The American Society of Colon and Rectal Surgeons' Clinical Practice Guideline for the Evaluation and Management of Constipation

Ian M. Paquette, M.D. • Madhulika Varma, M.D. • Charles Ternent, M.D.
Genevieve Melton-Meaux, M.D. • Janice F. Rafferty, M.D. • Daniel Feingold, M.D.
Scott R. Steele, M.D.

The American Society of Colon and Rectal Surgeons is dedicated to assuring high-quality patient care by advancing the science, 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. This is accompanied by developing Clinical Practice Guidelines based on the best available evidence. These guidelines are inclusive and not prescriptive. Their purpose is to provide information on which decisions can be made rather than to dictate a specific form of treatment. These guidelines are intended for the use of all practitioners, healthcare workers, and patients who desire information about the management of the conditions addressed by the topics covered in these guidelines. It should be recognized that these guidelines should not be deemed inclusive of all proper methods of care or exclusive of methods of care that are reasonably directed to obtaining the same results. The ultimate judgment regarding the propriety of any specific procedure must be made by the physician in light of all of the circumstances presented by the individual patient.

STATEMENT OF THE PROBLEM

Constipation is a benign condition that can have a significant impact on quality of life. The prevalence has been estimated to be as high as 30% in select populations and has been noted to be higher in women, nonwhites, those aged >65 years, and those with lower socioeconomic status.[1–6] Constipation is characterized by dysfunction of colonic motility and the defecation process. The Rome III criteria for functional constipation include at least 2 of the following symptoms during ≥25% of defecations: straining, lumpy or hard stools, sensation of incomplete evacuation, sensation of anorectal obstruction or blockage, relying on manual maneuvers to promote defecation, and having less than 3 unassisted bowel movements per week.[7,8] These criteria include constipation related to the 3 common subtypes: colonic inertia or slow transit constipation, normal transit constipation, and pelvic floor or defecation dysfunction. However, in reality, many patients demonstrate symptoms attributable to more than 1 constipation subtype and to constipation-predominant IBS, as well. The etiology of constipation is multifactorial and can include extrinsic factors such as diet, medications, metabolic or neurologic disorders, and psychosocial issues, as well as intrinsic factors mentioned above. The variable nature and severity of constipation symptoms require an individualized approach to evaluation and treatment. Constipation is most commonly managed by primary care physicians and gastroenterologists, with colon and rectal surgeons usually becoming involved for more complicated cases. A collaborative approach across specialties is often needed to achieve optimal outcomes.

METHODOLOGY

These guidelines are an update of the previous edition of The American Society of Colon and Rectal Surgeons practice parameters for treatment of constipation published in 2007.[9] An organized search of MEDLINE, PubMed, and the Cochrane Database of Collected Reviews was performed through June 2015. Key-word combinations included *constipation*, *obstructed defecation*, *slow transit*, *surgery*, *rectocele*, *rectal intussusception*, *pelvic dyssynergia*, *anismus*, *paradoxical puborectalis*, *megacolon*, *megarectum*, and related articles. Directed searches of the embedded references from primary articles were also performed. The primary authors reviewed all of the English language articles and studies in adults, systematic reviews, and

Dis Colon Rectum 2016; 59: 479–492
DOI: 10.1097/DCR.0000000000000599

meta-analyses. Recommendations were formulated by the primary authors and reviewed by the entire Clinical Practice Guidelines Committee. The final grade of recommendation was performed using the Grades of Recommendation, Assessment, Development, and Evaluation system[10] (Table 1) and approved by the entire Clinical Practice Guidelines Committee.

Evaluation of Constipation

1. A directed history and physical examination should be performed in patients with constipation. Grade of Recommendation: Strong recommendation based on low- or very-low-quality evidence, 1C

Although constipation is a benign condition, a thorough history and physical examination can help ensure that a serious life-threatening disease is not the underlying cause of the constipation. Patients who also report rectal bleeding, change in caliber of stools, blood in the stool, weight loss, anemia, or a family history of colorectal cancer should be evaluated for a colorectal malignancy that may be causing obstruction.[11,12] In addition, a careful history may elicit modifiable behavioral factors, such as diet, dehydration, or immobility, as well as medications that may be contributing to constipation.[8,11] Opioids, antidepressants, anticholinergics, calcium channel blockers, and calcium supplements are commonly implicated and may need to be stopped or modified. Patients may also have an associated or undiagnosed psychiatric, neurologic, or endocrine disorder that will require treatment to help address constipation symptoms.[13] Lastly, a careful assessment of symptoms may help distinguish among constipation subtypes. Those with infrequent, hard stools may be more likely to have colonic inertia, whereas those with incomplete evacuation and straining are more likely to have pelvic floor dysfunction. The presence of abdominal pain may indicate IBS. However, the history alone may be inadequate to clearly establish a diagnosis, because many patients will have symptoms associated with more than 1 subtype.

The physical examination is directed at the abdominal and anorectal components. Generally the abdomen is nontender but may be remarkable for distension or discomfort with palpation. External anorectal examination includes the evaluation for an anal wink and the presence of stool staining or excoriation, hemorrhoids, full-thickness or mucosal rectal prolapse, and fissures. Digital rectal examination can reveal the presence of anal hypertonia, poor incremental squeeze, paradoxical puborectalis contraction, rectocele, anorectal masses, stricture, or fecal impaction that can be associated with constipation. In particular, a Valsalva maneuver should be done to diagnose a rectocele, prolapse, pelvic floor

TABLE 1. The GRADE system: grading recommendations

No.	*Description*	*Benefit vs risk and burdens*	*Methodologic quality of supporting evidence*	*Implications*
1A	Strong recommendation, high-quality evidence	Benefits clearly outweigh risk and burdens or vice versa	RCTs without important limitations or overwhelming evidence from observational studies	Strong recommendation, can apply to most patients in most circumstances without reservation
1B	Strong recommendation, moderate-quality evidence	Benefits clearly outweigh risk and burdens or vice versa	RCTs with important limitations (inconsistent results, methodologic flaws, indirect, or imprecise) or exceptionally strong evidence from observational studies	Strong recommendation, can apply to most patients in most circumstances without reservation
1C	Strong recommendation, low- or very-low-quality evidence	Benefits clearly outweigh risk and burdens or vice versa	Observational studies or case series	Strong recommendation but may change when higher-quality evidence becomes available
2A	Weak recommendation, high-quality evidence	Benefits closely balanced with risks and burdens	RCTs without important limitations or overwhelming evidence from observational studies	Weak recommendation, best action may differ depending on circumstances or patient or societal values
2B	Weak recommendations, moderate-quality evidence	Benefits closely balanced with risks and burdens	RCTs with important limitations (inconsistent results, methodologic flaws, indirect, or imprecise) or exceptionally strong evidence from observational studies	Weak recommendation, best action may differ depending on circumstances or patient or societal values
2C	Weak recommendation, low- or very-low-quality evidence	Uncertainty in the estimates of benefits, risks and burden; benefits, risks, and burden may be closely balanced	Observational studies or case series	Very weak recommendations; other alternatives may be equally reasonable

Adapted with permission from *Chest*. 2006;129:174–181.
GRADE = Grades of Recommendation, Assessment, Development, and Evaluation; RCT = randomized controlled trial.

descent, or puborectalis dysfunction. Anoscopy or rigid proctoscopy, although not necessary, may also be helpful to evaluate internal hemorrhoids, proctitis, or masses. In women, the vagina should also be evaluated for rectocele and cystocele.

2. Validated measures that assess the nature, severity, and impact of constipation on quality of life can be used as part of the medical evaluation for constipation. Grade of Recommendation: Weak recommendation based on low- or very-low-quality evidence, 2C

Objective measures that assess the severity of constipation and its impact on quality of life may help providers decide on course of treatment or whether to pursue more diagnostic studies.[14] Although the Rome criteria are used to identify constipation and its subtypes, it does not assess severity of the condition.[15–18] Many measures have been developed to assess constipation specifically, with variable psychometric properties. These include the Constipation Assessment Scale,[19] Constipation Scoring System,[20] Patient Assessment of Constipation Symptom Questionnaire,[21,22] Knowles-Eccersley-Scott Symptom Score,[23] Garrigues Questionnaire,[24] Chinese Constipation Questionnaire,[25] and Constipation Severity Instrument.[26] Other measures assess all bowel function and incorporate measures of fecal incontinence or specifically address 1 aspect of constipation, such as obstructive defecation. The purpose of all of these measures is simply to develop a consistent means of categorizing the baseline severity of the disease and to follow response to treatment over time.

