, M.D., University of Cincinnati College of Medicine Surgery (Colon and Rectal), 2123 Auburn Ave #524, Cincinnati, OH 45219. E-mail: ian.m.paquette@gmail.com

Dis Colon Rectum 2023; 66: 647–661
DOI: 10.1097/DCR.0000000000002776

cause, and coexisting pathology.[2,13–17] Aside from conservative and supportive measures, several surgical interventions are available to treat FI with variable efficacy. This practice guideline reviews the medical and surgical options currently available for the management of patients with FI. Treatments for FI that are not currently approved for use in the United States by the Food and Drug Administration (FDA), have become unavailable in the United States, or lack clinical data to support their use are beyond the scope of this guideline.

## METHODOLOGY

These guidelines are based on the previous ASCRS Clinical Practice Guidelines for the Treatment of Fecal Incontinence published in 2015.[18] An organized search of MEDLINE, PubMed, Scopus, Cochrane Database of Collected Reviews, Embase, and Web of Science was performed from January 1, 2014, through September 22, 2022. Key word combinations included "fecal incontinence" AND ("fecal OR anal OR stool"), AND ("physical therapy OR rehabilitation OR biofeedback"), AND ("sphincteroplasty" OR "implants" OR "bowel sphincter" OR "artificial sphincter" OR "radiofrequency" OR "sacral nerve stimulation" OR "injectable"). The 2289 screened articles were evaluated for their level of evidence, favoring clinical trials, meta-analyses/systematic reviews, comparative studies, and large registry retrospective studies over single institutional series, retrospective reviews, and peer-reviewed observational studies. Additional references identified through embedded references and other sources as well as practice guidelines or consensus statements from relevant societies were also reviewed. A final list of 182 sources was evaluated for methodological quality, the evidence base was analyzed, and a treatment guideline was formulated by the subcommittee for this guideline (Fig. 1).

### Certainty of Evidence

The final grade of recommendation and level of evidence for each statement were determined using the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) system.[19] The certainty of evidence reflects the extent of our confidence in the estimates of effect. Evidence from randomized controlled trials (RCTs) start as high certainty, and evidence derived from observational studies start as low certainty. For each outcome, the evidence is graded as

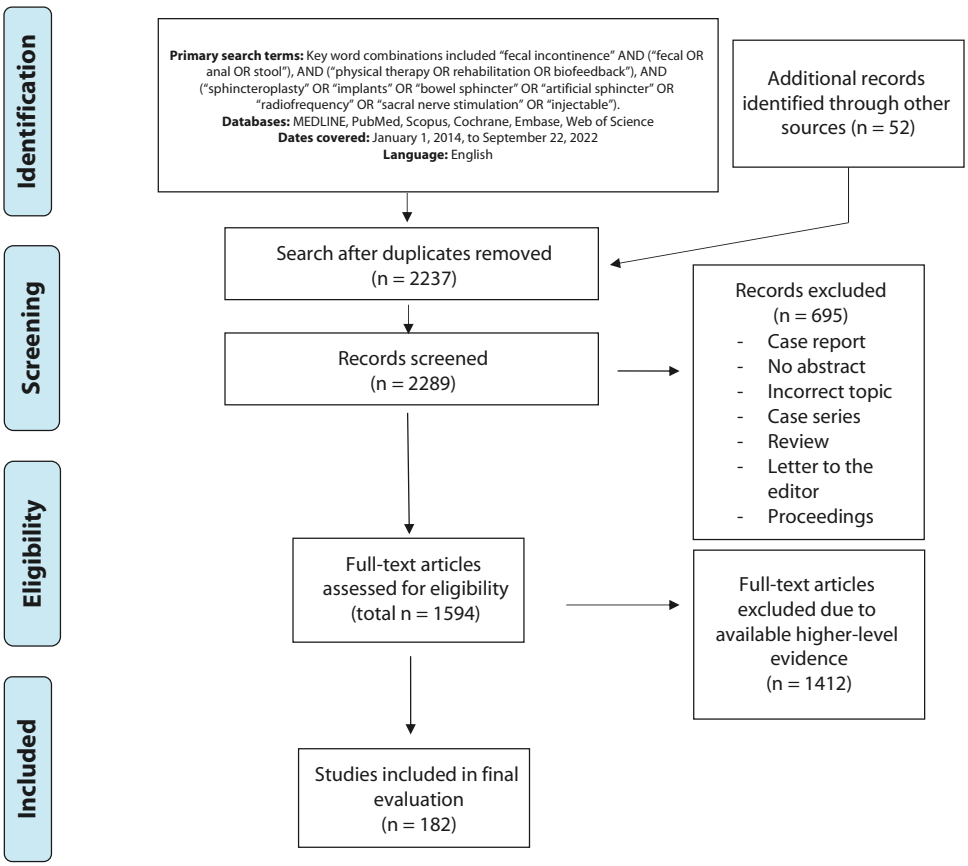


**FIGURE 1.** PRISMA literature search flow chart. PRISMA = Preferred Reporting Item for Systematic Reviews and Meta-Analysis.

high, moderate, low, or very low (Table 1). The evidence can be rated down for risk of bias, inconsistency, indirectness, imprecision, and publication bias. The certainty of evidence originating from observational studies can be rated up when there is a large magnitude of effect or dose–response relationship. As per GRADE methodology, recommendations are labeled as "strong" or "conditional" (Table 2). When agreement was incomplete regarding the evidence base or treatment guideline, consensus from the committee chair, vice chair, and 2 assigned reviewers determined the outcome. Recommendations formulated by the subcommittee were reviewed by the entire Clinical Practice Guidelines Committee. The submission was then approved by the ASCRS Executive Council and peer-reviewed in *Diseases of the Colon and Rectum*. In general, each ASCRS Clinical Practice Guideline is updated approximately every 5 years. No funding was received for preparing this guideline and the authors have declared no competing interests related to this material. This guideline conforms to the Appraisal of Guidelines for Research and Evaluation checklist.



## EVALUATION

### A History Should Be Obtained to Help Determine the Cause of Incontinence and Should Include Specific Risk Factors for Incontinence and Characterize the Duration and Severity of Symptoms

Maintaining continence depends on the complex interplay of multiple factors, including anal sphincter and pelvic floor musculature, rectal reservoir function (eg, capacity and compliance), stool consistency, and neurologic function (eg, colonic transit and motility, mental cognition, and sensorimotor function). Although conditions that alter these factors may result in FI, the cause of FI may be multifactorial, and the relative contribution of each factor may be difficult to ascertain. Independent risk factors for FI identified in population-based studies include older age, smoking, obesity, limited physical activity, white race, neurologic disease, diabetes mellitus, frequent and loose stools, and having multiple chronic comorbidities.[4,14] FI is more prevalent among those with Crohn's disease, ulcerative colitis, celiac disease, irritable bowel syndrome, or concomitant constipation.[4,7,20,21]

**TABLE 1.** Summary and strength of GRADE recommendations

| | *Summary* | *Recommendation strength* | *GRADE quality of evidence* |
|---|---|---|---|
| 1 | A history should be obtained to help determine the cause of incontinence and should include specific risk factors for incontinence and characterize the duration and severity of symptoms. | Strong | Expert opinion |
| 2 | Measures that assess the nature and severity of incontinence and the impact of incontinence on quality of life should be used as a part of the assessment of FI. | Conditional | Low |
| 3 | A physical examination is an essential component of the evaluation of patients with FI. | Strong | Expert opinion |
| 4 | Anorectal physiology testing (manometry, anorectal sensation, volume tolerance, and compliance) can be considered to help define the elements of dysfunction and guide management. | Conditional | Very low |
| 5 | Endoanal ultrasound may be useful to evaluate sphincter anatomy when planning a sphincter repair. | Conditional | Very low |
| 6 | Pudendal nerve terminal motor latency testing is not routinely recommended. | Strong | Very low |
| 7 | Endoscopy should be performed according to established screening guidelines and in patients presenting with symptoms that warrant further evaluation (ie, changes in bowel habits, bleeding). | Strong | Moderate |
| 8 | Dietary and medical management are recommended as first-line therapy for patients with FI. | Strong | Low |
| 9 | Bowel training programs can improve rectal evacuation in selected patients. | Conditional | Very low |
| 10 | Biofeedback may be considered for patients with FI. | Conditional | Low |
| 11 | Vaginal mechanical inserts are not routinely recommended for FI. | Conditional | Very low |
| 12 | Anal mechanical insert devices are not routinely recommended for FI. | Conditional | Very low |
| 13 | Anal sphincteroplasty may be considered in patients with a defect in the external anal sphincter, but clinical results often deteriorate over time. | Conditional | Low |
| 14 | Repeat anal sphincter reconstruction after a failed overlapping sphincteroplasty should generally be avoided. | Conditional | Very low |
| 15 | Sacral neuromodulation may be considered as a first-line surgical option for incontinent patients with or without sphincter defects. | Conditional | Low |
| 16 | Injection of biocompatible bulking agents into the anal canal is not routinely recommended for the treatment of FI. | Conditional | Low |
| 17 | Application of temperature-controlled radiofrequency energy to the sphincter complex is not recommended to treat FI. | Conditional | Very low |
| 18 | Antegrade colonic enemas can be considered in highly motivated patients who are seeking an alternative to a stoma. | Conditional | Very low |
| 19 | Colostomy is an option for patients who have failed or do not wish to pursue other therapies for FI. | Conditional | Very low |

FI = fecal incontinence.

