Treatment of Obstructed Defecation

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Abstract

Obstructed defecation is a common problem that adversely affects the quality of life for many patients. Known causes of obstructed defecation include pelvic dyssynergy, rectocele, rectal intussusception, enterocele, pelvic organ prolapse, and overt rectal prolapse. Management of this condition requires an understanding of urinary, defecatory, and sexual function to achieve an optimal outcome. The goal of surgical treatment is to restore the various pelvic organs to their appropriate anatomic positions. However, there is a poor correlation between anatomic and functional results. As the pelvis contains many structures, a pelvic support or function defect frequently affects other pelvic organs. Optimal outcomes can only be achieved by selecting appropriate treatment modalities that address all of the components of a patient's problem.

Keywords

- rectocele
- pelvic dyssynergy
- biofeedback
- enterocele
- rectal prolapse

Objectives: On completion of this article, the reader should understand the evaluation and treatment of the causes of obstructive defecation including pelvic dyssynergy, rectocele, enterocele, rectal intussusception, and pelvic organ prolapse.

Obstructed defecation is a broad term used to describe the condition of patients with defecatory dysfunction and constipation. These disorders are frequently encountered in clinical practice and affect at least 18% of the population.^{1–3} Although patients frequently complain of constipation, symptoms such as fruitless straining and incomplete evacuation are rather subjective and unreliable. Nevertheless, an international team of experts included these symptoms in the definition of constipation. This “Rome” definition requires two or more of the following criteria: (1) straining on more than 25% of bowel movements, (2) feeling of incomplete evacuation after more than 25% of bowel movements, (3) hard stool on more than 25% of bowel movements, and (4) infrequent defecation with three or fewer bowel actions weekly.⁴

Known causes of obstructed defecation include pelvic dyssynergy, rectocele, rectal intussusception, enterocele, pelvic organ prolapse, and overt rectal prolapse. All of these conditions represent either a defect of pelvic support or abnormal function of the pelvic floor musculature. The etiology of these defects is controversial; however, in child-bearing women damage to the innervation and soft tissues of the pelvis may have occurred as a direct consequence of

vaginal childbirth.^{5,6} Direct trauma to the pelvic soft tissues can result in endopelvic fascial and pelvic support defects.^{7,8} The structural and biochemical integrity of collagen will affect the strength of the pelvic connective tissues and many reports have correlated changes in collagen subtype and content with the presence of these defects.^{9–11} Traumatic damage to the pelvic support system does not produce immediate symptoms, which suggests that other factors are important. Cumulative nerve damage from childbirth and activities that cause chronic and repetitive increases in intraabdominal pressure such as obesity and chronic cough have been suggested to play a role in the development of symptomatic defects.⁹ The etiology of these defects has therapeutic implications. Repair with native tissues may not be the best alternative if defects of collagen integrity are suspected, suggesting a need for prosthetic materials. Likewise, repair of these defects may not achieve the desired results in the patient with a significant associated neurologic injury.

Ostensibly, correction of pelvic organ prolapse by either resection of the prolapsed organs or repairing the defects of pelvic support by shortening redundant tissue or using prosthetic materials, and retraining the pelvic floor using biofeedback techniques to correct musculature discoordination would result in excellent outcomes. However, evaluation of these patients not uncommonly reveals that although a satisfactory anatomic result has been achieved, the patient complains of persistent symptoms. Equally as often, patients

report a marked improvement in symptoms despite a less than ideal anatomic result from surgery.

Defects of pelvic floor support or function frequently affect the other pelvic organs and can lead to symptomatic vaginal vault or uterine prolapse, cystocele, or urethrocele. The incidence of these problems is unknown, but 11% of women will have an operative procedure for a defect of pelvic support before age 80 years.¹²