3. The routine use of blood tests, radiographic examinations, or endoscopy is not typically needed in patients with constipation in the absence of alarming symptoms, screening recommendations, or other significant comorbidities. Grade of Recommendation: Strong recommendation based on low- or very-low-quality evidence, 1C

The diagnostic workup for constipation should address other conditions that may be implicated, such as colorectal cancer or endocrine disorders. Blood tests can identify anemia, hypothyroidism, hyperparathyroidism, or diabetes mellitus but are not specifically helpful in assessing constipation. Select patients may require laboratory testing based on patient-, anesthesia-, or procedure-specific risk stratification. Similarly, imaging studies such as CT scans can demonstrate colonic dilation or fecal loading but are unlikely to demonstrate an anatomic abnormality or obstruction unless the patient reports symptoms that are suspicious for these findings.[27] A colonoscopy should be recommended if the patient meets the guidelines for general screening or if other concerning symptoms, such as hematochezia, weight loss of >10 pounds, anemia, or blood in the stool, warrant further investigation.[28,29]

4. Anorectal physiology and colon transit investigations may help identify the underlying etiology and are useful in patients with refractory constipation. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C

In those patients who do not respond to basic treatments involving fiber supplementation and osmotic laxatives and where no other underlying cause is identified, further testing is warranted. Disorders of defecation, described as pelvic floor dysfunction, pelvic floor dyssynergia, anismus, obstructive defecation, or pelvic outlet obstruction, are best assessed using anorectal physiology testing.[30,31] This includes measurement of resting and squeeze pressures with anal manometry, measurement of rectal volume sensation, testing of rectoanal inhibitory reflex, and balloon expulsion. EMG is used to assess puborectalis relaxation. Classic findings include internal sphincter hypertonia, poor incremental squeeze pressures, blunted rectal sensation, paradoxical puborectalis relaxation or nonrelaxing puborectalis muscle, and lack of balloon expulsion. However, not all of these findings are required to diagnose pelvic floor dysfunction, nor does any single test confirm the diagnosis.[32] There is some evidence that balloon expulsion testing results are not necessarily diagnostic of obstructed defecation.[33,34] The rectoanal inhibitory reflex is specifically absent in the setting of Hirschsprung disease.[35] If the findings are normal, then it is reasonable to proceed with investigations of colonic transit that can be performed using radiopaque markers, scintigraphy, or wireless motility capsules. Most commonly, radiopaque markers are used because they are widely available, inexpensive, and easy to use.[27,30,36–38]

5. Imaging with cinedefecography, MRI defecography, or transperineal ultrasound echodefecography may be useful in identifying anatomical abnormalities associated with obstructive defecation. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C

If anorectal physiology testing is not diagnostic for defecation dysfunction, other imaging studies, such as defecography, can be useful to identify anatomic abnormalities, such as rectocele, enterocele, internal intussusception, or prolapse, that may be associated with constipation.[39,40] A recent review of 630 patients with chronic constipation determined that cinedefecography was abnormal in 90.9% of patients.[41] Cinedefecography or cystocolpoproctography involves specialized fluoroscopic equipment, exposes patients to ionizing radiation, and is often uncomfortable and embarrassing for the patient. However, it provides an excellent view of posterior compartment anatomic defects and pelvic floor function. MRI defecography has the advantages of eliminating radiation exposure and demonstrating the anterior compartment organs (bladder and vagina) that may have associated abnormalities. The primary disadvantages of MRI are related to cost and the

supine positioning of the patient who does not mimic the normal positioning of defecation.[42] Transperineal ultrasound, echodefecography, and 3-dimensional anorectal/vaginal ultrasonography have all been reported to assess pelvic floor function with high specificity and sensitivity to pelvic floor abnormalities, but their use is limited by lack of availability and operator expertise.[43,44]

Nonoperative Management of Constipation

1. The initial management of symptomatic constipation is dietary modification, including fiber and fluid supplementation. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B

Diet modification to increase water and fiber consumption is considered an important, first-line component in the management of constipation and is typically recommended before technical investigations of pelvic floor function and colon motility are performed.[45–48] Dietary fiber fortification by increasing intake of food items that are high in fiber offers a strategy that is a gentler alternative to using laxatives and enemas.[49–53] Dietary fiber supplementation has been shown to allow discontinuation of laxatives in 59% to 80% of elderly patients with chronic idiopathic constipation while improving body weight and well-being.[54] A moderate increase in dietary fiber intake has been shown to be a safe and convenient alternative to laxatives and works by increasing bowel frequency and fecal bulk in patients with chronic idiopathic constipation even in the setting of pelvic outlet obstruction.[49,51,55,56] However, 80% of patients with slow colon transit and 63% of patients with a disorder of defecation and outlet obstruction issues do not respond to increased dietary fiber, whereas 85% of patients without an underlying pathological finding improve or become symptom free.[48]

A systematic review of the efficacy of soluble and insoluble fiber supplementation in the management of chronic idiopathic constipation from 2011 identified 6 randomized controlled trials comparing fiber with placebo or no therapy in adult patients with chronic idiopathic constipation.[57] Formal meta-analysis was not undertaken because of concerns related to methodology across the studies. Compared with placebo, soluble fiber led to improvements in global symptoms (86.5% vs 47.4%), straining (55.6% vs 28.6%), pain on defecation, stool consistency, and the mean number of stools per week (3.8 stools per week after therapy compared with 2.9 stools per week at baseline), as well as a reduction in the number of days between stools.

2. The use of osmotic laxatives, such as polyethylene glycol and lactulose, is appropriate for the management of chronic constipation. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B

Lactulose and polyethylene glycol, commonly used osmotic laxatives, have been shown to be effective and safe treatments for chronic constipation. A recent Cochrane review evaluated the efficacy of lactulose or polyethylene glycol in treating chronic constipation and fecal impaction.[58] The meta-analysis included 10 randomized controlled trials that compared lactulose with polyethylene glycol in the management of chronic constipation. The findings indicated that polyethylene glycol was better than lactulose in outcomes of stool frequency per week, form of stool, relief of abdominal pain, and the need for additional product use. The authors concluded that polyethylene glycol should be used in preference to lactulose in the treatment of chronic constipation.[58]

3. The use of stimulant laxatives, such as bisacodyl, for chronic constipation is reasonable in the short term as a second-line treatment. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B

There have been few rigorously conducted trials assessing the efficacy of stimulant laxatives to treat patients with constipation. The efficacy and safety of 4 weeks of treatment with oral bisacodyl tablets in patients with chronic constipation, defined by Rome III criteria, was tested in a randomized, double-blind, placebo-controlled, multicenter trial in the United Kingdom.[59] Patients were randomly assigned, in a 2:1 ratio, to groups that were given 10 mg of bisacodyl (n = 247) or placebo (n = 121), once daily, for 4 weeks. Patients used an electronic diary each day to record information relating to their constipation. The number of complete spontaneous bowel movements per week during the treatment period increased from 1.1 ± 0.1 in both groups to 5.2 ± 0.3 in the bisacodyl group and 1.9 ± 0.3 in the placebo group. Compared with baseline, there was a statistically significant improvement in the overall Patient Assessment of Constipation quality of life score and all of the subscales in the patients treated with bisacodyl compared with those who received placebo. The authors concluded that oral bisacodyl was an effective and well-tolerated treatment for patients with chronic constipation. However, the long-term effects of chronic stimulant laxative use were not assessed,[59] and there is still a paucity of quality data regarding many other commonly used agents, including milk of magnesia, senna, and stool softeners, for the management of chronic constipation.[60]

4. The use of newer agents for constipation, such as lubiprostone and linaclotide, may be considered when dietary modifications, as well as osmotic and stimulant laxatives, have failed. Grade of Recommendation: Weak recommendation based on moderate-quality evidence, 2B

Lubiprostone (Amitiza) is an intestinal type-2 chloride channel activator that increases intestinal fluid secretion and improves small intestinal transit and stool passage. Lubiprostone is currently approved by the US Food and

Drug Administration for the treatment of chronic idiopathic constipation in adults, opioid-induced constipation in adults with chronic noncancer pain, and irritable bowel syndrome with predominant constipation in women ≥18 years of age.[61]

Linaclotide (Linzess), a potent guanylate cyclase C agonist, is a therapeutic peptide approved in the United States for the treatment of irritable bowel syndrome with constipation and chronic idiopathic constipation. Linaclotide has also been shown to reduce visceral hypersensitivity in preclinical studies and to improve abdominal pain and constipation symptoms in phase 2 and 3 clinical trials of patients with irritable bowel syndrome with constipation.[62,63]

Newer agents, such as elobixibat,[64,65] prucalopride,[66] and plecanatide,[67] are currently under investigation. Although these agents have shown some success in European trials, their ultimate role in the management of constipation awaits formal approval by the US Food and Drug Administration, as well as longer-term results and follow-up.