**TABLE 2.** Interpretation of strong and conditional recommendations using the GRADE approach

| *Recommendation* | *Interpretation* |
|---|---|
| Strong | Most individuals should receive the intervention. Formal decision aids are not likely to be needed to help individuals make decisions consistent with their values and preferences. |
| Conditional | Different choices will be appropriate for individual patients consistent with their values and preferences. Use shared decision-making. Decision aids may be useful in helping patients make decisions consistent with their individual risks, values, and preferences. |
| GRADE certainty rankings | |
| High | The authors are confident that the true effect is similar to the estimated effect. |
| Moderate | The authors believe that the true effect is probably close to the estimated effect. |
| Low | The true effect might be markedly different from the estimated effect. |
| Very low | The true effect is probably markedly different from the estimated effect. |

GRADE = Grades of Recommendation, Assessment, Development, and Evaluation.



Obstetric-related sphincter injury is clinically recognized in approximately 4% to 10% of all vaginal deliveries, but occult sphincter damage may be present in up to 21% to 35% of women after vaginal delivery.[6,22] Among patients with a birthing injury, clinically relevant FI is more commonly observed in multiparous women and in patients who had instrument-assisted deliveries.[23] Some women develop delayed FI, which can make it difficult to determine whether the FI is associated with prior, sometimes remote, sphincter injury or with other factors such as menopause, pelvic organ prolapse, internal intussusception, obesity, or aging.[16] Additional causes of FI include sphincter injury from anorectal procedures (eg, hemorrhoidectomy, sphincterotomy, fistula surgery),[14,24–27] hysterectomy, pelvic surgery, or transanal surgery, or after surgical or nonsurgical treatment for rectal cancer.[12,28–30]

Patients with FI frequently have coexisting pelvic floor disorders and may benefit from a multidisciplinary evaluation.[31] For example, patients with concurrent constipation represent a specific phenotype of FI that may be related to pelvic organ prolapse or internal rectal intussusception.[16,32] Addressing the FI alone in this subgroup may not significantly improve patients' quality of life.

A detailed history goes beyond simply accounting for prior obstetric injury, anorectal surgery, or perineal trauma. For example, assessing changes in stool consistency and potential causative factors, dietary modifications, changes in medications and supplements, food intolerances, and allergies may help elucidate the underlying cause of FI. Operations such as cholecystectomy and gastric bypass can alter stool consistency and frequency and should also be considered when evaluating patients.[1]

### *Measures That Assess the Nature and Severity of Incontinence and the Impact of Incontinence on Quality of Life Should Be Used as a Part of the Assessment of FI*

A number of instruments have been developed to describe the type, frequency, and degree of incontinence as well as the impact of FI on quality of life. FI severity has been assessed most commonly with the Fecal Incontinence Severity Index,[33] the St. Marks Fecal Incontinence Score (Vaizey Score),[34] and the Cleveland Clinic Florida Fecal Incontinence Score (Wexner Score),[35] although other measures of FI also have been reported.[36–40] Using objective measures of severity can help establish baseline scores for a particular patient, measure response to treatment over time, and permit comparisons among groups of patients treated with different strategies.[41]

A Wexner score of 9 or higher indicates a significant impairment of quality of life and is the threshold at which patients will commonly seek medical care.[40] The Fecal Incontinence Quality-of-Life Scale[39] is an incontinence-specific quality-of-life measure commonly used in conjunction with more general quality-of-life measures such as the Short Form 36 and is more commonly used in the research setting.[42] A recent review by the ASCRS Pelvic Floor Disorders Consortium suggested that standardizing measurements would be beneficial in streamlining clinical care and research regarding patients with FI and recommended the routine use of a combination instrument labeled "IMPACT" (Initial Measurement of Patient-Reported Pelvic Floor Complaints Tool) that combines the Wexner and the Vaizey scores while limiting the number of questions patients are asked.[43]

All of these instruments are based on patients' subjective experience of FI. A bowel diary that documents the daily number and severity of FI episodes may help clinicians quantify disease severity before and after therapeutic intervention. A cutoff of 50% or more reduction in the number of episodes per week has been used in recent FI studies as an objective measure of clinical improvement after an intervention. Although this is the most commonly used measure of success in industry-sponsored trials, it has not been validated against other measures.

### *A Physical Examination Is an Essential Component of the Evaluation of Patients With FI*

Elements of a focused clinical examination include external inspection and digital rectal examination.[14] The perianal skin should be evaluated for stool staining, skin irritation or excoriation, surgical scars, trauma, the presence of a patulous anus on spreading the buttocks, or

other pathology such as an external fistula opening or rectal prolapse.[44] The thickness of the perineal body should be noted as well. Examining patients during a Valsalva maneuver or when straining on the commode may demonstrate a mucosal or full-thickness prolapse.[45] Digital examination may provide rough estimates of anal resting tone, squeeze pressure, muscle coordination (including the use of accessory gluteal muscles), and sphincter integrity. Furthermore, it is important to exclude the presence of a distal rectal mass, stricture, or fecal impaction, which would suggest other causes of incontinence. Anoscopy and proctoscopy can be useful for identifying pathology, including hemorrhoids, proctitis, or neoplasia that may be contributing to incontinence.

### *Anorectal Physiology Testing (Manometry, Anorectal Sensation, Volume Tolerance, and Compliance) Can Be Considered to Help Define the Elements of Dysfunction and Guide Management*

An evaluation of pelvic floor function can be considered in patients who fail to respond to conservative therapy. However, anorectal physiology testing does not routinely influence management and debate persists as to which tests are considered helpful. Anorectal manometry can provide detailed information regarding anal sphincter and puborectalis motor function as well as rectal sensation. Anorectal physiology (ARP) testing consists of a number of elements that measure the resting and squeeze pressures of the anal sphincter, determine the length of the high-pressure zone and the pressure profile of the anal canal, and assess anorectal sensation, rectal capacity, and rectal compliance.[45–55] Consensus statements have recommended standardizing definitions for various manometric variables to facilitate both clinical care and research.[53,54] A meta-analysis of 13 studies, including 2981 patients with FI and 1028 controls, indicated that the number of appropriately controlled studies evaluating anorectal manometry is small and that the risk of bias within the literature was high.[56]

Although manometric profiles would ideally provide objective findings to guide optimal treatment, evidence describing the clinical value of ARP is generally lacking.[47,57,58] For example, ARP cannot reliably differentiate patients who would benefit from sacral neuromodulation therapy or colostomy creation or reversal.[59,60] The unsupported utility of ARP may be explained, in part, by the lack of standardization of manometry techniques and/or the broad spectrum of FI phenotypes observed in clinical practice.[61] A notable exception to the general narrative regarding ARP testing is that manometry may be useful to guide biofeedback therapy in patients with obstructed defecation.[62,63] Patients with combined obstructive defecation and FI may benefit from dynamic imaging such as defecography as well.

### *Endoanal Ultrasound May Be Useful to Evaluate Sphincter Anatomy When Planning a Sphincter Repair*

Endoanal ultrasound is a useful and sensitive tool to investigate a sphincter defect in the setting of FI, especially when there is a history of vaginal delivery or when a surgeon considers performing a sphincter repair. Although ultrasound can reliably identify internal and external sphincter defects, the presence of a sphincter defect alone is not sufficient to predict symptomatic FI.[23,64] Some older studies using 2-dimensional ultrasound suggested a correlation between sphincter defects on ultrasound and lower pressures measured on anal manometry.[65,66] However, a 2011 study of 61 patients using 3-dimensional ultrasound demonstrated lower maximum squeeze pressure (66.9 versus 99.7 mm Hg; $p = 0.009$) in patients with external sphincter defects on ultrasound but no difference in Wexner incontinence scores (12.5 versus 11.5).[67] Patients with delayed FI years after vaginal delivery are frequently found to have sonographic evidence of a sphincter defect, but the size of these defects does not necessarily correlate with the severity of their FI.[57,67]

The addition of advanced dynamic endoanal ultrasound and perineal pelvic floor ultrasound can identify additional causes of FI, which can coexist with anal sphincter defects, including levator ani injuries and internal rectal intussusception, but these imaging techniques are not widely available.[68–70] Alternative imaging modalities such as dynamic MRI and fluorodefecography should be considered when endoanal ultrasound imaging is not available or when an endoanal ultrasound reports a normal sphincter complex in appropriately selected patients.[71,72]

### *Pudendal Nerve Terminal Motor Latency Testing Is Not Routinely Recommended*

Pudendal nerve terminal motor latency (PNTML) testing is no longer routinely recommended.[73] Although a number of reports have correlated clinical symptoms or manometry testing with the degree of PNTML impairment,[72,74–78] the presence or absence of pudendal neuropathy does not reliably predict outcomes after a sphincter repair or sacral neuromodulation.[77–83] However, severe denervation and pudendal nerve damage have been reported in some patients who remain incontinent after an otherwise successful sphincter repair.[78–86] It is unclear as to whether this finding is clinically relevant or whether the pudendal nerve conduction delay is only a marker for other conditions related to pelvic floor damage, including perineal descent, levator hiatus injury or distortion, or internal intussusception. Given the lack of clinical utility, PNTML testing is not routinely recommended in patients with FI. No studies have been published in support of this testing modality since 2013, and the 2 more recent studies did not support this test for clinical decision-making.[73,87]

### *Endoscopy Should Be Performed According to Established Screening Guidelines and in Patients Presenting With Symptoms That Warrant Further Evaluation (ie, Changes in Bowel Habits, Bleeding)*

Although colonoscopy rarely contributes to the diagnosis and management of FI, diarrhea is commonly observed in women with late-onset incontinence, and endoscopic evaluation may be warranted under these circumstances to rule out other pathology.[85,88] Other symptoms of concern include bleeding, urgency, tenesmus, and mucus drainage that may be because of incontinence, colorectal cancer, or other serious pathology. General screening recommendations should be followed for all other patients to exclude concomitant colorectal pathology that might require attention.[89]

## NONOPERATIVE MANAGEMENT

### *Dietary and Medical Management Are Recommended as First-Line Therapy for Patients With FI*

Conservative management is considered first-line therapy because 22% to 54% of patients with FI report improved symptoms after behavior modification regarding dietary habits and fluid management and changes to medications.[90–92] An evaluation of patients' dietary habits combined with information collected via a bowel diary regarding the frequency of bowel movements, the degree of incontinent episodes, and the consistency of incontinent stools may be helpful when adjusting patients' medical management regimen. The goal of this process is to identify, modify, and avoid triggering aggravating factors in patients' daily routines.[86] Specific attention should be directed toward the use and effects of caffeine, artificial sweeteners, lactose, gluten, and dietary supplements or prescription medications that may trigger fecal urgency or diarrhea in a particular patient.