Pelvic Dyssynergy

During defecation, the puborectalis sling muscle and the external anal sphincter relax and permit defecation. However, some chronically constipated patients fail to coordinate the relaxation of these muscles with the result of obstructed defecation. It is estimated that 25 to 50% of patients with constipation or obstructed defecation will have a pelvic floor dyssynergy type of outlet obstruction.^{13–16} This muscular discoordination affects all the pelvic musculature and is an equally common cause of urinary complaints. The concept of pelvic floor dyssynergy encompasses many diagnoses including anismus, spastic pelvic floor syndrome, and paradoxical puborectalis contraction. Anal electromyography or a balloon expulsion test are arguably the best modalities for the diagnosis of pelvic dyssynergy.¹⁷ Defecography is reported to be too sensitive and can lead to a false-positive diagnosis, but does have the advantage of evaluating any coexistent pelvic pathology.¹⁸

Pelvic dyssynergy is present in 60% of patients with a rectocele and has been proposed as the cause of this condition. Rectal intussusception and descending perineum syndrome are also frequently associated with this problem.¹⁹

Biofeedback

Biofeedback is frequently used as first-line therapy to manage pelvic floor dyssynergy-type constipation.^{20–22} However, there is controversy over the patient-selection criteria and the testing to be performed prior to treatment. In addition, there is no consensus regarding the technique for conducting biofeedback teaching, the number of sessions needed, or which components of treatment are most effective. How to assess the outcome of treatment and the long-term efficacy of biofeedback are also debated. Four recent randomized controlled studies have provided evidence supporting the use of biofeedback therapy in the treatment of dyssynergic defecation.^{23–26}

Chiarioni et al²³ compared 14.6 g of polyethylene glycol (PEG) with five weekly biofeedback sessions in patients who did not respond to conservative therapy. At 6 months, major improvements were reported by patients enrolled in the biofeedback arm (80%) compared with PEG and counseling group (22%). The benefit of biofeedback was sustained at 12 months. Biofeedback also produced greater reductions in straining, sensation of incomplete evacuation, use of enemas, and abdominal pain ($P < 0.01$). Rao et al²⁴ compared biofeedback with sham biofeedback or a standard therapy of diet, exercise, and laxatives in 77 randomly assigned patients.

Dyssynergia was corrected in 79% of patients in the biofeedback group, compared with 4% in the sham group. The number of complete spontaneous bowel movements was higher in the biofeedback group compared with the sham group, and overall bowel satisfaction also improved in the biofeedback group. Heymen et al²⁶ conducted a randomized controlled trial comparing electromyographic (EMG) biofeedback to placebo and diazepam in 84 patients with dyssynergia. The placebo and diazepam pills were taken 1 hour prior to eating dinner. Biofeedback was superior to diazepam and placebo, 70% versus 23% versus 28% reporting symptomatic improvement at 3 months.

Biofeedback training for constipation resulting from pelvic dyssynergy attempts to coordinate pelvic floor muscle relaxation with a downward intraabdominal propulsive force. Techniques of biofeedback fall into two categories, depending on whether EMG or an intrarectal pressure monitor is used to assess pelvic floor muscle relaxation. Although EMG is more commonly used, there are no studies with sufficient power to compare the two techniques reliably. However, a recent meta-analysis found that intrarectal pressure monitored biofeedback was superior to EMG-monitored biofeedback.²⁷ A comparison of intraanal and perianal EMG monitoring showed no difference in the outcomes between the two methods.²⁷

Anxiety and/or psychological distress are definitely associated with pelvic floor dyssynergy, although there is debate whether the psychopathology is a cause^{28–30} or a consequence³¹ of the condition. Whichever is true, establishing an effective psychotherapeutic relationship may be necessary to achieve the best results with biofeedback. The quality of the therapeutic relationship between the patient and the biofeedback therapist certainly improves motivation and outcomes to the degree that “the success of biofeedback training depends on the skill of the trainer/therapist.”^{32,33}

Despite the wide range of reported results, biofeedback should be the initial therapy for patients with outlet obstruction associated with pelvic floor dyssynergy given the low incidence of adverse effects associated with its use.

Botulinum Toxin

Patients who fail a course of dietary management and biofeedback can be considered for injection of botulinum toxin into the puborectalis muscle and external anal sphincter. Seventy-five percent of patients improve, although the benefit is short term, ranging from 1 to 3 months in most patients.^{34,35} The most significant side effect is transient fecal incontinence, which occurs in 25% of patients but resolves in 1 to 3 months. Given the expense of the botulinum toxin and the short duration on benefit, this regime should be used only for the very symptomatic patient as a therapy of last resort.