5. Biofeedback therapy is a first-line treatment for symptomatic pelvic floor dyssynergia. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B

Biofeedback can help patients with constipation and dyssynergic defecation. A prospective randomized trial investigated the efficacy of biofeedback (manometric-assisted anal relaxation, muscle coordination, and simulated defecation training biofeedback) with either sham feedback therapy or standard therapy (diet, exercise, and laxatives) in 77 subjects (69 women) with chronic constipation and dyssynergic defecation.[68] At baseline and after 3 months of treatment, physiologic changes were assessed by anorectal manometry, balloon expulsion, and colonic transit study, and symptomatic changes and stool characteristics were recorded using a visual analog scale and prospective stool diary. Subjects in the biofeedback group were more likely to correct their dyssynergia, improve defecation indexes, and decrease balloon expulsion time. Colonic transit improved after biofeedback or standard therapy but not after sham therapy. Biofeedback increased the number of complete spontaneous bowel movements and decreased the use of digital maneuvers and was associated with higher global bowel satisfaction. In this study, biofeedback relieved constipation and improved physiologic bowel function in patients with dyssynergia.[68] A high pretreatment constipation symptom score, a high rectal sensory threshold, and a delayed colonic transit time have been associated with a poor biofeedback treatment outcomes for pelvic floor dyssynergia.[69] The presence or absence of irritable bowel syndrome does not appear to impact the success rates of biofeedback for constipation.[70]

Surgical Management of Constipation

1. Patients with refractory colonic slow-transit constipation may benefit from total abdominal colectomy with ileorectal anastomosis. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C

In contrast to segmental colon resection where failure rates for the treatment of slow-transit constipation can be as high as 100%,[71] patients with slow-transit constipation refractory to medical therapy not associated with pelvic outlet obstruction or functional problems demonstrate good rates of clinical improvement (50%–100%) after total abdominal colectomy with ileorectal anastomosis (TAC-IRA).[31,71–74] Morbidity after TAC-IRA includes anastomotic leak (1%–11%),[75] bowel obstruction (8%–33%),[74] and prolonged postoperative ileus (24%).[72] TAC-IRA has also been described with a laparoscopic approach with good results.[76]

Although constipation generally improves after TAC-IRA for slow-transit constipation, patients may experience diarrhea, abdominal pain, fecal incontinence, and recurrent constipation.[74] In a series of 17 patients with TAC-IRA for slow-transit constipation at long-term follow-up, symptoms included abdominal pain in 41%, bloating in 65%, need for bowel movement assistance in 29%, and incontinence to gas or liquid stool in 47%, as well as lower quality of life score (Medical Outcomes Study Short Form 36) compared with the general population.[77] Similar findings were observed in a survey of 75 patients at long-term follow-up, where diarrhea was reported in 46% and lower GI quality-of-life scores were associated with abdominal pain, diarrhea, and incontinence.[78] Despite this, >90% of patients reported that they would undergo TAC-IRA again to treat their constipation.[78]

Several alternative surgical procedures for the treatment of slow-transit constipation have been described, such as side-to-side cecorectal anastomosis and antiperistaltic cecorectal anastomosis with subtotal colectomy using either open or laparoscopic approaches. The efficacy of these procedures compared with TAC-IRA is unclear. A subtotal total colectomy with cecorectal anastomosis potentially addresses obstructive defecation, resulting in less diarrhea because of preservation of the ileocecal valve.[79,80] The side-to-side cecorectal anastomosis (Jinling procedure) via an open or laparoscopic approach has been reported in several series with good success. In a retrospective review of 117 patients who underwent this procedure, there was a significant reduction in the Cleveland Clinic Florida constipation scores observed at 1 month that was maintained at 48 months, as well as significant improvements in postoperative GI quality of life and high satisfaction rates.[81]

Similarly, a subtotal colectomy with antiperistaltic cecorectal anastomosis via a laparoscopic or open approach appears to have good immediate postoperative

outcomes, good postoperative function with a mean of 4.8 ± 7.5 bowel movements daily, and decent satisfaction, with 78% of patients stating that they would undergo this surgery again.[82–86] Quality of life after antiperistaltic cecorectal anastomosis also appears comparable to that seen with TAC-IRA.[86] In a retrospective study comparing antiperistaltic cecorectal anastomosis and subtotal colectomy using the laparoscopic versus open approach, functional outcomes appeared comparable, but the laparoscopic approach was associated with less postoperative complications.[85] Retrospective comparison of cecorectal anastomosis versus ileosigmoid anastomosis with subtotal colectomy demonstrated that cecorectal anastomosis was more often associated with persistent constipation and lower patient satisfaction (73% versus 93%) with the procedure.[87] Although long-term outcomes are not available, a small number of reports describe the use of colonic bypass with various cecorectal or ileorectal anastomoses to treat slow transit constipation.[88,89]

2. Patients with refractory slow-transit constipation associated with pelvic outlet obstruction or functional disorders often require treatment for pelvic floor dysfunction before TAC-IRA, although treatment should be individualized based on symptoms. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C

A thorough constipation workup, including defecography, colon transit study, and anorectal physiology, can help to differentiate patients with irritable bowel syndrome and normal-transit constipation who are less likely to benefit from surgery and can identify patients with slow-transit constipation, outlet obstruction, functional disorders, and/or other pelvic floor disorders. Patients with slow-transit constipation should be assessed for concomitant outlet obstruction or functional disorders, which may benefit from additional management.[31,90–95] In general, patients with slow-transit constipation and pelvic floor dyssynergia should be treated with biofeedback before subtotal colectomy, because TAC-IRA in this population is associated with higher rates of recurrent constipation and lower rates of satisfaction.[71] When slow-transit constipation is associated with rectal intussusception or a nonemptying rectocele/enterocele on defecography, repair of the outlet obstruction is recommended before or concomitant with TAC-IRA.[90,92]

3. In patients with significant outlet obstruction symptoms from a rectocele, surgical repair may be considered after addressing any concomitant functional etiologies of obstructive defecation. Grade of Recommendation: Strong recommendation based on moderate-quality evidence, 1B

Rectocele repair has been described using transvaginal, transrectal, or transperineal approaches with good results in patients with symptoms of outlet obstruction, such as manual manipulation of the vaginal wall or rectum, difficult rectal vault emptying with defecation, and an abnormal defecography with a lack of emptying of contrast from the rectocele. An additional indication that has been suggested is that a rectocele >4 cm in size should be repaired if it is symptomatic.[96]

Synthetic or biological mesh products have been described in rectocele repairs, particularly for rectocele repairs performed with a transvaginal or transperineal approach. Some cases of erosion have been reported with the use of mesh.[97,98] The use of dermal allografts and porcine collagen matrix for repair of rectoceles has also been described with similar postoperative results.[99,100] It is unclear whether recurrence rates and functional outcomes are significantly improved with the addition of mesh or biological materials, especially with the transvaginal approach,[101–103] although there may be some efficacy with transperineal repair.[104]

Transvaginal repair of a rectocele may allow for relatively better visualization and access to the endopelvic fascia and levator musculature, as well as maintenance of rectal mucosal integrity that may reduce infection and fistula complications. Transvaginal rectocele repair has also been described more recently using a defect-specific anatomic approach where the rectovaginal defect is closed transversely. Short-term results show improved constipation symptoms in >80% of patients, decreased need for digital assistance, and perineal support and low recurrence.[105–108] Sand et al[109] retrospectively identified patients after transvaginal rectocele repair with traditional nonanatomic (N = 183) and anatomic site-specific repairs (N = 124) ≥1 year after surgery and found a higher anatomic recurrence rate in the defect-specific repair compared with the traditional approach but found no difference in dyspareunia or bowel symptoms between the 2 approaches.

A randomized trial of more than 100 patients compared traditional nonanatomic transvaginal repair with defect-specific transvaginal repair with or without graft augmentation and found no differences in anatomic cure rates, functional failure (15% overall), sexual function improvement, and dyspareunia at 1-year follow-up among the 3 groups.[102] Sand et al[109] reported on 132 women undergoing either standard transvaginal rectocele repair or repair reinforced with polyglactin 910 mesh (an absorbable mesh) and found no difference in recurrence rates at 1 year between the 2 groups.[101] More recently, Sung et al[103] conducted a trial of 137 patients who were randomly assigned to porcine submucosal graft versus no graft with a transvaginal rectocele repair and found no difference in anatomic failure, vaginal bulge failure, or defecatory symptom failure 1 year after surgery.

Transrectal rectocele repair theoretically has the advantage of less sexual and defecatory dysfunction than repairs with the transvaginal approach and also being

able to simultaneously address other anorectal pathology simultaneously seen in <80% of patients.[110] Transrectal anatomic repair is relatively contraindicated in patients with combined rectocele and fecal incontinence, because the rectocele is closed transversely, plicating the muscularis anteriorly, which may shorten the anal canal and worsen internal sphincter function.[111–113] Although outcome measurements and patient selection are variably reported, both defect-specific anatomic and nonanatomic transrectal approaches have similar outcomes, with improvement of evacuation problems, decreased need for digital assistance or perineal support, and improvement of constipation in >50% of patients.

The transperineal approach involves a transverse incision made across the bulbocavernosus and transverse perineal muscles followed by identification and development of the plane between the external anal sphincter and the vaginal mucosa superior to the cul-de-sac, often with placement of mesh along the length of dissection, with plication of the levator muscles and closure of the vaginal mucosa. This approach is particularly appealing for patients with both a symptomatic rectocele and fecal incontinence as a result of a sphincter defect, because with this approach a concomitant sphincteroplasty or levatorplasty may be performed. Ayabaca et al[114] at a median 48 months of follow-up observed improvement in fecal continence in 74% (25/34). Transperineal repair with prosthetic mesh is described and in at least 1 series was associated with a decreased need for digital assistance or perineal support with defecation and improvement of defecography findings.[104]

A few prospective studies have been conducted to assess the efficacy of different approaches. Rectocele operations performed via transrectal versus transvaginal approaches demonstrated equal complication rates in the 2 groups.[115] In all, 54% of patients had postoperative constipation, and 34% had gas, liquid, or stool incontinence. Sexual dysfunction was reported in 22%. A small, recent, prospective study examining transvaginal versus transrectal repair in 30 patients demonstrated improvement of outlet obstruction symptoms (93% and 73%), no de novo dyspareunia with both, and less recurrence in the transvaginal group (7% vs 40%) at 12 months after surgery.[116]

4. Transrectal stapled repair of rectoceles and rectal intussusception are typically not recommended because of the high rate of complications. Grade of Recommendation: Weak recommendation based on moderate-quality evidence, 2B