Generally, medical management of FI focuses on slowing colonic motility and optimizing stool consistency.[93] Pharmacologic treatments have been used to slow colonic transit, decrease intestinal fluid secretion, increase absorption, and reduce sphincter relaxation.[94,95] Much of the variability in stool consistency may be addressed by fiber supplementation, which will ideally thicken and optimize stool consistency. A RCT comparing 39 patients who were treated with either fiber supplementation or placebo showed that patients in the fiber supplementation group decreased their percentage of incontinent stools to less than half of that in the placebo group and had an improvement in stool consistency.[90]

Other medical treatments for FI are supported by less robust evidence and mainly focus on the management of diarrhea and urgency. A Cochrane review analyzed 16 randomized trials (558 pooled patients) that used medications other than fiber to address FI and noted that antidiarrheal drugs such as loperamide or diphenoxylate-atropine may decrease episodes of FI in patients with preexisting diarrhea.[96] Common medications used in these circumstances include adsorbents (eg, Kaopectate and Pepto Bismol), which absorb excess fluid in the stool. A trial of cholestyramine may be reasonable in patients with suspected urgency from bile salt diarrhea after cholecystectomy or ileocolonic resection.[95] Symptomatic management of FI should also include supportive measures that provide advice on skin care, protective (barrier) ointments (eg, zinc oxide), gentle soaps, wipes, deodorants, and pads.

### *Bowel Training Programs Can Improve Rectal Evacuation in Selected Patients*

Bowel management programs vary from simply training patients to facilitate emptying by using scheduled enemas or suppositories to more complex regimens involving the instillation of larger volumes of either water or cathartic enema solutions into the rectum and the descending colon (techniques referred to as transanal irrigation [TAI] or retrograde colonic irrigation). High-volume irrigations require specific devices (eg, Foley catheter, stopcocks, tubing) and education on how to administer high-volume hydrotherapy. There is a commercially available device for TAI, and this has been studied most closely in the pediatric population and patients with spinal cord injury. Although TAI has been most commonly described in pediatric populations,[97,98] it has been evaluated in small studies in patients with FI caused by low anterior resection syndrome (LARS) or neurological injuries.[99–101] The success rate of high-volume irrigation, namely TAI, is typically evaluated as the proportion of patients continuing TAI because they perceive a benefit. Success has been reported in 80% of patients initially, with 50% continuing long-term TAI.[99] Those who choose to discontinue TAI may eventually pursue alternative interventions such as sacral neuromodulation.[100–102]

### *Biofeedback May Be Considered for Patients With FI*

Biofeedback training, also called pelvic floor rehabilitation, is a noninvasive treatment option for patients with FI who have not responded adequately to dietary modification, medications, counseling, and other supportive measures. The goals of a comprehensive biofeedback program are to improve sensation, coordination, and strength and to provide supportive counseling and practical advice regarding diet, bowel habits, behavior modification, and skin care.[103,104] The reported utility of biofeedback in the setting of FI has substantial variability, and outcomes appear to be affected by the degree of presenting symptoms, disease cause, and unique patient factors.[104–112] Although nonrandomized, prospective, and retrospective case series report 64% to 89% improvement in FI related to biofeedback, many of the smaller studies have

methodological weaknesses that make it difficult to draw definitive conclusions regarding the utility of biofeedback.[104–106,108,109,111–114] Interestingly, randomized trials have compared biofeedback to different treatment approaches such as pelvic floor exercise, counseling, and education, but there are no RCTs comparing biofeedback to sham therapy.[90,106,108,110,111,113,115–119] Standardized treatment protocols and larger, well-designed studies are needed to determine the efficacy of this treatment modality.[120,121]

### *Vaginal Mechanical Inserts Are Not Routinely Recommended for FI*

The vaginal bowel-control system is a soft, inflatable vaginal pessary that can be inflated in the vagina in such a way as to occlude the rectum and provide a barrier to the fecal stream to improve FI symptoms. In a multicenter, prospective trial including 110 women, 61 patients (55%) achieved a successful device fit and were treated for FI. After 1 month of treatment, 78.7% of treated patients achieved 50% or more reduction in weekly FI episodes.[122] In a subsequent multicenter prospective trial of 73 patients, the clinical success of 50% or more reduction in weekly FI episodes was achieved in 73% of patients at 3 months of follow-up ($p < 0.001$). At 12 months of follow-up, major FI episodes per 2 weeks decreased from a baseline of 5.0 to 1.2 ($p < 0.001$), and Vaizey scores decreased from 16.5 to 9.8 ($p < 0.001$).[123] Although these results are encouraging, the available clinical evidence suggests that only 55% to 80% of patients are able to achieve a good clinical fit with this device and additional clinical evidence is needed to further evaluate device efficacy.[123,124] Of note, there have been no new clinical studies of this device published since 2016.

### *Anal Mechanical Insert Devices Are Not Routinely Recommended for FI*

Anal inserts for the treatment of FI have been studied in small series that reported modest improvements in FI; the most common adverse events reported were discomfort and device slippage.[125,126] The largest prospective study evaluating this approach reported that 62% of 91 patients achieved a 50% or more reduction in FI episodes. This study had no comparison group and did not report any quality-of-life metrics.[127] A recent pilot study randomly assigned 50 patients to treatment either with an anal insert (n = 25) or with percutaneous tibial neuromodulation and reported a 50% or more reduction in FI episodes in 19 patients (76%) treated with an anal insert compared to 12 patients (48%) treated with tibial nerve stimulation ($p = 0.04$).[128] Although these data provide some insight, studies of a number of various anal insert devices during the past 20 years have reported limited long-term tolerability or efficacy beyond 3 months; the utility of these devices for treating FI remains unclear.[127,129–134]

## *SURGICAL MANAGEMENT*

### *Anal Sphincteroplasty May Be Considered in Patients With a Defect in the External Anal Sphincter, but Clinical Results Often Deteriorate Over Time*

Anal sphincteroplasty is typically performed to treat injuries to the anterior anal sphincter because of a complicated vaginal delivery. Although sphincteroplasty repairs of obstetric injuries have been historically associated with good to excellent short-term results in up to 85% of patients, many studies did not use uniform criteria to define functional success, making it difficult to compare various series and different procedures.[114,135–137] The major limitation of anal sphincter reconstruction is that the clinical results often worsen over time. After 5 years, as few as 10% to 14% of patients have a sustained improvement in function, suggesting that FI after obstetric injury is multifactorial.[114,119,138,139] Single-center case series have shown improvement in Wexner scores in the short term after sphincteroplasty, but these results typically diminish to baseline by 3 years.[135–137,140,141] Given the potentially short-lived benefits, some authors have questioned the utility of sphincteroplasty, especially in women who develop incontinence decades after their obstetric trauma, and have recommended considering other approaches such as sacral neuromodulation.[60,79,140,142–145] Population data showed a 7-fold decrease in the number of anal sphincteroplasty operations performed in the United States from 2009 to 2015.[146] In a retrospective review that compared 26 patients with an external sphincter defect who underwent sphincteroplasty (n = 13) versus sacral neuromodulation (SNM; n = 13), patients who had SNM had a decrease in their Wexner score at 3 months (baseline 15.9–8.4; $p = 0.003$), whereas patients who underwent sphincteroplasty did not experience a significant improvement in Wexner score at 3 months (16.9–12.9; $p = 0.078$).[147]

### *Repeat Anal Sphincter Reconstruction After a Failed Overlapping Sphincteroplasty Should Generally Be Avoided*

Deterioration in function after overlapping sphincteroplasty over time occurs commonly.[114,119] In patients without a specific factor responsible for failure of their first repair, such as recurrent sphincter injury because of repeat vaginal delivery, repeat sphincteroplasty is unlikely to be successful. Older studies evaluating repeat sphincteroplasty reported subjective outcomes without long-term follow-up. A single-center retrospective review of 56 patients who underwent repeat sphincteroplasty for FI showed poor long-term success. Although the mean Wexner score decreased from 16.5 to 11.9 ($p < 0.001$) after repeat sphincteroplasty, it is important to recognize that patients with a Wexner score more than 9 are considered to have severe FI, and patients with this range of scores typically seek medical care.[40] Not surprisingly, 21.4% of the

patients in this study underwent further procedures for FI and 5.4% underwent colostomy creation. Furthermore, after 74 months of follow-up, only 28.6% of patients subjectively reported a "good" result.[148]

### *Sacral Neuromodulation May Be Considered as a First-Line Surgical Option for Incontinent Patients With or Without Sphincter Defects*