Surgery

Surgical division of puborectalis muscle in the posterior midline has been utilized for patients with intractable pelvic dyssynergy who are debilitated by their symptoms. With one exception,³⁶ the results have been disappointing with only a very few patients obtaining any benefit from the

procedure.^{37,38} The current opinion is that there is little, if any role for this procedure.

Rectocele

A rectocele is a herniation of the anterior rectal wall into the posterior vagina. The true incidence of this anomaly and its pathogenesis are debated, as are the indications and techniques for surgical repair. Anatomically, the most common defect is a transverse separation of the fibers of the rectovaginal fascia occurring just proximal to the attachments to the perineal body. This defect may or may not be associated with disruption of the soft tissues of the perineal body from obstetric trauma.³⁹

The symptoms associated with a rectocele are listed in ▶Table 1.^{40–49} Fecal incontinence is not a symptom that most associate with rectoceles, although it may be present. The etiology is debated, but a rectocele may be the result of a synchronous defect of the external anal sphincter. Traction pudendal neuropathy from long-standing, excessive straining to defecate has also been proposed as a cause as has an overflow-type mechanism resulting from the filling of a large rectocele.^{46,47}

The clinical diagnosis is made by physical examination. During the examination, it is important to evaluate for the possibility of a coexistent enterocele or prolapse of other pelvic organs. Defecography is the usual means to assess a rectocele, with the size and ability to empty the rectocele being measured. Defecography can also be used to investigate the possibility of pelvic dyssynergy or rectal intussusception. If opacification of the vagina, bladder, and small bowel is utilized, defecography is useful to assess for an enterocele or prolapse of other pelvic organs. Most studies, however, have failed to show any clear association between either the depth of the rectocele or the completeness of emptying and the clinical symptoms and outcomes following surgical repair.^{48–50}

The initial management of a symptomatic rectocele is dietary with adequate fluid and fiber intake. Biofeedback can be considered if available, for bowel retraining and treatment of the associated pelvic dyssynergy that will be present in 60% of patients.^{19,51} If these fail, most surgeons recommend operative repair. Specific selection criteria for the surgical repair of a rectocele are debated. Surgical repair has been recommended when the rectocele is greater than 3 cm in depth, if there is significant barium trapping on

defecography, or if digital assistance of defecation is frequently necessary for satisfactory emptying.^{52,53} However, there are multiple studies that have shown no correlation between the size of a rectocele or the extent of barium trapping and the degree of symptoms or outcome of rectocele repair.^{49,54} The preoperative need for digital assistance for defecation is also not predictive of a good result after surgical intervention.⁵¹ Although some would disagree,^{55,56} pelvic dyssynergy has been suggested as a causative factor in the formation of a rectocele¹⁹ and is associated with poor surgical results.^{53–55} Nevertheless, all agree that delayed colonic transit and the long-term use of laxatives or stimulants are predictive of a less-favorable outcome following rectocele repair.^{51,53,57} Once the decision for surgery has been made, rectoceles can be approached via a transvaginal, a transrectal, or a transperineal approach.

Transvaginal Repairs

The traditional technique for transvaginal rectocele repair involves a posterior colporrhaphy with vaginal mucosectomy, anterior levator plication, and repair of any soft tissue defects of the perineal body. The procedure involves the excision of a diamond-shaped piece of vaginal mucosa and perineal skin from the posterior vaginal wall. Dissection is performed through this defect to free the puborectalis and transverse perineal muscles from the overlying vagina and perineum. The rectovaginal fascial defect is plicated *longitudinally* with the repair continuing onto the perineal body where the puborectalis and perineal muscles are also reapproximated. Excess vaginal tissue is excised and the vaginal wound is closed.⁵⁸ This technique is a nonanatomic longitudinal repair of a transverse defect, but is successful in preventing vaginal bulging in 80% and corrects the need for digital assistance of defecation in 67% of patients.^{51,59} Others have reported less-favorable clinical results with an incidence of failure to relieve evacuatory difficulty and lower rectal symptoms of 33%. Postoperative dyspareunia will be present in 25% of patients and 10% will develop a recurrent clinical rectocele requiring reoperation.^{44,59}