A variety of approaches for repairing rectoceles and internal intussusception with endoanal staplers have been described. Early reports showed some promise for these procedures for evacuatory improvement, but few studies compared outcomes of transrectal stapled rectocele repair with other traditional approaches, and there was inconsistent assessment of long-term outcomes.[117–130] Series also described postoperative complications, including pain, urgency, incontinence, constipation, rectal diverticulum, retroperitoneal emphysema, and bleeding,[126,131–136] as well as the development of rectovaginal fistula.[137] Proctalgia after transrectal stapled repair is commonly described and appears, at least in part, to be associated with inflammation from retained staples.[133]

A moderate-to-high degree of satisfaction has been reported with stapled transanal rectal resection, between 64% and 86%,[135,138–140] despite significant morbidity in 7% and defecation urgency and rectal sensitivity between 11% and 25%.[121,128,129,135] A prospective, multicenter trial following 90 patients after stapled transanal rectal resection demonstrated at 1-year follow-up improvement in all of the constipation symptoms without worsening of fecal incontinence.[141] In this study, there was no incidence of dyspareunia; 17.8% of patients had fecal urgency and 8.7% had incontinence to flatus. Longer follow-up results include a series of 344 patients followed for a median of 81 months where 81% of patients were highly satisfied and rectal urgency was resolved in all of the patients at long-term follow-up.[139] In contrast, several medium-term studies (median follow-up, 39–42 months) demonstrate increasing symptomatic recurrence over time,[142] including 1 study with ongoing decline from 18 months onward of symptoms and quality-of-life scores.[130,143,144]

5. Surgical repair of rectal intussusception may be considered in patients with severe symptoms of obstructed defecation after failing nonoperative treatments. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C

Several approaches to treat outlet obstruction attributed to rectal intussusception (internal rectal prolapse) have been described, including rectopexy using different techniques, Delorme repair, and the Ripstein procedure. Although surgical repair may resolve anatomic issues like rectal ulcers[145] or rectal intussusception seen on defecography,[146] many of these repairs may not improve or may potentially worsen functional outcomes for patients. Furthermore, in almost half of the cases, functional improvement can be attained without the use of surgery.[147] Although there are only small numbers of studies, no direct comparisons between procedures and little functional outcome data, several series of ventral rectopexy appear promising.

Ventral rectopexy for the treatment of rectal intussusception appears to be associated with improvement in constipation in 80% to 95% of patients with minimal new-onset constipation and ≈5% recurrence rates.[148,149] A series of 40 patients after ventral mesh rectopexy without sigmoid resection in the setting of rectal intussusception (mean follow-up of 38 months) found that 65% of

patients on self-assessment reported being "cured," with another 33% "improved," along with significant improvement in symptoms of fecal incontinence.[149]

6. Antegrade colonic enema with appendicostomy or cecostomy may be an effective bowel management strategy in select highly motivated patients with refractory chronic constipation, although this is not a common alternative. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C

Although most commonly used in the treatment of constipation and fecal incontinence in children, antegrade enema therapy has been described in adults with neurogenic constipation (spina bifida or spinal cord lesion),[150–152] as well as slow-transit constipation or obstructed defecation.[153–156] To administer antegrade enema therapy, a catheterizable conduit is created most commonly using the appendix, although a cecostomy tube technique has also been described.[157]

The main disadvantage to antegrade colonic enema is the high incidence of surgical complications, with stenosis of the conduit occurring in 23% to 100% of cases.[152,155] Many of these stenoses are amenable to minor revision, although some require takedown of the conduit. There is some evidence to suggest a decreased incidence of stenosis when an indwelling catheter is left in place.[158] In a series of 45 patients with constipation, leaving an indwelling catheter in the conduit eliminated the need for surgical revision because of stenosis. Although antegrade irrigation failed in one third of patients, satisfactory functional outcomes were achieved in the 65% who continued to irrigate.[158] Success has been reported as technical success, with little objective data available regarding improvement of constipation. Lees et al[152] reported that 47% of 37 patients had a functional conduit at a median follow-up of 36 months and that 88% of patients in their series required at least 1 revision. Most series report that ≈50% of patients still use the conduit for irrigations at latest follow-up.[152,155,158,159] In addition to technical complications, patient compliance appears to play a crucial role, with most series describing a high proportion of patients with a functional conduit who chose not to continue their antegrade enemas. The best-reported functional results come from Hirst et al,[153] who described that 65% of the patients experienced subjective improvement in defecation, although this may represent a best-case scenario, because 25% of their patients were lost to follow-up. The limited available data suggest that this procedure may be chosen in highly motivated patients, with the best success being demonstrated in patients with neurogenic causes for constipation.[150,153,159]

7. Sacral neuromodulation may be an effective treatment for patients with chronic constipation and successful peripheral nerve evaluation test when conservative measures have failed; however, it is not currently approved by the US Food and Drug Administration for this condition in the United States. Grade of Recommendation: Weak recommendation based on moderate-quality evidence, 2B

Sacral neuromodulation (SNM) has been used for the treatment of chronic constipation from slow transit or outlet dysfunction outside of the United States.[160–164] The reported success of peripheral nerve evaluation test stimulation has been 42% to 100%,[160] whereas the largest multi-institution series reported a 73% full-system implantation rate.[165] Two double-blind crossover studies have demonstrated significant improvements in the percentage of successful bowel movements and Wexner constipation scores when the device was turned on versus off.[166,167] The 2 largest prospective studies have shown improvements in Cleveland Clinic constipation scores from 18 to 10 at longest available follow-up.[165,168] Kamm et al[165] also demonstrated improvement of a visual analog score for bowel function from a baseline of 8 up to 66 after treatment (0 represented the worst function, whereas 100 represented perfect function.) The aforementioned studies all included patients with slow-transit constipation, as well as outlet dysfunction constipation. Although patients from both subgroups derived clinical benefit from the therapy, the studies did not separately report efficacy for the 2 subgroups. One study by Ratto et al[161] indicated that 47% of implanted patients sustained a ≥50% improvement in Cleveland Clinic constipation score at mean follow-up of 51 months, but improvement was better in the setting of obstructed defecation. Another study by Graf et al[163] showed that only 11% of patients had sustained improvement at 24 months.

A recent double-blind, randomized crossover study was conducted for SNM in slow-transit constipation. This 18-month trial compared SNM with sham, with a *successful outcome* defined as >2 days per week for ≥2 of 3 weeks of passing a bowel movement with the sense of complete evacuation. A total of 59 patients were included in this study. There was no difference in achievement of the primary outcome in patients treated with SNM vs sham. However, only 28% of the patients had a positive response to SNM during test implantation, and all of the patients were included in the trial whether they had success on test implant or not.[169]

Although the available evidence suggests that SNM is an effective treatment for chronic constipation, the majority of published reports were uncontrolled, with no comparison with any other treatment modality. There was also no consistent definition of constipation or uniform method to measure improvement in these studies. Additional evidence is needed to determine which criteria should be used to determine success with test stimulation, whether patients who fail a test implantation should be implanted with a permanent stimulator, and which criteria should be

used to determine success of permanent stimulation, as well as to delineate which patients may benefit from this treatment versus other modalities.

8. Completion proctectomy with IPAA is typically not recommended. Grade of Recommendation: Weak recommendation based on low-quality evidence, 2C

There have been limited case reports in the literature of proctectomy and IPAA for refractory constipation.[170–173] In all of the reported cases, patients had failed all available options and were considering IPAA as a last option before a permanent ostomy. The majority of these patients previously underwent abdominal colectomy with ileorectal anastomosis. Although the case reports describe a mixture of slow-transit constipation and patients with megarectum, all of the patients had Hirschsprung disease excluded with either a normal rectoanal inhibitory reflex on anal manometry or a full-thickness rectal biopsy. The available literature consistently reports that patients experience 2 to 8 bowel movements per day after the procedure. One study demonstrated objective improvements in the Rand health survey index in the categories of physical function, social function, and pain compared with preoperative baseline.[173] However, complications were often described in these patients, with different series describing 0% to 50% of patients requiring pouch excision for either recurrent constipation or persistent pain.[170–174] The available literature does not justify the risk of complications from an IPAA in the setting of an unclear clinical benefit. Before considering this option, other options should be exhausted and patients should be counseled extensively.

9. Patients who have failed or are not candidates for the currently available treatment options for intractable constipation should consider fecal diversion with an ileostomy or colostomy. Grade of Recommendation: Strong recommendation based on low-quality evidence, 1C

Patients who have failed other available treatment options may consider a permanent ostomy as a last resort. The majority of the evidence has described the use of an ileostomy in this setting.[175–177] Ileostomy was successful in alleviating constipation in 96% of 24 patients studied.[176] Successful relief of constipation must be weighed against the risk of chronic complications, such as dehydration, parastomal herniation, and stomal retraction. There is less evidence to support the use of diverting colostomy in this situation. Stabile et al[177] treated 8 patients with refractory constipation with chronic colon or rectal dilation with diverting sigmoid colostomy. Of these, 100% of patients (6/6) with rectosigmoid dilation reported improved symptoms with a colostomy, although 1 patient ultimately was unable to tolerate his stoma. Two patients with dilation of the entire colon did not experience any benefit from a colostomy. In select patients who have failed other available options, permanent ostomy creation may be a reasonable alternative.