SNM was approved by the FDA in 2011 for fecal and urinary incontinence.[149–154] With this approach, patients undergo a 2-week evaluation after placing a test lead in the operating room or a 1-week evaluation with percutaneous leads placed in the office setting; patients with at least a 50% improvement in FI episodes during their evaluation period are offered full system implantation.[155] In a pooled analysis of 61 SNM studies, a median of 79% of patients experienced 50% or more improvement in weekly FI episodes in the short term (ie, 0–12 mo), and a median of 84% of patients experienced 50% or more improvement at >36 months follow-up.[150] In a prospective, nonrandomized, multicenter study of 120 patients with SNM treated at 14 centers across the United States, Canada, and Australia,[156] of the 76 patients who were followed for at least 5 years, 27 (35.5%) required at least 1 revision, replacement, or explant, highlighting the need for long-term patient follow-up.[156] Rechargeable devices and devices with up to 15 years of battery life are now available and may theoretically decrease the frequency of revisions required because of battery life issues, but clinical studies will need to determine whether this leads to fewer device revisions in the future.[157,158] One small prospective study of 15 patients treated with the rechargeable device implanted in a single stage indicated 50% or more improvement in FI in 13 patients (87%) at 4 weeks. This response was sustained at 6 months.[157,158]

The best predictor of success with SNM is a successful trial of test stimulation. Meanwhile, clinical factors such as the presence of a sphincter defect or pudendal neuropathy or a history of a previous sphincter repair do not accurately predict outcomes of SNM.[79] For example, in a retrospective study of 237 patients treated for FI with SNM, the 128 patients who had a sphincter injury on endoanal ultrasound demonstrated similar responses to SNM compared to the 109 patients with an intact sphincter.[159] Another retrospective study evaluating the impact of a sphincter injury on the success of SNM compared 54 patients with ultrasound-confirmed external sphincter muscle defect (mean defect size = 105 degrees) to 91 patients without a sphincter defect. In this study, patients with an external sphincter defect improved from a baseline median Cleveland Clinic Florida Fecal Incontinence Score (CCF-FIS) score of 15 to 2.5 at 12-month follow-up, which was comparable to the patients without a sphincter defect who improved from a baseline median CCF-FIS score of 14 to 3 at 12 months.[144] Furthermore, a systematic review of 10 studies including 119 SNM patients with a sphincter injury demonstrated a decrease in the weighted average Cleveland Clinic Florida Fecal Incontinence Score (CCF-FIS) score from 16.5 to 3.8.[160] Success of SNM has been reported in patients with sphincter defects of up to 120 degrees.[149,161] SNM may also improve FI symptoms in patients with LARS. A pooled analysis of 10 studies in patients with LARS found a significant reduction in FI after SNM implantation (mean LARS score difference 11.23; 95% CI, 9.38–13.07; $p < 0.001$).[162]

Meanwhile, a single retrospective study from 2015 indicated that temporary test stimulation for SNM to treat FI was successful in 69% of patients with high-grade internal intussusception diagnosed on defecography and in 86% of patients without high-grade intussusception.[163] Although intriguing, these data have not been reproduced.

The efficacy of SNM for FI may be better in women than men. In a single-center retrospective study comparing 31 men and 321 women, the 1-, 3-, and 5-year cumulative successful treatment rates were 88.6%, 63.9%, and 43.9% in men and 92.0%, 76.8%, and 63.6% in women, respectively.[164] Another prospective study of 360 patients treated with SNM at 7 French centers reported that at 10 years, 94 patients (26.1%) required SNM explantation because of a variety of reasons such as loss of efficacy (n = 83; 23.1%) or infection (n = 28; 7.8%), and male sex appeared predictive of less favorable outcomes (HR: 1.98 [1.09– 3.61]; $p = 0.02$). The relatively worse outcomes in men may be partly because of differences in pathophysiology of FI as men with FI in these studies were more likely to have had previous anorectal surgery or low anterior resection, whereas women with FI were more likely to have had prior obstetric trauma.

Although there is mounting evidence demonstrating long-term success of SNM, there are only a few studies comparing SNM to other treatments or other surgical approaches.[165] Another randomized trial that used CCF-FIS scores compared SNM (n = 60) with a medically managed control group (n = 60) and reported 100% continence in 41.5% of SNM patients and that 90% of patients had at least a 50% improvement; meanwhile, there was no significant functional improvement in the control group.[149]

### *Injection of Biocompatible Bulking Agents Into the Anal Canal Is Not Routinely Recommended for the Treatment of FI*

In 2011, the FDA approved a nonanimal stabilized hyaluronic acid dextranomer gel (NASHA Dx) for submucosal injection in patients with passive FI. The largest series evaluating this approach at the time was a randomized, double-blinded, placebo-controlled, multicenter trial of 206 patients from Europe and the United States.[166] In this study, at 6-month follow-up, 52% of patients in the

NASHA Dx group reported 50% or more reduction in FI episodes, compared to 31% of patients in the placebo arm ($p = 0.008$). A subsequent 36-month follow-up indicated that 57% of study patients still had 0% or more improvement in FI episodes compared to baseline, but median Wexner scores in this group of patients only decreased from 14 at baseline to 11 at 36 months ($p < 0.001$), indicating fairly significant persistent FI.[167] Additionally, most patients whose function improved in this trial had 2 separate injections of the bulking agent. In a retrospective study with long-term follow-up of 19 patients treated with an injectable for FI, ultrasound evaluation indicated that less than 14% of the injected substance was still present after 5 years, and the Wexner scores of these patients had returned to pretreatment baseline.[168] Given the limited improvement over placebo, diminishing long-term results, and cost, injectable bulking agents are not considered first-line treatment for FI.

### *Application of Temperature-Controlled Radiofrequency Energy to the Sphincter Complex Is Not Recommended to Treat FI*

The application of radiofrequency energy for FI was adapted from the treatment for gastroesophageal reflux disease and was FDA approved for this indication in 2002. Meanwhile, the evidence supporting this approach for the management of FI is relatively sparse and has relevant limitations. Early studies regarding this technology, mostly single-center series without long-term follow-up, reported modest improvement in FI.[169–175] One series considered 55% to 80% of patients responders at 12 months based on having had some improvement in CCF-FIS scores, but most series did not meet a threshold of demonstrating 50% or more improvement in incontinence episodes.[175] A 2017 placebo-controlled trial of 40 patients treated with either radiofrequency energy or a sham procedure reported that the mean Vaizey scores decreased from 16.8 to 14.3 in the treatment group and from 15.6 to 13.2 in the sham group, and there was no statistically significant improvement in quality of life at 6 months.[176] Another retrospective study of 10 patients treated with radiofrequency energy with 15 years of follow-up showed no improvement in the Wexner scores (12.4 from 13.8; $p = 0.24$) or quality-of-life scores compared to baseline.[177] Based on the available data, radiofrequency energy delivery is not recommended for the treatment of FI. Additionally, no new studies evaluating this modality have been published since 2014.

### *Antegrade Colonic Enemas Can Be Considered in Highly Motivated Patients Who Are Seeking an Alternative to a Stoma*

Historical data regarding the use of antegrade enemas via an appendicostomy (Malone) or a cecostomy tube have been mostly limited to the pediatric population. A systematic review by Patel et al, published in 2015, analyzed several case series evaluating antegrade enema therapy for the treatment of constipation or incontinence in adults. In this review, most of the patients had FI because of spinal cord injury, anorectal malformation, or prior anorectal surgery; the primary outcome was the percentage of patients still irrigating with antegrade enemas at the end of the study. Of the 134 patients with FI included in the study treated with antegrade enemas, 78% to 100% were still using antegrade enemas at 22 to 48 months of follow-up.[178] Only 1 retrospective telephone survey of 75 patients used a validated scoring system and found a significant decrease in the Wexner score (14.3–3.4; $p < 0.001$) at a median follow-up of 48 months.[179]

### *Colostomy Is an Option for Patients Who Have Failed or Do Not Wish to Pursue Other Therapies for FI*

When alternative therapies are not appropriate or have failed, a colostomy may allow patients with FI to resume normal activities and may improve their quality of life.[180,181] In a questionnaire study comparing 39 patients with FI treated with a colostomy to 71 patients with FI without diversion, responders who had a colostomy reported better scores in various Fecal Incontinence Quality-of-Life Scale domains such as coping (2.7 versus 2.0; $p = 0.005$), embarrassment (2.7 versus 2.2; $p = 0.01$), and lifestyle (3.2 versus 2.7; $p = 0.14$), and had depression scores comparable to the control group (3.1 versus 2.9; $p = 0.62$).[182] Similarly, in another survey of 69 patients with FI treated with colostomy, 83% of patients reported a significant improvement in lifestyle and 84% of patients stated that they would choose to have the stoma created again.[181] Patients who described persistent restrictions because of their stoma reported needing to be conscious of the location of toilets, having travel restrictions, feeling self-conscious about stoma-related noises or odors, and being concerned about the possibility of appliance or anal leakage.

## *REFERENCES*

1. Bharucha AE, Dunivan G, Goode PS, et al. Epidemiology, pathophysiology, and classification of fecal incontinence: state of the science summary for the national institute of diabetes and digestive and kidney diseases (NIDDK) workshop. *Am J Gastroenterol.* 2015;110:127–136.
2. Rao SS; American College of Gastroenterology Practice Parameters Committee. Diagnosis and management of fecal incontinence. *Am J Gastroenterol.* 2004;99:1585–1604.
3. Johanson JF, Lafferty J. Epidemiology of fecal incontinence: the silent affliction. *Am J Gastroenterol.* 1996;91:33–36.
4. Ditah I, Devaki P, Luma HN, Ditah C, Njey B, Jaiyeoba C, et al. Prevalence, trends, and risk factors for fecal incontinence in United States adults, 2005-2010. *Clin Gastroenterol Hepatol.* 2014;12:636–643 e1-2.