Recently, an anatomic “defect-specific” transvaginal repair of rectoceles has been advocated. In this procedure, an incision is made in the posterior vaginal wall with dissection performed through this defect to identify the edges of the rectovaginal fascial defect, which is then closed *transversely*. Any associated defects in the soft tissues of the perineal body are also repaired. Excess vaginal tissue is excised and the wound closed.³⁹ Although long-term results are not available, over the short term this technique seems encouraging (▶Table 2).^{60–63} This procedure has a very low incidence of recurrent clinical rectocele or a postoperative need for digital assistance of defecation; constipation is improved in over 80% of patients.^{59–63} However, 25% of patients complain of postoperative dyspareunia and 36% report a problem with fecal incontinence.^{62–65}

Transvaginal approaches do have the advantage of providing adequate access for the repair of coexistent enteroceles, cystoceles, and apical vaginal vault prolapse. A vaginal

Table 1 Symptoms Associated with Rectoceles

Symptom	Prevalence (%)
Obstructed defecation ^{40,41}	75–100
Manual assistance of defecation ^{42,43}	20–75
Rectal pain ^{44,45}	12–70
Rectal bleeding ^{46,47}	20–60
Incontinence ^{48,49}	10–30

Table 2 Results of Transvaginal Defect-Specific Rectocele Repair

Study	Number of Patients	Improvement (%)			Dyspareunia (%)
		Evacuatory Difficulty	Digital Assistance	Constipation	
Glavine and Madsen ⁶⁰	67	63	NS	NS	18
Kenton et al ⁶¹	66	41	42	37	36
Porter et al ⁶²	125	28	43	17	37
Cundiff et al ⁶³	69	NS	37	66	27

NS, not stated.

hysterectomy can also be performed if necessary for uterine prolapse or other problems. Transvaginal rectocele repair has been recommended as the procedure of choice in this situation.⁶⁶

Transrectal Repair

Although transrectal repairs of rectoceles were described in the mid-1960s, the poor results in terms of bowel and sexual function of the transvaginal repairs led to the rediscovery and popularity of this technique in the 1980s.^{42,45,67} As with the transvaginal approach, there is no consensus on the method of transrectal repair; the absence of studies directly comparing the various techniques precludes reaching any definite conclusions. Randomized studies comparing transvaginal to transrectal rectocele repair have found the incidence of postoperative dyspareunia to be significantly less with the latter technique.^{44,68} Another benefit of transanal repair is the ability to address the coexistent anorectal pathology that will be present in 80% of patients. Hemorrhoids, anterior mucosal prolapse, and fissures are the most frequently encountered anorectal conditions associated with rectoceles.⁶⁹

The transrectal, anatomic, defect-specific rectocele repair was described by Sullivan et al⁷⁰ and is the most widely used method. The technique involves the elevation of mucosal flaps over the lax rectocele with the *transverse* closure of the defect by an interrupted plication of the muscularis anteriorly akin to Delorme's procedure for rectal prolapse. Excess mucosa and submucosa are trimmed and the mucosal defect is closed.⁷¹ This method results in a relative foreshort-

ening of the anal canal with diminished internal sphincter function and resting anal pressures—leading some to conclude that this procedure is contraindicated in patients with combined fecal incontinence and rectocele.⁷²

A nonanatomic repair is a technique used by many. This technique also begins with the elevation of mucosal flaps over the lax rectocele, but the defect is repaired *longitudinally* by approximating the musculofascial edges of the defect. Again, excess mucosa and submucosa are trimmed and the mucosal defect is closed.^{42,45} This repair tends to be under tension resulting in a greater risk of sepsis and separation of the wound⁷³ but does lengthen the anal canal,⁷⁴ which may address the potential for worsening of fecal incontinence with the anatomic repair.

The results with either of these techniques are variable, but generally acceptable (►Table 3).^{46,47,52,72,75,76} Most of the differences in results are related to patient selection, with those studies having a more strict selection criteria reporting better results compared with those with less-stringent criteria.