APPENDIX

Contributing members of the ASCRS Clinical Practice Guidelines Committee: Joseph Carmichael, Wolfgang Gaertner, Daniel Herzig, Eric Johnson, John Migaly, Arden Morris, David Stewart, Jon Vogel, and Martin Weiser.

REFERENCES

1. Higgins PD, Johanson JF. Epidemiology of constipation in North America: a systematic review. *Am J Gastroenterol*. 2004;99:750–759.
2. Ribas Y, Saldaña E, Martí-Ragué J, Clavé P. Prevalence and pathophysiology of functional constipation among women in Catalonia, Spain. *Dis Colon Rectum*. 2011;54:1560–1569.
3. Knowles CH, Scott SM, Rayner C, et al. Idiopathic slow-transit constipation: an almost exclusively female disorder. *Dis Colon Rectum*. 2003;46:1716–1717.
4. Sandler RS, Jordan MC, Shelton BJ. Demographic and dietary determinants of constipation in the US population. *Am J Public Health*. 1990;80:185–189.
5. Johanson JF, Sonnenberg A, Koch TR. Clinical epidemiology of chronic constipation. *J Clin Gastroenterol*. 1989;11:525–536.
6. Talley NJ, Fleming KC, Evans JM, et al. Constipation in an elderly community: a study of prevalence and potential risk factors. *Am J Gastroenterol*. 1996;91:19–25.
7. Drossman DA. The functional gastrointestinal disorders and the Rome III process. *Gastroenterology*. 2006;130:1377–1390.
8. Longstreth GF, Thompson WG, Chey WD, Houghton LA, Mearin F, Spiller RC. Functional bowel disorders. *Gastroenterology*. 2006;130:1480–1491.
9. Ternent CA, Bastawrous AL, Morin NA, Ellis CN, Hyman NH, Buie WD; Standards Practice Task Force of The American Society of Colon and Rectal Surgeons. Practice parameters for the evaluation and management of constipation. *Dis Colon Rectum*. 2007;50:2013–2022.
10. Guyatt G, Gutterman D, Baumann MH, et al. Grading strength of recommendations and quality of evidence in clinical guidelines: report from an american college of chest physicians task force. *Chest*. 2006;129:174–181.
11. Beck DE. Evaluation and management of constipation. *Ochsner J*. 2008;8:25–31.
12. Brandt LJ, Prather CM, Quigley EM, Schiller LR, Schoenfeld P, Talley NJ. Systematic review on the management of chronic constipation in North America. *Am J Gastroenterol*. 2005;100(suppl 1):S5–S21.
13. Rao SS, Tuteja AK, Vellema T, Kempf J, Stessman M. Dyssynergic defecation: demographics, symptoms, stool patterns, and quality of life. *J Clin Gastroenterol*. 2004;38:680–685.
14. McCrea GL, Miaskowski C, Stotts NA, Macera L, Hart SA, Varma MG. Review article: self-report measures to evaluate constipation. *Aliment Pharmacol Ther*. 2008;27:638–648.
15. Digesu GA, Panayi D, Kundi N, Tekkis P, Fernando R, Khullar V. Validity of the Rome III Criteria in assessing constipation in women. *Int Urogynecol J*. 2010;21:1185–1193.
16. Xin HW, Fang XC, Zhu LM, et al. Diagnosis of functional constipation: agreement between Rome III and Rome II criteria and evaluation for the practicality. *J Dig Dis*. 2014;15:314–320.
17. Wong RK, Palsson OS, Turner MJ, et al. Inability of the Rome III criteria to distinguish functional constipation from consti-

pation-subtype irritable bowel syndrome. *Am J Gastroenterol*. 2010;105:2228–2234.
18. Ruiz-López MC, Coss-Adame E. Quality of life in patients with different constipation subtypes based on the Rome III criteria. *Rev Gastroenterol Mex*. 2015;80:13–20.
19. McMillan SC, Williams FA. Validity and reliability of the Constipation Assessment Scale. *Cancer Nurs*. 1989;12:183–188.
20. Agachan F, Chen T, Pfeifer J, Reissman P, Wexner SD. A constipation scoring system to simplify evaluation and management of constipated patients. *Dis Colon Rectum*. 1996;39:681–685.
21. Neri L, Conway PM, Basilisco G; Laxative Inadequate Relief Survey (LIRS) Group. Confirmatory factor analysis of the Patient Assessment of Constipation-Symptoms (PAC-SYM) among patients with chronic constipation. *Qual Life Res*. 2015;24:1597–1605.
22. Frank L, Kleinman L, Farup C, Taylor L, Miner P Jr. Psychometric validation of a constipation symptom assessment questionnaire. *Scand J Gastroenterol*. 1999;34:870–877.
23. Knowles CH, Eccersley AJ, Scott SM, Walker SM, Reeves B, Lunniss PJ. Linear discriminant analysis of symptoms in patients with chronic constipation: validation of a new scoring system (KESS). *Dis Colon Rectum*. 2000;43:1419–1426.
24. Garrigues V, Gálvez C, Ortiz V, Ponce M, Nos P, Ponce J. Prevalence of constipation: agreement among several criteria and evaluation of the diagnostic accuracy of qualifying symptoms and self-reported definition in a population-based survey in Spain. *Am J Epidemiol*. 2004;159:520–526.
25. Chan AO, Lam KF, Hui WM, et al. Validated questionnaire on diagnosis and symptom severity for functional constipation in the Chinese population. *Aliment Pharmacol Ther*. 2005;22:483–488.
26. Varma MG, Wang JY, Berian JR, Patterson TR, McCrea GL, Hart SL. The constipation severity instrument: a validated measure. *Dis Colon Rectum*. 2008;51:162–172.
27. Rao SS, Ozturk R, Laine L. Clinical utility of diagnostic tests for constipation in adults: a systematic review. *Am J Gastroenterol*. 2005;100:1605–1615.
28. Bharucha AE, Dorn SD, Lembo A, Pressman A; American Gastroenterological Association. American Gastroenterological Association medical position statement on constipation. *Gastroenterology*. 2013;144:211–217.
29. Power AM, Talley NJ, Ford AC. Association between constipation and colorectal cancer: systematic review and meta-analysis of observational studies. *Am J Gastroenterol*. 2013;108:894–904.
30. Nam YS, Pikarsky AJ, Wexner SD, et al. Reproducibility of colonic transit study in patients with chronic constipation. *Dis Colon Rectum*. 2001;44:86–92.
31. Wexner SD, Daniel N, Jagelman DG. Colectomy for constipation: physiologic investigation is the key to success. *Dis Colon Rectum*. 1991;34:851–856.
32. Videlock EJ, Lembo A, Cremonini F. Diagnostic testing for dyssynergic defecation in chronic constipation: meta-analysis. *Neurogastroenterol Motil*. 2013;25:509–520.
33. Staller K, Barshop K, Ananthakrishnan AN, Kuo B. Rectosigmoid localization of radiopaque markers does not correlate with prolonged balloon expulsion in chronic constipation: results from a multicenter cohort. *Am J Gastroenterol*. 2015;110:1049–1055.
34. Kassis NC, Wo JM, James-Stevenson TN, Maglinte DD, Heit MH, Hale DS. Balloon expulsion testing for the diagnosis of dyssynergic defecation in women with chronic constipation. *Int Urogynecol J*. 2015;26:1385–1390.
35. Tobon F, Reid NC, Talbert JL, Schuster MM. Nonsurgical test for the diagnosis of Hirschsprung's disease. *N Engl J Med*. 1968;278:188–193.
36. Hinton JM, Lennard-Jones JE, Young AC. A new method for studying gut transit times using radioopaque markers. *Gut*. 1969;10:842–847.
37. Metcalf AM, Phillips SF, Zinsmeister AR, MacCarty RL, Beart RW, Wolff BG. Simplified assessment of segmental colonic transit. *Gastroenterology*. 1987;92:40–47.
38. Cowlam S, Khan U, Mackie A, Varma JS, Yiannankou Y. Validity of segmental transit studies used in routine clinical practice, to characterize defaecatory disorder in patients with functional constipation. *Colorectal Dis*. 2008;10:818–822.
39. Bremmer S, Ahlbäck SO, Udén R, Mellgren A. Simultaneous defecography and peritoneography in defecation disorders. *Dis Colon Rectum*. 1995;38:969–973.
40. Mellgren A, Bremmer S. Defecography and its clinical significance: increased use of an "old" technique [in Swedish]. *Lakartidningen*. 1995;92:4416–4421.
41. Bozkurt MA, Kocataş A, Sürek A, Kankaya B, Kalaycı MU, Alış H. The importance of defecography in the assessment of the etiology of chronic constipation: an analysis of 630 patients. *Ulus Cerrahi Derg*. 2014;30:183–185.
42. Matsuoka H, Wexner SD, Desai MB, et al. A comparison between dynamic pelvic magnetic resonance imaging and videoproctography in patients with constipation. *Dis Colon Rectum*. 2001;44:571–576.
43. Pescatori M, Spyrou M, Pulvirenti d'Urso A. A prospective evaluation of occult disorders in obstructed defecation using the "iceberg diagram." *Colorectal Dis*. 2007;9:452–456.
44. Wieczorek AP, Stankiewicz A, Santoro GA, Woźniak MM, Bogusiewicz M, Rechberger T. Pelvic floor disorders: role of new ultrasonographic techniques. *World J Urol*. 2011;29:615–623.
45. Anti M, Pignataro G, Armuzzi A, et al. Water supplementation enhances the effect of high-fiber diet on stool frequency and laxative consumption in adult patients with functional constipation. *Hepatogastroenterology*. 1998;45:727–732.
46. Ashraf W, Park F, Lof J, Quigley EM. Effects of psyllium therapy on stool characteristics, colon transit and anorectal function in chronic idiopathic constipation. *Aliment Pharmacol Ther*. 1995;9:639–647.
47. Rodrigues-Fisher L, Bourguignon C, Good BV. Dietary fiber nursing intervention: prevention of constipation in older adults. *Clin Nurs Res*. 1993;2:464–477.
48. Voderholzer WA, Schatke W, Mühldorfer BE, Klauser AG, Birkner B, Müller-Lissner SA. Clinical response to dietary fiber treatment of chronic constipation. *Am J Gastroenterol*. 1997;92:95–98.
49. Dahl WJ, Whiting SJ, Healey A, Zello GA, Hildebrandt SL. Increased stool frequency occurs when finely processed pea hull fiber is added to usual foods consumed by elderly residents in long-term care. *J Am Diet Assoc*. 2003;103:1199–1202.
50. Sturtzel B, Elmadfa I. Intervention with dietary fiber to treat constipation and reduce laxative use in residents of nursing homes. *Ann Nutr Metab*. 2008;52(suppl 1):54–56.