5. Goode PS, Burgio KL, Halli AD, et al. Prevalence and correlates of fecal incontinence in community-dwelling older adults. *J Am Geriatr Soc.* 2005;53:629–635.
6. Markland AD, Goode PS, Burgio KL, et al. Incidence and risk factors for fecal incontinence in black and white older adults: a population-based study. *J Am Geriatr Soc.* 2010;58:1341–1346.
7. Nelson RL. Epidemiology of fecal incontinence. *Gastroenterology.* 2004;126(suppl 1):S3–S7.
8. Whitehead WE, Borrud L, Goode PS, Meikle S, Mueller ER, Tuteja A, et al; Pelvic Floor Disorders Network. Fecal incontinence in us adults: epidemiology and risk factors. *Gastroenterology.* 2009;137:512–517. 7 e1-2.
9. Ng KS, Nassar N, Hamd K, Nagarajah A, Gladman MA. Prevalence of functional bowel disorders and faecal incontinence: an Australian primary care survey. *Colorectal Dis.* 2015;17:150–159.
10. Brown HW, Wexner SD, Segall MM, Brezoczky KL, Lukacz ES. Accidental bowel leakage in the mature women's health study: prevalence and predictors. *Int J Clin Pract.* 2012;66:1101–1108.
11. Cox CK, Schimpf MO, Berger MB. Stigma associated with pelvic floor disorders. *Female Pelvic Med Reconstr Surg.* 2021;27:e453–e456.
12. Townsend DC, Carrington EV, Grossi U, et al. Pathophysiology of fecal incontinence differs between men and women: a case-matched study in 200 patients. *Neurogastroenterol Motil.* 2016;28:1580–1588.
13. Tjandra JJ, Dykes SL, Kumar RR, et al; Standards Practice Task Force of The American Society of Colon and Rectal Surgeons. Practice parameters for the treatment of fecal incontinence. *Dis Colon Rectum.* 2007;50:1497–1507.
14. Madoff RD, Parker SC, Varma MG, Lowry AC. Faecal incontinence in adults. *Lancet.* 2004;364:621–632.
15. Mellgren A. Fecal incontinence. *Surg Clin North Am.* 2010;90:185–194.
16. Cauley CE, Savitt LR, Weinstein M, et al. A quality-of-life comparison of two fecal incontinence phenotypes: isolated fecal incontinence versus concurrent fecal incontinence with constipation. *Dis Colon Rectum.* 2019;62:63–70.
17. Assmann SL, Keszthelyi D, Kleijnen J, et al. Guideline for the diagnosis and treatment of faecal incontinence—a UEG/ESCP/ESNM/ESPCG collaboration. *United European Gastroenterol J.* 2022;10:251–286.
18. Paquette IM, Varma MG, Kaiser AM, Steele SR, Rafferty JF. The American Society of Colon and Rectal Surgeons' clinical practice guideline for the treatment of fecal incontinence. *Dis Colon Rectum.* 2015;58:623–636.
19. Guyatt G, Oxman AD, Akl EA, et al. GRADE guidelines: 1. Introduction—GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol.* 2011;64:383–394.
20. Menees SB, Almario CV, Spiegel BMR, Chey WD. Prevalence of and factors associated with fecal incontinence: results from a population-based survey. *Gastroenterology.* 2018;154:1672–1681.e3.
21. Townsend MK, Matthews CA, Whitehead WE, Grodstein F. Risk factors for fecal incontinence in older women. *Am J Gastroenterol.* 2013;108:113–119.
22. Johnson JK, Lindow SW, Duthie GS. The prevalence of occult obstetric anal sphincter injury following childbirth—literature review. *J Matern Fetal Neonatal Med.* 2007;20:547–554.
23. Bharucha AE, Fletcher JG, Melton LI, Zinsmeister AR. Obstetric trauma, pelvic floor injury and fecal incontinence: a population-based case-control study. *Am J Gastroenterol.* 2012;107:902–911.
24. Christoforidis D, Bordeianou L, Rockwood TH, et al.Faecal incontinence in men. *Colorectal Dis.* 2011;13:906–913.
25. Markland AD, Dunivan GC, Vaughan CP, Rogers RG. Anal intercourse and fecal incontinence: evidence from the 2009-2010 national health and nutrition examination survey. *Am J Gastroenterol.* 2016;111:269–274.
26. Qureshi MS, Rao MM, Sasapu KK, et al. Male faecal incontinence presents as two separate entities with implications for management. *Int J Colorectal Dis.* 2011;26:1589–1594.
27. Ommer A, Wenger FA, Rolfs T, Walz MK. Continence disorders after anal surgery—a relevant problem? *Int J Colorectal Dis.* 2008;23:1023–1031.
28. Kocaay AF, Oztuna D, Su FA, Elhan AH, Kuzu MA. Effects of hysterectomy on pelvic floor disorders: a longitudinal study. *Dis Colon Rectum.* 2017;60:303–310.
29. Jakubauskas M, Jotautas V, Poskus E, et al. Fecal incontinence after transanal endoscopic microsurgery. *Int J Colorectal Dis.* 2018;33:467–472.
30. Kupsch J, Jackisch T, Matzel KE, et al. Outcome of bowel function following anterior resection for rectal cancer—an analysis using the low anterior resection syndrome (LARS) score. *Int J Colorectal Dis.* 2018;33:787–798.
31. Bordeianou L, Hicks CW, Olariu A, et al. Effect of coexisting pelvic floor disorders on fecal incontinence quality of life scores: a prospective, survey-based study. *Dis Colon Rectum.* 2015;58:1091–1097.
32. Bloemendaal AL, Buchs NC, Prapasrivorakul S, et al. High-grade internal rectal prolapse: does it explain so-called "idiopathic" faecal incontinence? *Int J Surg.* 2016;25:118–122.
33. Rockwood TH, Church JM, Fleshman JW, et al. Patient and surgeon ranking of the severity of symptoms associated with fecal incontinence: the fecal incontinence severity index. *Dis Colon Rectum.* 1999;42:1525–1532.
34. Vaizey CJ, Carapeti E, Cahill JA, Kamm MA. Prospective comparison of faecal incontinence grading systems. *Gut.* 1999;44:77–80.
35. Jorge JM, Wexner SD. Etiology and management of fecal incontinence. *Dis Colon Rectum.* 1993;36:77–97.
36. Cotterill N, Norton C, Avery KN, Abrams P, Donovan JL. Psychometric evaluation of a new patient-completed questionnaire for evaluating anal incontinence symptoms and impact on quality of life: the ICIQ-B. *Dis Colon Rectum.* 2011;54:1235–1250.
37. Macmillan AK, Merrie AE, Marshall RJ, Parry BR. Design and validation of a comprehensive fecal incontinence questionnaire. *Dis Colon Rectum.* 2008;51:1502–1522.
38. Kwon S, Visco AG, Fitzgerald MP, Ye W, Whitehead WE; Pelvic Floor Disorders Network (PFDN). Validity and reliability of the modified manchester health questionnaire in assessing patients with fecal incontinence. *Dis Colon Rectum.* 2005;48:323–331.
39. Rockwood TH, Church JM, Fleshman JW, et al. Fecal incontinence quality of life scale: quality of life instrument for patients with fecal incontinence. *Dis Colon Rectum.* 2000;43:9–16.
40. Rothbarth J, Bemelman WA, Meijerink WJ, et al. What is the impact of fecal incontinence on quality of life? *Dis Colon Rectum.* 2001;44:67–71.
41. Soffer EE, Hull T. Fecal incontinence: a practical approach to evaluation and treatment. *Am J Gastroenterol.* 2000;95:1873–1880.

42. Ware JE, Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care.* 1992;30:473–483.
43. Bordeianou LG, Anger JT, Boutros M, et al; Members of the Pelvic Floor Disorders Consortium Working Groups on Patient-Reported Outcomes. Measuring pelvic floor disorder symptoms using patient-reported instruments: proceedings of the consensus meeting of the pelvic floor consortium of the American Society of Colon and Rectal Surgeons, the International Continence Society, the American Urogynecologic Society, and the Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction. *Female Pelvic Med Reconstr Surg.* 2020;26:1–15.
44. Lussiez A, Lowry AC, Kwakye G. Need for increased awareness of female genital mutilation among physicians. *Dis Colon Rectum.* 2020;63:3–5.
45. Sands DR. Common tests for the pelvic floor. In: Steele S, Hull T, Read T, Saclarides T, Senagore A, Whitlow C. *The ASCRS Textbook of Colon and Rectal Surgery*. 3rd ed. New York, NY: Springer; 2016:1027–1049.
46. Bharucha AE. Outcome measures for fecal incontinence: anorectal structure and function. *Gastroenterology.* 2004;126(suppl 1):S90–S98.
47. Bharucha AE. Update of tests of colon and rectal structure and function. *J Clin Gastroenterol.* 2006;40:96–103.
48. Bharucha AE. Pro: anorectal testing is useful in fecal incontinence. *Am J Gastroenterol.* 2006;101:2679–2681.
49. Lam TJ, Kuik DJ, Felt-Bersma RJ. Anorectal function evaluation and predictive factors for faecal incontinence in 600 patients. *Colorectal Dis.* 2012;14:214–223.
50. Choe JH, Choo MS, Lee KS. The impact of tension-free vaginal tape on overactive bladder symptoms in women with stress urinary incontinence: significance of detrusor overactivity. *J Urol.* 2008;179:214–219.
51. Thekkinkattil DK, Lim M, Stojkovic SG, et al. A classification system for faecal incontinence based on anorectal investigations. *Br J Surg.* 2008;95:222–228.
52. Wald A. Con: anorectal manometry and imaging are not necessary in patients with fecal incontinence. *Am J Gastroenterol.* 2006;101:2681–2683.
53. Carrington EV, Scott SM, Bharucha A, et al; International Anorectal Physiology Working Group and the International Working Group for Disorders of Gastrointestinal Motility and Function. Expert consensus document: advances in the evaluation of anorectal function. *Nat Rev Gastroenterol Hepatol.* 2018;15:309–323.
54. Bordeianou LG, Carmichael JC, Paquette IM, et al. Consensus statement of definitions for anorectal physiology testing and pelvic floor terminology (revised). *Dis Colon Rectum.* 2018;61:421–427.
55. Deutekom M, Dobben AC, Terra MP, et al. Clinical presentation of fecal incontinence and anorectal function: what is the relationship? *Am J Gastroenterol.* 2007;102:351–361.
56. Rasijeff AMP, García-Zermeño K, Di Tanna GL, et al. Systematic review and meta-analysis of anal motor and rectal sensory dysfunction in male and female patients undergoing anorectal manometry for symptoms of faecal incontinence. *Colorectal Dis.* 2022;24:562–576.
57. Bordeianou L, Lee KY, Rockwood T, et al. Anal resting pressures at manometry correlate with the fecal incontinence severity index and with presence of sphincter defects on ultrasound. *Dis Colon Rectum.* 2008;51:1010–1014.
58. Liberman H, Faria J, Ternent CA, et al. A prospective evaluation of the value of anorectal physiology in the management of fecal incontinence. *Dis Colon Rectum.* 2001;44:1567–1574.
59. Quezada Y, Whiteside JL, Rice T, et al. Does preoperative anal physiology testing or ultrasonography predict clinical outcome with sacral neuromodulation for fecal incontinence? *Int Urogynecol J Pelvic Floor Dysfunct.* 2015;26:1613–1617.
60. Duelund-Jakobsen J, van Wunnik B, Buntzen S, et al. Baseline factors predictive of patient satisfaction with sacral neuromodulation for idiopathic fecal incontinence. *Int J Colorectal Dis.* 2014;29:793–798.
61. Carrington EV, Heinrich H, Knowles CH, et al; International anorectal physiology working party group (IAPWG). Methods of anorectal manometry vary widely in clinical practice: results from an international survey. *Neurogastroenterol Motil.* 2017;29:e13016.
62. Staller K. Role of Anorectal manometry in clinical practice. *Curr Treat Options Gastroenterol.* 2015;13:418–431.
63. Cohan JN, Chou AB, Varma MG. Faecal incontinence in men referred for specialty care: a cross-sectional study. *Colorectal Dis.* 2015;17:802–809.
64. Varma A, Gunn J, Gardiner A, Lindow SW, Duthie GS. Obstetric anal sphincter injury: prospective evaluation of incidence. *Dis Colon Rectum.* 1999;42:1537–1543.
65. Pinsk I, Brown J, Phang PT. Assessment of sonographic quality of anal sphincter muscles in patients with faecal incontinence. *Colorectal Dis.* 2009;11:933–940.
66. Titi MA, Jenkins JT, Urie A, Molloy RG. Correlation between anal manometry and endosonography in females with faecal incontinence. *Colorectal Dis* 2008;10:131–137.
67. Wasserberg N, Mazaheri A, Petrone P, Tulchinsky H, Kaufman HS. Three-dimensional endoanal ultrasonography of external anal sphincter defects in patients with faecal incontinence: correlation with symptoms and manometry. *Colorectal Dis* 2011;13:449–453.
68. Handa VL, Blomquist JL, Roem J, Muñoz A, Dietz HP. Pelvic floor disorders after obstetric avulsion of the levator ani muscle. *Female Pelvic Med Reconstr Surg.* 2019;25:3–7.
69. Mathew S, Guzmán Rojas RA, Salvesen KA, Volløyhaug I. Levator ani muscle injury and risk for urinary and fecal incontinence in parous women from a normal population, a cross-sectional study. *Neurourol Urodyn.* 2019;38:2296–2302.
70. Hawkins AT, Olariu AG, Savitt LR, et al. Impact of rising grades of internal rectal intussusception on fecal continence and symptoms of constipation. *Dis Colon Rectum.* 2016;59:54–61.
71. Osterberg A, Graf W, Eeg-Olofsson EK, Hynninen P, Påhlman L. Results of neurophysiologic evaluation in fecal incontinence. *Dis Colon Rectum.* 2000;43:1256–1261.
72. Fitzpatrick M, O'brien C, O'connell PR, O'herlihy C. Patterns of abnormal pudendal nerve function that are associated with postpartum fecal incontinence. *Am J Obstet Gynecol.* 2003;189:730–735.
73. Saraidaridis JT, Molina G, Savit LR, et al. Pudendal nerve terminal motor latency testing does not provide useful information in guiding therapy for fecal incontinence. *Int J Colorectal Dis.* 2018;33:305–310.
74. Gooneratne ML, Scott SM, Lunniss PJ. Unilateral pudendal neuropathy is common in patients with fecal incontinence. *Dis Colon Rectum.* 2007;50:449–458.

75. Rasmussen OO, Christiansen J, Tetzschner T, Sørensen M. Pudendal nerve function in idiopathic fecal incontinence. *Dis Colon Rectum.* 2000;43:633–636.
76. Súilleabháin CB, Horgan AF, McEnroe L, et al. The relationship of pudendal nerve terminal motor latency to squeeze pressure in patients with idiopathic fecal incontinence. *Dis Colon Rectum.* 2001;44:666–671.
77. Buie WD, Lowry AC, Rothenberger DA, Madoff RD. Clinical rather than laboratory assessment predicts continence after anterior sphincteroplasty. *Dis Colon Rectum.* 2001;44:1255–1260.
78. Chen AS, Luchtefeld MA, Senagore AJ, Mackeigan JM, Hoyt C. Pudendal nerve latency. Does it predict outcome of anal sphincter repair? *Dis Colon Rectum.* 1998;41:1005–1009.
79. Brouwer R, Duthie G. Sacral nerve neuromodulation is effective treatment for fecal incontinence in the presence of a sphincter defect, pudendal neuropathy, or previous sphincter repair. *Dis Colon Rectum.* 2010;53:273–278.
80. Rothbarth J, Bemelman WA, Meijerink WJ, Buyze-Westerweel ME, van Dijk JG, Delemarre JB. Long-term results of anterior anal sphincter repair for fecal incontinence due to obstetric injury/ with invited commentaries. *Dig Surg.* 2000;17:390–393.
81. Gilliland R, Altomare DF, Moreira H, Jr, Oliveira L, Gilliland JE, Wexner SD. Pudendal neuropathy is predictive of failure following anterior overlapping sphincteroplasty. *Dis Colon Rectum.* 1998;41:1516–1522.
82. Ricciardi R, Mellgren AF, Madoff RD, Baxter NN, Karulf RE, Parker SC. The utility of pudendal nerve terminal motor latencies in idiopathic incontinence. *Dis Colon Rectum.* 2006;49:852–857.
83. Sangwan YP, Coller JA, Barrett RC, et al. Unilateral pudendal neuropathy. Impact on outcome of anal sphincter repair. *Dis Colon Rectum.* 1996;39:686–689.
84. Johnson E, Carlsen E, Steen TB, et al. Short- and long-term results of secondary anterior sphincteroplasty in 33 patients with obstetric injury. *Acta Obstet Gynecol Scand.* 2010;89:1466–1472.
85. Bharucha AE, Zinsmeister AR, Schleck CD, Melton LI. Bowel disturbances are the most important risk factors for late onset fecal incontinence: a population-based case-control study in women. *Gastroenterology.* 2010;139:1559–1566.
86. Croswell E, Bliss DZ, Savik K. Diet and eating pattern modifications used by community-living adults to manage their fecal incontinence. *J Wound Ostomy Continence Nurs.* 2010;37:677–682.
87. Han SH, Choi K, Shim GY, Kim J. Pudendal nerve terminal motor latency compared by anorectal manometry diagnosing fecal incontinence: a retrospective study. *Am J Phys Med Rehabil.* 2022;101:124–128.
88. Rosier PF, Szabó L, Capewell A, et al. International consultation on incontinence 2008 committee on dynamic testing. Executive summary: the international consultation on incontinence 2008—committee on: "dynamic testing"; for urinary or fecal incontinence. Part 2: urodynamic testing in male patients with symptoms of urinary incontinence, in patients with relevant neurological abnormalities, and in children and in frail elderly with symptoms of urinary incontinence. *Neurourol Urodyn.* 2010;29:146–152.
89. Davidson KW, Barry MJ, Mangione CM, et al; US Preventive Services Task Force. Screening for colorectal cancer: US Preventive Services Task Force recommendation statement. *JAMA.* 2021;325:1965–1977.
90. Bliss DZ, Jung HJ, Savik K, et al. Supplementation with dietary fiber improves fecal incontinence. *Nurs Res.* 2001;50:203–213.
91. Bliss DZ, Norton C. Conservative management of fecal incontinence. *Am J Nurs.* 2010;110:30–38.
92. Bliss DZ, Savik K, Jung HJ, et al. Dietary fiber supplementation for fecal incontinence: a randomized clinical trial. *Res Nurs Health.* 2014;37:367–378.
93. Quigley EM. What we have learned about colonic motility: normal and disturbed. *Curr Opin Gastroenterol.* 2010;26:53–60.
94. Cheetham M, Brazzelli M, Norton C, Glazener CM. Drug treatment for faecal incontinence in adults. *Cochrane Database Syst Rev.* 2003:CD002116.
95. Remes-Troche JM, Ozturk R, Philips C, Stessman M, Rao SS. Cholestyramine—a useful adjunct for the treatment of patients with fecal incontinence. *Int J Colorectal Dis.* 2008;23:189–194.
96. Omar MI, Alexander CE. Drug treatment for faecal incontinence in adults. *Cochrane Database Syst Rev.* 2013;2013:CD002116.
97. Eradi B, Hamrick M, Bischoff A, et al. The role of a colon resection in combination with a Malone appendicostomy as part of a bowel management program for the treatment of fecal incontinence. *J Pediatr Surg.* 2013;48:2296–2300.
98. Lim IIP, Cushing CC, Jenkins T, et al. Prospective quality of life outcomes in pediatric fecal incontinence following bowel management. *J Pediatr Surg.* 2021;56:1459–1464.
99. Dale M, Morgan H, Carter K, White J, Carolan-Rees G. Peristeen transanal irrigation system to manage bowel dysfunction: a NICE medical technology guidance. *Appl Health Econ Health Policy.* 2019;17:25–34.
100. Jørgensen CS, Kamperis K, Modin L, Rittig CS, Rittig S. Transanal irrigation is effective in functional fecal incontinence. *Eur J Pediatr.* 2017;176:731–736.
101. Juul T, Christensen P. Prospective evaluation of transanal irrigation for fecal incontinence and constipation. *Tech Coloproctol.* 2017;21:363–371.
102. Martellucci J, Sturiale A, Bergamini C, et al. Role of transanal irrigation in the treatment of anterior resection syndrome. *Tech Coloproctol.* 2018;22:519–527.
103. Tries J. Protocol- and therapist-related variables affecting outcomes of behavioral interventions for urinary and fecal incontinence. *Gastroenterology.* 2004;126(suppl 1):S152–S158.
104. Lacima G, Pera M, Amador A, Escaramis G, Pique JM. Long-term results of biofeedback treatment for faecal incontinence: a comparative study with untreated controls. *Colorectal Dis* 2010;12:742–749.
105. Chiarioni G, Bassotti G, Stanganini S, Vantini I, Whitehead WE. Sensory retraining is key to biofeedback therapy for formed stool fecal incontinence. *Am J Gastroenterol.* 2002;97:109–117.
106. Norton C, Cody JD. Biofeedback and/or sphincter exercises for the treatment of faecal incontinence in adults. *Cochrane Database Syst Rev.* 2012:CD002111.
107. Norton C, Cody JD, Hosker G. Biofeedback and/or sphincter exercises for the treatment of faecal incontinence in adults. *Cochrane Database Syst Rev.* 2006:CD002111.
108. Norton C, Kamm MA. Outcome of biofeedback for faecal incontinence. *Br J Surg.* 1999;86:1159–1163.
109. Pager CK, Solomon MJ, Rex J, Roberts RA. Long-term outcomes of pelvic floor exercise and biofeedback treatment for patients with fecal incontinence. *Dis Colon Rectum.* 2002;45:997–1003.