51. Jenkins DJ, Kendall CW, Vuksan V, et al. Effect of cocoa bran on low-density lipoprotein oxidation and fecal bulking. *Arch Intern Med*. 2000;160:2374–2379.
52. Graham DY, Moser SE, Estes MK. The effect of bran on bowel function in constipation. *Am J Gastroenterol*. 1982;77:599–603.
53. Hull C, Greco RS, Brooks DL. Alleviation of constipation in the elderly by dietary fiber supplementation. *J Am Geriatr Soc*. 1980;28:410–414.
54. Sturtzel B MC, Gisinger C, Elmadfa I. Use of fiber instead of laxative treatment in a geriatric hospital to improve the wellbeing of seniors. *J Nutr Health Aging*. 2009;12:136–139.
55. Badiali D, Corazziari E, Habib FI, et al. Effect of wheat bran in treatment of chronic nonorganic constipation: a double-blind controlled trial. *Dig Dis Sci*. 1995;40:349–356.
56. Shariati A, Maceda JS, Hale DS. High-fiber diet for treatment of constipation in women with pelvic floor disorders. *Obstet Gynecol*. 2008;111:908–913.
57. Suares NC, Ford AC. Systematic review: the effects of fibre in the management of chronic idiopathic constipation. *Aliment Pharmacol Ther*. 2011;33:895–901.
58. Lee-Robichaud H, Thomas K, Morgan J, Nelson RL. Lactulose versus polyethylene glycol for chronic constipation. *Cochrane Database Syst Rev*. 2010;(7):CD007570.
59. Kamm MA, Mueller-Lissner S, Wald A, Richter E, Swallow R, Gessner U. Oral bisacodyl is effective and well-tolerated in patients with chronic constipation. *Clin Gastroenterol Hepatol*. 2011;9:577–583.
60. Ramkumar D, Rao SS. Efficacy and safety of traditional medical therapies for chronic constipation: systematic review. *Am J Gastroenterol*. 2005;100:936–971.
61. Gras-Miralles B, Cremonini F. A critical appraisal of lubiprostone in the treatment of chronic constipation in the elderly. *Clin Interv Aging*. 2013;8:191–200.
62. Johnston JM, Shiff SJ, Quigley EM. A review of the clinical efficacy of linaclotide in irritable bowel syndrome with constipation. *Curr Med Res Opin*. 2013;29:149–160.
63. Quigley EM, Tack J, Chey WD, et al. Randomised clinical trials: linaclotide phase 3 studies in IBS-C–a prespecified further analysis based on European Medicines Agency-specified endpoints. *Aliment Pharmacol Ther*. 2013;37:49–61.
64. Acosta A, Camilleri M. Elobixibat and its potential role in chronic idiopathic constipation. *Therap Adv Gastroenterol*. 2014;7:167–175.
65. Wong BS, Camilleri M. Elobixibat for the treatment of constipation. *Expert Opin Investig Drugs*. 2013;22:277–284.
66. Woodward S. The use of Resolor (prucalopride) for chronic constipation in women. *Br J Nurs*. 2012;21:982, 984–986.
67. Shailubhai K, Comiskey S, Foss JA, et al. Plecanatide, an oral guanylate cyclase C agonist acting locally in the gastrointestinal tract, is safe and well-tolerated in single doses. *Dig Dis Sci*. 2013;58:2580–2586.
68. Rao SS, Seaton K, Miller M, et al. Randomized controlled trial of biofeedback, sham feedback, and standard therapy for dyssynergic defecation. *Clin Gastroenterol Hepatol*. 2007;5:331–338.
69. Patcharatrakul T, Gonlachanvit S. Outcome of biofeedback therapy in dyssynergic defecation patients with and without irritable bowel syndrome. *J Clin Gastroenterol*. 2011;45:593–598.
70. Ahadi T, Madjlesi F, Mahjoubi B, et al. The effect of biofeedback therapy on dyssynergic constipation in patients with or without irritable bowel syndrome. *J Res Med Sci*. 2014;19:950–955.
71. Knowles CH, Scott M, Lunniss PJ. Outcome of colectomy for slow transit constipation. *Ann Surg*. 1999;230:627–638.
72. Webster C, Dayton M. Results after colectomy for colonic inertia: a sixteen-year experience. *Am J Surg*. 2001;182:639–644.
73. Redmond JM, Smith GW, Barofsky I, Ratych RE, Goldsborough DC, Schuster MM. Physiological tests to predict long-term outcome of total abdominal colectomy for intractable constipation. *Am J Gastroenterol*. 1995;90:748–753.
74. Pikarsky AJ, Singh JJ, Weiss EG, Nogueras JJ, Wexner SD. Long-term follow-up of patients undergoing colectomy for colonic inertia. *Dis Colon Rectum*. 2001;44:179–183.
75. Pikarsky A, Singh J, Weiss E, al e. Long-term follow-up of patients undergoing colectomy for colonic inertia. *Dis Colon Rectum*. 2001;44:1898–1899.
76. Hsiao KC, Jao SW, Wu CC, Lee TY, Lai HJ, Kang JC. Hand-assisted laparoscopic total colectomy for slow transit constipation. *Int J Colorectal Dis*. 2008;23:419–424.
77. Thaler K, Dinnewitzer A, Oberwalder M, et al. Quality of life after colectomy for colonic inertia. *Tech Coloproctol*. 2005;9:133–137.
78. FitzHarris GP, Garcia-Aguilar J, Parker SC, et al. Quality of life after subtotal colectomy for slow-transit constipation: both quality and quantity count. *Dis Colon Rectum*. 2003;46:433–440.
79. Wei D, Cai J, Zhao T, et al. Influence of length of preserved ileocecum on the efficacy of laparoscopic subtotal colectomy antiperistaltic cecorectal anastomosis in the treatment of slow transit constipation [in Chinese]. *Zhonghua Wei Chang Wai Ke Za Zhi*. 2015;18:454–458.
80. Gao F, Xu M, Wu W, Yang Z, Zhang X. Subtotal colectomy with cecorectal end-side anastomosis in the treatment of slow transit constipation [in Chinese]. *Zhonghua Wei Chang Wai Ke Za Zhi*. 2014;17:680–682.
81. Li N, Jiang J, Feng X, Ding W, Liu J, Li J. Long-term follow up of the Jinling procedure for combined slow-transit constipation and obstructive defecation.
82. Jiang CQ, Qian Q, Liu ZS, Bangoura G, Zheng KY, Wu YH. Subtotal colectomy with antiperistaltic cecoproctostomy for selected patients with slow transit constipation-from Chinese report. *Int J Colorectal Dis*. 2008;23:1251–1256.
83. Iannelli A, Fabiani P, Mouiel J, Gugenheim J. Laparoscopic subtotal colectomy with cecorectal anastomosis for slow-transit constipation. *Surg Endosc*. 2006;20:171–173.
84. Iannelli A, Piche T, Dainese R, et al. Long-term results of subtotal colectomy with cecorectal anastomosis for isolated colonic inertia. *World J Gastroenterol*. 2007;13:2590–2595.
85. Marchesi F, Percalli L, Pinna F, Cecchini S, Ricco' M, Roncoroni L. Laparoscopic subtotal colectomy with antiperistaltic cecorectal anastomosis: a new step in the treatment of slow-transit constipation. *Surg Endosc*. 2012;26:1528–1533.
86. Marchesi F, Sarli L, Percalli L, et al. Subtotal colectomy with antiperistaltic cecorectal anastomosis in the treatment of slow-transit constipation: long-term impact on quality of life. *World J Surg*. 2007;31:1658–1664.
87. Feng Y, Jianjiang L. Functional outcomes of two types of subtotal colectomy for slow-transit constipation: ileosigmoidal anastomosis and cecorectal anastomosis. *Am J Surg*. 2008;195:73–77.

88. Wang Y, Zhai C, Niu L, Tian L, Yang J, Hu Z. Retrospective series of subtotal colonic bypass and antiperistaltic cecoproctostomy for the treatment of slow-transit constipation. *Int J Colorectal Dis*. 2010;25:613–618.
89. Pinedo G, León F, Molina ME, Soto G, López F, Zúñiga A. A novel surgical approach to slow-transit constipation: report of two cases. *Dis Colon Rectum*. 2008;51:139–141.
90. Zenilman ME, Dunnegan DL, Soper NJ, Becker JM. Successful surgical treatment of idiopathic colonic dysmotility: the role of preoperative evaluation of coloanal motor function. *Arch Surg*. 1989;124:947–951.
91. Yalcin S, Yalcin B, Gecim EI. Surgical interventions in patients with chronic constipation refractory to intensive medical treatment. *Bratisl Lek Listy*. 2009;110:35–37.
92. Pemberton JH, Rath DM, Ilstrup DM. Evaluation and surgical treatment of severe chronic constipation. *Ann Surg*. 1991;214:403–411.
93. Christiansen J, Rasmussen OO. Colectomy for severe slow-transit constipation in strictly selected patients. *Scand J Gastroenterol*. 1996;31:770–773.
94. Lahr SJ, Lahr CJ, Srinivasan A, Clerico ET, Limehouse VM, Serbezov IK. Operative management of severe constipation. *Am Surg*. 1999;65:1117–1122.
95. Nyam DC, Pemberton JH, Ilstrup DM, Rath DM. Long-term results of surgery for chronic constipation. *Dis Colon Rectum*. 1997;40:273–279.
96. Mellgren A, Anzén B, Nilsson BY, et al. Results of rectocele repair: a prospective study. *Dis Colon Rectum*. 1995;38:7–13.
97. de Tayrac R, Picone O, Chauveaud-Lambling A, Fernandez H. A 2-year anatomical and functional assessment of transvaginal rectocele repair using a polypropylene mesh. *Int Urogynecol J Pelvic Floor Dysfunct*. 2006;17:100–105.
98. Iglesia CB, Fenner DE, Brubaker L. The use of mesh in gynecologic surgery. *Int Urogynecol J Pelvic Floor Dysfunct*. 1997;8:105–115.
99. Kohli N, Miklos JR. Dermal graft-augmented rectocele repair. *Int Urogynecol J Pelvic Floor Dysfunct*. 2003;14:146–149.
100. Dell JR, O'Kelley KR. PelviSoft BioMesh augmentation of rectocele repair: the initial clinical experience in 35 patients. *Int Urogynecol J Pelvic Floor Dysfunct*. 2005;16:44–47.
101. Sand PK, Koduri S, Lobel RW, et al. Prospective randomized trial of polyglactin 910 mesh to prevent recurrence of cystoceles and rectoceles. *Am J Obstet Gynecol*. 2001;184:1357–1362.
102. Paraiso MF, Barber MD, Muir TW, Walters MD. Rectocele repair: a randomized trial of three surgical techniques including graft augmentation. *Am J Obstet Gynecol*. 2006;195:1762–1771.
103. Sung VW, Rardin CR, Raker CA, Lasala CA, Myers DL. Porcine subintestinal submucosal graft augmentation for rectocele repair: a randomized controlled trial. *Obstet Gynecol*. 2012;119:125–133.
104. Watson SJ, Loder PB, Halligan S, Bartram CI, Kamm MA, Phillips RK. Transperineal repair of symptomatic rectocele with Marlex mesh: a clinical, physiological and radiologic assessment of treatment. *J Am Coll Surg*. 1996;183:257–261.
105. Kahn MA, Stanton SL. Techniques of rectocele repair and their effects on bowel function. *Int Urogynecol J Pelvic Floor Dysfunct*. 1998;9:37–47.
106. Glavind K, Madsen H. A prospective study of the discrete fascial defect rectocele repair. *Acta Obstet Gynecol Scand*. 2000;79:145–147.
107. Kenton K, Shott S, Brubaker L. Outcome after rectovaginal fascia reattachment for rectocele repair. *Am J Obstet Gynecol*. 1999;181:1360–1363.
108. Porter WE, Steele A, Walsh P, Kohli N, Karram MM. The anatomic and functional outcomes of defect-specific rectocele repairs. *Am J Obstet Gynecol*. 1999;181:1353–1358.
109. Sand P, Abramov Y, Gandhi S, Goldberg R, Botros S, Kwon C. Site-specific rectocele repair compared with standard posterior colporrhaphy. *Obstet Gynecol*. 2005;105:314–318.
110. Pitchford CA. Rectocele: a cause of anorectal pathologic changes in women. *Dis Colon Rectum*. 1967;10:464–466.
111. Sullivan ES, Leaverton GH, Hardwick CE. Transrectal perineal repair: an adjunct to improved function after anorectal surgery. *Dis Colon Rectum*. 1968;11:106–114.
112. Khubchandani IT, Clancy JP 3rd, Rosen L, Riether RD, Stasik JJ Jr. Endorectal repair of rectocele revisited. *Br J Surg*. 1997;84:89–91.
113. Ho YH, Ang M, Nyam D, Tan M, Seow-Choen F. Transanal approach to rectocele repair may compromise anal sphincter pressures. *Dis Colon Rectum*. 1998;41:354–358.
114. Ayabaca SM, Zbar AP, Pescatori M. Anal continence after rectocele repair. *Dis Colon Rectum*. 2002;45:63–69.
115. Arnold MW, Stewart WR, Aguilar PS. Rectocele repair: four years' experience. *Dis Colon Rectum*. 1990;33:684–687.
116. Nieminen K, Hiltunen KM, Laitinen J, Oksala J, Heinonen PK. Transanal or vaginal approach to rectocele repair: a prospective, randomized pilot study. *Dis Colon Rectum*. 2004;47:1636–1642.
117. Maurel J, Gignoux M. Surgical treatment of supralevator rectocele. Value of transanal excision with automatic stapler and linear suture clips [in French]. *Ann Chir*. 1993;47:326–330.
118. Petersen S, Hellmich G, Schuster A, Lehmann D, Albert W, Ludwig K. Stapled transanal rectal resection under laparoscopic surveillance for rectocele and concomitant enterocele. *Dis Colon Rectum*. 2006;49:685–689.
119. Corman ML, Carriero A, Hager T, et al. Consensus conference on the stapled transanal rectal resection (STARR) for disordered defaecation. *Colorectal Dis*. 2006;8:98–101.
120. Ommer A, Albrecht K, Wenger F, Walz MK. Stapled transanal rectal resection (STARR): a new option in the treatment of obstructive defecation syndrome. *Langenbecks Arch Surg*. 2006;391:32–37.
121. Reboa G, Gipponi M, Ligorio M, Logorio M, Marino P, Lantieri F. The impact of stapled transanal rectal resection on anorectal function in patients with obstructed defecation syndrome. *Dis Colon Rectum*. 2009;52:1598–1604.
122. Renzi A, Izzo D, Di Sarno G, Izzo G, Di Martino N. Stapled transanal rectal resection to treat obstructed defecation caused by rectal intussusception and rectocele. *Int J Colorectal Dis*. 2006;13:1–7.
123. Binda GA, Pescatori M, Romano G. The dark side of double-stapled transanal rectal resection. *Dis Colon Rectum*. 2005;48:1830–1831.
124. Jayne DG, Finan PJ. Stapled transanal rectal resection for obstructed defaecation and evidence-based practice. *Br J Surg*. 2005;92:793–794.