110. Heymen S, Scarlett Y, Jones K, et al. Randomized controlled trial shows biofeedback to be superior to pelvic floor exercises for fecal incontinence. *Dis Colon Rectum.* 2009;52:1730–1737.
111. Damon H, Siproudhis L, Faucheron JL, et al. Oralia Trial Group. Perineal retraining improves conservative treatment for faecal incontinence: a multicentre randomized study. *Dig Liver Dis.* 2014;46:237–242.
112. Murad-Regadas SM, Regadas FSP, Regadas Filho FSP, et al. Predictors of unsuccessful of treatment for fecal incontinence biofeedback for fecal incontinence in female. *Arq Gastroenterol.* 2019;56:61–65.
113. Vonthein R, Heimerl T, Schwandner T, Ziegler A. Electrical stimulation and biofeedback for the treatment of fecal incontinence: a systematic review. *Int J Colorectal Dis.* 2013;28:1567–1577.
114. Bravo Gutierrez A, Madoff RD, Lowry AC, et al. Long-term results of anterior sphincteroplasty. *Dis Colon Rectum.* 2004;47:727–731.
115. Norton C, Chelvanayagam S, Wilson-Barnett J, Redfern S, Kamm MA. Randomized controlled trial of biofeedback for fecal incontinence. *Gastroenterology.* 2003;125:1320–1329.
116. Leite FR, Lima MJ, Lacerda-Filho A. Early functional results of biofeedback and its impact on quality of life of patients with anal incontinence. *Arq Gastroenterol.* 2013;50:163–169.
117. Solomon MJ, Pager CK, Rex J, Roberts R, Manning J. Randomized, controlled trial of biofeedback with anal manometry, transanal ultrasound, or pelvic floor retraining with digital guidance alone in the treatment of mild to moderate fecal incontinence. *Dis Colon Rectum.* 2003;46:703–710.
118. Byrne CM, Solomon MJ, Rex J, et al. Telephone vs. face-to-face biofeedback for fecal incontinence: comparison of two techniques in 239 patients. *Dis Colon Rectum.* 2005;48:2281–2288.
119. Glasgow SC, Lowry AC. Long-term outcomes of anal sphincter repair for fecal incontinence: a systematic review. *Dis Colon Rectum.* 2012;55:482–490.
120. Markland AD, Jelovsek JE, Whitehead WE, et al; Pelvic Floor Disorders Network. Improving biofeedback for the treatment of fecal incontinence in women: implementation of a standardized multi-site manometric biofeedback protocol. *Neurogastroenterol Motil.* 2017;29:e12906.
121. Lacima G, Pera M, González-Argenté X, et al. Is electromyography a predictive test of patient response to biofeedback in the treatment of fecal incontinence? *Neurourol Urodyn.* 2016;35:390–394.
122. Richter HE, Matthews CA, Muir T, et al. A vaginal bowel-control system for the treatment of fecal incontinence. *Obstet Gynecol.* 2015;125:540–547.
123. Richter HE, Dunivan G, Brown HW, et al. 12-Month clinical durability of effectiveness and safety evaluation of a vaginal bowel control system for the nonsurgical treatment of fecal incontinence. *Female Pelvic Med Reconstr Surg.* 2019;25:113–119.
124. Matthews CA, Varma MG, Takase-Sanchez MM, et al. Characteristics associated with successful fitting of a vaginal bowel control system for fecal incontinence. *Female Pelvic Med Reconstr Surg.* 2016;22:359–363.
125. How P, Trivedi PM, Bearn PE, Thomas GP. Insert devices for faecal incontinence. *Tech Coloproctol.* 2021;25:255–265.
126. Buono K, Davé-Heliker B. Mechanical inserts for the treatment of faecal incontinence: a systematic review. *Arab J Urol.* 2019;17:69–76.
127. Lukacz ES, Segall MM, Wexner SD. Evaluation of an anal insert device for the conservative management of fecal incontinence. *Dis Colon Rectum.* 2015;58:892–898.
128. Leo CA, Thomas GP, Hodgkinson JD, et al. Randomized pilot study: anal inserts versus percutaneous tibial nerve stimulation in patients with fecal incontinence. *Dis Colon Rectum.* 2021;64:466–474.
129. Christiansen J, Roed-Petersen K. Clinical assessment of the anal continence plug. *Dis Colon Rectum.* 1993;36:740–742.
130. Norton C, Kamm MA. Anal plug for faecal incontinence. *Colorectal Dis.* 2001;3:323–327.
131. Pfrommer W, Holschneider AM, Löffler N, Schauff B, Ure BM. A new polyurethane anal plug in the treatment of incontinence after anal atresia repair. *Eur J Pediatr Surg.* 2000;10:186–190.
132. Giamundo P, Welber A, Weiss EG, et al. The procon incontinence device: a new nonsurgical approach to preventing episodes of fecal incontinence. *Am J Gastroenterol.* 2002;97:2328–2332.
133. Leo CA, Thomas GP, Hodgkinson JD, et al. The Renew® anal insert for passive faecal incontinence: a retrospective audit of our use of a novel device. *Colorectal Dis.* 2019;21:684–688.
134. Segal JP, Leo CA, Hodgkinson JD, et al. Acceptability, effectiveness and safety of a Renew® anal insert in patients who have undergone restorative proctocolectomy with ileal pouch-anal anastomosis. *Colorectal Dis.* 2019;21:73–78.
135. Haug HM, Carlsen E, Johannessen HO, Johnson E. Short-, long-, and very long-term results of secondary anterior sphincteroplasty in 20 patients with obstetric injury. *Int J Colorectal Dis.* 2021;36:2775–2778.
136. Berkesoglu M, Colak T, Turkmenoglu MO, et al. Long-term results from modified sphincteroplasty in patients with traumatic sphincter injury: a retrospective study. *Sao Paulo Med J.* 2021;139:58–64.
137. Pla-Mart V, Martín-Arévalo J, Marti-Fernandez R, et al. Long-term evolution of continence and quality of life after sphincteroplasty for obstetric fecal incontinence. *Ann Coloproctol.* 2020;38:13–19.
138. Halverson AL, Hull TL, Paraiso MF, Floruta C. Outcome of sphincteroplasty combined with surgery for urinary incontinence and pelvic organ prolapse. *Dis Colon Rectum.* 2001;44:1421–1426.
139. Karoui S, Leroi AM, Koning E, et al. Results of sphincteroplasty in 86 patients with anal incontinence. *Dis Colon Rectum.* 2000;43:813–820.
140. Berg MR, Gregussen H, Sahlin Y. Long-term outcome of sphincteroplasty with separate suturing of the internal and the external anal sphincter. *Tech Coloproctol.* 2019;23:1163–1172.
141. Hong KD, DaSilva G, Dollerschell JT, Wexner SD. Suboptimal results after sphincteroplasty: another hazard of obesity. *Tech Coloproctol.* 2014;18:1055–1059.
142. Chan MK, Tjandra JJ. Sacral nerve stimulation for fecal incontinence: external anal sphincter defect vs. intact anal sphincter. *Dis Colon Rectum.* 2008;51:1015–1024.
143. Goldman HB, Lloyd JC, Noblett KL, et al. International Continence Society best practice statement for use of sacral neuromodulation. *Neurourol Urodyn.* 2018;37:1823–1848.

144. Johnson BI, Abodeely A, Ferguson MA, Davis BR, Rafferty JF, Paquette IM. Is sacral neuromodulation here to stay? Clinical outcomes of a new treatment for fecal incontinence. *J Gastrointest Surg.* 2015;19:15–19.
145. Katuwal B, Bhullar J. Current position of sacral neuromodulation in treatment of fecal incontinence. *Clin Colon Rectal Surg.* 2021;34:22–27.
146. Kreydin EI, Chaudhry ZQ, Kazanjian KK, Lin AY. Anal sphincteroplasty in the minimally invasive era: assessment of national trends and complications. *Am Surg.* 2019;85:46–51.
147. Rodrigues FG, Chadi SA, Cracco AJ, et al. Faecal incontinence in patients with a sphincter defect: comparison of sphincteroplasty and sacral nerve stimulation. *Colorectal Dis.* 2017;19:456–461.
148. Hong K, Dasilva G, Dollerschell JT, Maron D, Wexner SD. Redo sphincteroplasty: are the results sustainable? *Gastroenterol Rep (Oxf).* 2016;4:39–42.
149. Tjandra JJ, Chan MK, Yeh CH, Murray-Green C. Sacral nerve stimulation is more effective than optimal medical therapy for severe fecal incontinence: a randomized, controlled study. *Dis Colon Rectum.* 2008;51:494–502.
150. Thin NN, Horrocks EJ, Hotouras A, et al. Systematic review of the clinical effectiveness of neuromodulation in the treatment of faecal incontinence. *Br J Surg.* 2013;100:1430–1447.
151. George AT, Kalmar K, Panarese A, et al. Long-term outcomes of sacral nerve stimulation for fecal incontinence. *Dis Colon Rectum.* 2012;55:302–306.
152. Hollingshead JR, Dudding TC, Vaizey CJ. Sacral nerve stimulation for faecal incontinence: results from a single centre over a 10-year period. *Colorectal Dis.* 2011;13:1030–1034.
153. Matzel KE, Lux P, Heuer S, Besendörfer M, Zhang W. Sacral nerve stimulation for faecal incontinence: long-term outcome. *Colorectal Dis.* 2009;11:636–641.
154. Meurette G, Siproudhis L, Leroi AM, Damon H, Urs Josef Keller D, Faucheron JL; French Faecal Registry Study Group. Sacral neuromodulation with the InterStim™ system for faecal incontinence: results from a prospective French multicentre observational study. *Colorectal Dis.* 2021;23:1463–1473.
155. Rice TC, Quezada Y, Rafferty JF, Paquette IM. Percutaneous nerve evaluation versus staged sacral nerve stimulation for fecal incontinence. *Dis Colon Rectum.* 2016;59:962–967.
156. Hull T, Giese C, Wexner SD, et al; SNS Study Group. Long-term durability of sacral nerve stimulation therapy for chronic fecal incontinence. *Dis Colon Rectum.* 2013;56:234–245.
157. Cohn JA, Kowalik CG, Kaufman MR, et al. Evaluation of the axonics modulation technologies sacral neuromodulation system for the treatment of urinary and fecal dysfunction. *Expert Rev Med Devices.* 2017;14:3–14.
158. Jottard K, Van den Broeck S, Komen N, Bruyninx L, De Wachter S. Treatment of fecal incontinence with a rechargeable sacral neuromodulation system: efficacy, clinical outcome, and ease of use-six-month follow-up. *Neuromodulation.* 2021;24:1284–1288.
159. Kirss J, Jr, Pinta T, Rautio T, et al. Impact of sphincter lesions and delayed sphincter repair on sacral neuromodulation treatment outcomes for faecal incontinence: results from a Finnish national cohort study. *Int J Colorectal Dis.* 2018;33:1709–1714.
160. Ratto C, Litta F, Parello A, et al. Sacral nerve stimulation in faecal incontinence associated with an anal sphincter lesion: a systematic review. *Colorectal Dis.* 2012;14:e297–e304.
161. Meurette G, La Torre M, Regenet N, Robert-Yap J, Lehur PA. Value of sacral nerve stimulation in the treatment of severe faecal incontinence: a comparison to the artificial bowel sphincter. *Colorectal Dis.* 2009;11:631–635.
162. Huang Y, Koh CE. Sacral nerve stimulation for bowel dysfunction following low anterior resection: a systematic review and meta-analysis. *Colorectal Dis.* 2019;21:1240–1248.
163. Prapasrivorakul S, Gosselink MP, Gorissen KJ, et al. Sacral neuromodulation for faecal incontinence: is the outcome compromised in patients with high-grade internal rectal prolapse? *Int J Colorectal Dis.* 2015;30:229–234.
164. Brochard C, Mege D, Bridoux V, et al. Is sacral nerve modulation a good option for fecal incontinence in men? *Neuromodulation.* 2019;22:745–750.
165. Forte ML, Andrade KE, Lowry AC, et al. Systematic review of surgical treatments for fecal incontinence. *Dis Colon Rectum.* 2016;59:443–469.
166. Graf W, Mellgren A, Matzel KE, et al; NASHA Dx Study Group. Efficacy of dextranomer in stabilised hyaluronic acid for treatment of faecal incontinence: a randomised, sham-controlled trial. *Lancet.* 2011;377:997–1003.
167. Mellgren A, Matzel KE, Pollack J, et al; Nasha Dx Study Group. Long-term efficacy of NASHA Dx injection therapy for treatment of fecal incontinence. *Neurogastroenterol Motil.* 2014;26:1087–1094.
168. Guerra F, La Torre M, Giuliani G, et al. Long-term evaluation of bulking agents for the treatment of fecal incontinence: clinical outcomes and ultrasound evidence. *Tech Coloproctol.* 2015;19:23–27.
169. Efron JE. The SECCA procedure: a new therapy for treatment of fecal incontinence. *Surg Technol Int.* 2004;13:107–110.
170. Felt-Bersma RJ, Szojda MM, Mulder CJ. Temperature-controlled radiofrequency energy (SECCA) to the anal canal for the treatment of faecal incontinence offers moderate improvement. *Eur J Gastroenterol Hepatol.* 2007;19:575–580.
171. Kim DW, Yoon HM, Park JS, Kim YH, Kang SB. Radiofrequency energy delivery to the anal canal: is it a promising new approach to the treatment of fecal incontinence? *Am J Surg.* 2009;197:14–18.
172. Lefebure B, Tuech JJ, Bridoux V, et al. Temperature-controlled radio frequency energy delivery (SECCA procedure) for the treatment of fecal incontinence: results of a prospective study. *Int J Colorectal Dis.* 2008;23:993–997.
173. Ruiz D, Pinto RA, Hull TL, Efron JE, Wexner SD. Does the radiofrequency procedure for fecal incontinence improve quality of life and incontinence at 1-year follow-up? *Dis Colon Rectum.* 2010;53:1041–1046.
174. Takahashi-Monroy T, Morales M, Garcia-Osogobio S, et al. SECCA procedure for the treatment of fecal incontinence: results of five-year follow-up. *Dis Colon Rectum.* 2008;51:355–359.
175. Frascio M, Mandolfino F, Imperatore M, et al. The SECCA procedure for faecal incontinence: a review. *Colorectal Dis.* 2014;16:167–172.
176. Visscher AP, Lam TJ, Meurs-Szojda MM, Felt-Bersma RJF. Temperature-controlled delivery of radiofrequency energy in fecal incontinence: a randomized sham-controlled clinical trial. *Dis Colon Rectum.* 2017;60:860–865.
177. Vergara-Fernandez O, Arciniega-Hernández JA, Trejo-Avila M. Long-term outcomes of radiofrequency treatment for fecal

incontinence: are the results maintainable? *Int J Colorectal Dis.* 2020;35:173–176.
178. Patel AS, Saratzis A, Arasaradnam R, Harmston C. Use of antegrade continence enema for the treatment of fecal incontinence and functional constipation in adults: a systematic review. *Dis Colon Rectum.* 2015;58:999–1013.
179. Chereau N, Lefevre JH, Shields C, et al. Antegrade colonic enema for faecal incontinence in adults: long-term results of 75 patients. *Colorectal Dis.* 2011;13:e238–e242.
180. Ivatury SJ, Wilson LR, Paquette IM. Surgical treatment alternatives to sacral neuromodulation for fecal incontinence: injectables, sphincter repair, and colostomy. *Clin Colon Rectal Surg.* 2021;34:40–48.
181. Norton C, Burch J, Kamm MA. Patients' views of a colostomy for fecal incontinence. *Dis Colon Rectum.* 2005;48:1062–1069.
182. Colquhoun P, Kaiser R, Jr, Efron J, et al. Is the quality of life better in patients with colostomy than patients with fecal incontience? *World J Surg.* 2006;30:1925–1928.