125. Grassi R, Romano S, Micera O, Fioroni C, Boller B. Radiographic findings of post-operative double stapled trans anal rectal resection (STARR) in patient with obstructed defecation syndrome (ODS). *Eur J Radiol*. 2005;53:410–416.
126. Boenicke L, Reibetanz J, Kim M, Schlegel N, Germer CT, Isbert C. Predictive factors for postoperative constipation and continence after stapled transanal rectal resection. *Br J Surg*. 2012;99:416–422.
127. Zhang B, Ding JH, Yin SH, Zhang M, Zhao K. Stapled transanal rectal resection for obstructed defecation syndrome associated with rectocele and rectal intussusception. *World J Gastroenterol*. 2010;16:2542–2548.
128. Stuto A, Renzi A, Carriero A, et al. Stapled trans-anal rectal resection (STARR) in the surgical treatment of the obstructed defecation syndrome: results of STARR Italian Registry. *Surg Innov*. 2011;18:248–253.
129. Schwandner O, Fürst A; German STARR Registry Study Group. Assessing the safety, effectiveness, and quality of life after the STARR procedure for obstructed defecation: results of the German STARR registry. *Langenbecks Arch Surg*. 2010;395:505–513.
130. Wolff K, Marti L, Beutner U, Steffen T, Lange J, Hetzer FH. Functional outcome and quality of life after stapled transanal rectal resection for obstructed defecation syndrome. *Dis Colon Rectum*. 2010;53:881–888.
131. Dodi G, Pietroletti R, Milito G, Binda G, Pescatori M. Bleeding, incontinence, pain and constipation after STARR transanal double stapling rectotomy for obstructed defecation. *Tech Coloproctol*. 2003;7:148–153.
132. Sciaudone G, Di Stazio C, Guadagni I, Selvaggi F. Rectal diverticulum: a new complication of STARR procedure for obstructed defecation. *Tech Coloproctol*. 2008;12:61–63.
133. De Nardi P, Bottini C, Faticanti Scucchi L, Palazzi A, Pescatori M. Proctalgia in a patient with staples retained in the puborectalis muscle after STARR operation. *Tech Coloproctol*. 2007;11:353–356.
134. Schulte T, Bokelmann F, Jongen J, Peleikis HG, Fändrich F, Kahlke V. Mediastinal and retro-/intraperitoneal emphysema after stapled transanal rectal resection (STARR-operation) using the Contour Transtar stapler in obstructive defecation syndrome. *Int J Colorectal Dis*. 2008;23:1019–1020.
135. Titu LV, Riyad K, Carter H, Dixon AR. Stapled transanal rectal resection for obstructed defecation: a cautionary tale. *Dis Colon Rectum*. 2009;52:1716–1722.
136. Martellucci J, Talento P, Carriero A. Early complications after stapled transanal rectal resection performed using the Contour® Transtar™ device. *Colorectal Dis*. 2011;13:1428–1431.
137. Pescatori M, Dodi G, Salafia C, Zbar AP. Rectovaginal fistula after double-stapled transanal rectotomy (STARR) for obstructed defaecation. *Int J Colorectal Dis*. 2005;20:83–85.
138. Song KH, Lee du S, Shin JK, et al. Clinical outcomes of stapled transanal rectal resection (STARR) for obstructed defecation syndrome (ODS): a single institution experience in South Korea. *Int J Colorectal Dis*. 2011;26:693–698.
139. Goede AC, Glancy D, Carter H, Mills A, Mabey K, Dixon AR. Medium-term results of stapled transanal rectal resection (STARR) for obstructed defecation and symptomatic rectal-anal intussusception. *Colorectal Dis*. 2011;13:1052–1057.
140. Zehler O, Vashist YK, Bogoevski D, et al. Quo vadis STARR? A prospective long-term follow-up of stapled transanal rectal resection for obstructed defecation syndrome. *J Gastrointest Surg*. 2010;14:1349–1354.
141. Boccasanta P, Venturi M, Roviaro G. What is the benefit of a new stapler device in the surgical treatment of obstructed defecation? Three-year outcomes from a randomized controlled trial. *Dis Colon Rectum*. 2011;54:77–84.
142. Köhler K, Stelzner S, Hellmich G, et al. Results in the long-term course after stapled transanal rectal resection (STARR). *Langenbecks Arch Surg*. 2012;397:771–778.
143. Lenisa L, Schwandner O, Stuto A, et al. STARR with Contour Transtar: prospective multicentre European study. *Colorectal Dis*. 2009;11:821–827.
144. Madbouly KM, Abbas KS, Hussein AM. Disappointing long-term outcomes after stapled transanal rectal resection for obstructed defecation. *World J Surg*. 2010;34:2191–2196.
145. van Tets WF, Kuijpers JH. Internal rectal intussusception: fact or fancy? *Dis Colon Rectum*. 1995;38:1080–1083.
146. Christiansen J, Zhu BW, Rasmussen OO, Sørensen M. Internal rectal intussusception: results of surgical repair. *Dis Colon Rectum*. 1992;35:1026–1028.
147. Murad-Regadas SM, Regadas FS, Rodrigues LV, Fernandes GO, Buchen G, Kenmoti VT. Management of patients with rectocele, multiple pelvic floor dysfunctions and obstructed defecation syndrome. *Arq Gastroenterol*. 2012;49:135–142.
148. Slawik S, Soulsby R, Carter H, Payne H, Dixon AR. Laparoscopic ventral rectopexy, posterior colporrhaphy and vaginal sacrocolpopexy for the treatment of recto-genital prolapse and mechanical outlet obstruction. *Colorectal Dis*. 2008;10:138–143.
149. Portier G, Kirzin S, Cabarrot P, Queralto M, Lazorthes F. The effect of abdominal ventral rectopexy on faecal incontinence and constipation in patients with internal intra-anal rectal intussusception. *Colorectal Dis*. 2011;13:914–917.
150. Krogh K, Laurberg S. Malone antegrade continence enema for faecal incontinence and constipation in adults. *Br J Surg*. 1998;85:974–977.
151. Teichman JM, Harris JM, Currie DM, Barber DB. Malone antegrade continence enema for adults with neurogenic bowel disease. *J Urol*. 1998;160:1278–1281.
152. Lees NP, Hodson P, Hill J, Pearson RC, MacLennan I. Long-term results of the antegrade continent enema procedure for constipation in adults. *Colorectal Dis*. 2004;6:362–368.
153. Hirst GR, Arumugam PJ, Watkins AJ, et al. Antegrade continence enema in the treatment of obstructed defaecation with or without faecal incontinence. *Tech Coloproctol*. 2005;9:217–221.
154. Poirier M, Abcarian H, Nelson R. Malone antegrade continent enema: an alternative to resection in severe defecation disorders. *Dis Colon Rectum*. 2007;50:22–28.
155. Worsøe J, Christensen P, Krogh K, Buntzen S, Laurberg S. Long-term results of antegrade colonic enema in adult patients: assessment of functional results. *Dis Colon Rectum*. 2008;51:1523–1528.
156. Meurette G, Lehur PA, Coron E, Regenet N. Long-term results of Malone's procedure with antegrade irrigation for severe chronic constipation. *Gastroenterol Clin Biol*. 2010;34:209–212.
157. Biyani D, Barrow E, Hodson P, Watson AJ, Maclennan I. Endoscopically placed caecostomy buttons: a trial ACE procedure. *Colorectal Dis*. 2007;9:373–376.

158. Patton V, Lubowski DZ. Clinical outcome and efficacy of antegrade colonic enemas administered via an indwelling cecostomy catheter in adults with defecatory disorders. *Dis Colon Rectum*. 2015;58:457–462.
159. Gerharz EW, Vik V, Webb G, Leaver R, Shah PJ, Woodhouse CR. The value of the MACE (Malone antegrade colonic enema) procedure in adult patients. *J Am Coll Surg*. 1997;185:544–547.
160. Thomas GP, Dudding TC, Rahbour G, Nicholls RJ, Vaizey CJ. Sacral nerve stimulation for constipation. *Br J Surg*. 2013;100:174–181.
161. Ratto C, Ganio E, Naldini G; GINS. Long-term results following sacral nerve stimulation for chronic constipation. *Colorectal Dis*. 2015;17:320–328.
162. Maeda Y, O'Connell PR, Lehur PA, Matzel KE, Laurberg S; European SNS Bowel Study Group. Sacral nerve stimulation for faecal incontinence and constipation: a European consensus statement. *Colorectal Dis*. 2015;17:O74–O87.
163. Graf W, Sonesson AC, Lindberg B, Akerud P, Karlbom U. Results after sacral nerve stimulation for chronic constipation. *Neurogastroenterol Motil*. In press.
164. Ortiz H, de Miguel M, Rinaldi M, Oteiza F, Altomare DF. Functional outcome of sacral nerve stimulation in patients with severe constipation. *Dis Colon Rectum*. 2012;55:876–880.
165. Kamm MA, Dudding TC, Melenhorst J, et al. Sacral nerve stimulation for intractable constipation. *Gut*. 2010;59:333–340.
166. Kenefick NJ, Vaizey CJ, Cohen CR, Nicholls RJ, Kamm MA. Double-blind placebo-controlled crossover study of sacral nerve stimulation for idiopathic constipation. *Br J Surg*. 2002;89:1570–1571.
167. Knowles CH, Thin N, Gill K, et al. Prospective randomized double-blind study of temporary sacral nerve stimulation in patients with rectal evacuatory dysfunction and rectal hyposensitivity. *Ann Surg*. 2012;255:643–649.
168. Sharma A, Liu B, Waudby P, Duthie GS. Sacral neuromodulation for the management of severe constipation: development of a constipation treatment protocol. *Int J Colorectal Dis*. 2011;26:1583–1587.
169. Dinning PG, Hunt L, Patton V, et al. Treatment efficacy of sacral nerve stimulation in slow transit constipation: a two-phase, double-blind randomized controlled crossover study. *Am J Gastroenterol*. 2015;110:733–740.
170. Nicholls RJ, Kamm MA. Proctocolectomy with restorative ileoanal reservoir for severe idiopathic constipation. Report of two cases. *Dis Colon Rectum*. 1988;31:968–969.
171. Hosie KB, Kmiot WA, Keighley MR. Constipation: another indication for restorative proctocolectomy. *Br J Surg*. 1990;77:801–802.
172. Thakur A, Fonkalsrud EW, Buchmiller T, French S. Surgical treatment of severe colonic inertia with restorative proctocolectomy. *Am Surg*. 2001;67:36–40.
173. Kalbassi MR, Winter DC, Deasy JM. Quality-of-life assessment of patients after ileal pouch-anal anastomosis for slow-transit constipation with rectal inertia. *Dis Colon Rectum*. 2003;46:1508–1512.
174. Keighley MR, Grobler S, Bain I. An audit of restorative proctocolectomy. *Gut*. 1993;34:680–684.
175. El-Tawil AM. Reasons for creation of permanent ileostomy for the management of idiopathic chronic constipation. *J Gastroenterol Hepatol*. 2004;19:844–846.
176. Scarpa M, Barollo M, Keighley MR. Ileostomy for constipation: long-term postoperative outcome. *Colorectal Dis*. 2005;7:224–227.
177. Stabile G, Kamm MA, Hawley PR, Lennard-Jones JE. Results of stoma formation for idiopathic megarectum and megacolon. *Int J Colorectal Dis*. 1992;7:82–84.