A third technique is not currently performed as frequently as the other two. This method uses an obliterative suture to incorporate the redundant mucosa and submucosa of small rectoceles where the anterior prolapse does not extend distally beyond the dentate line or proximally for more than 5 cm.⁷⁷ This procedure does not require the development of mucosal flaps, but does have the potential for soft tissue necrosis and sepsis.⁶⁶ This technique is best used in patients with relatively asymptomatic rectoceles and good sphincter function.⁴⁷

Table 3 Results of Transanal Rectocele Repair

Study	Number of Patients	Improvement (%)			Incontinence (%)
		Evacuatory Difficulty	Digital Assistance	Constipation	
Ayabaca et al ⁴⁷	60	NS	NS*	62	14
van Dam et al ⁴⁶	89	71	100	48	18
Marti et al ⁷⁵	150	NS	NS	71	19
van Laarhoven et al ⁷⁶	26	47	54	NS	NS
Ho et al ⁷²	21	84	100	NS	0
Murthy et al ⁵²	33	NS	NS	58	27

NS, not stated.

Recently, a novel transanal stapling procedure has been investigated for the treatment of outlet obstruction caused by a combination of intussusception and rectocele. With the observation that stapled anopexy for hemorrhoids or mucosal prolapse may reduce the bulging of a concomitant rectocele, a new technique using a single circular stapler combined with levatorplasty was proposed to correct both mucosal prolapse and rectocele.^{78,79} Longo⁸⁰ proposed the use of two circular staplers: the first to reduce the intussusception and the bulging rectocele anteriorly, correcting the anterior wall muscle defect, the second to correct the intussusception posteriorly. In a prospective study,⁸¹ 156 patients with outlet obstructive defecation from a combination of intussusception and/or rectocele were operated on in nine colorectal surgical centers. In addition, biofeedback was performed in four 20-minute sessions twice weekly for 2 months. Patients were followed postoperatively for a mean of 16.3 ± 2.9 months. Using a constipation scoring system, patients had significant improvement from baseline at 3, 6, and 12 months. At 12 months, 1% reported urgency and incontinence of flatus, and 3% had stenosis. Preoperative and postoperative resting and squeeze anal pressures did not differ significantly, but rectal compliance decreased significantly postoperatively.⁸¹ A randomized trial comparing stapled transanal prolapsectomy with perineal levatorplasty (STAPL) with double-stapled transanal rectal resection (STARR) was performed on 50 patients with descending perineum, rectoanal intussusception, and anterior rectocele who failed conventional medical therapy and biofeedback.⁸² The STARR group showed a significantly lower incidence of postoperative pain and a greater decrease in rectal sensory thresholds. No differences were found between the groups with regard to operative time, hospital stay, or time to return to work. Complications in the STAPL group were higher than in the STARR group. Neither surgery modified anal pressures or injured the anal sphincters.⁸²

The European STARR Registry (2006–2008)⁸³ recruited almost 3000 patients from three countries. A significant reduction in obstructed defecation (OD) and symptom severity scores was found coupled with improved quality of life. As with other studies,⁸⁴ continence improved. Complications were reported in 36%, which included pain (7.1%), urinary retention (6.9%), bleeding (5%), sepsis (4.4%), and staple line complications (3.5%). Postoperative urgency was recorded in 27% of patients at 12 months with fecal incontinence occurring in 1.8%. The final report, which contained 12-month follow-up data, concluded that in the short term, STARR was safe and effective with significant improvements in ODS and quality of life.⁸⁵ Recurrence of rectocele has been noted in up to 33% at 1 year. Rectovaginal fistulas also have been reported in the literature.⁸⁶

Transperineal Repair

There is only limited data regarding the use and outcome of transperineal surgery for rectoceles, although the technique has been recommended in combination with a conventional

sphincteroplasty and/or levatorplasty for the patient with a symptomatic rectocele and incontinence secondary to a sphincter defect.⁶⁶ Short-term results of this combined procedure show an improvement in evacuation and continence in 75% of patients.⁴⁷ The transperineal insertion of a prosthetic mesh for the anatomic restoration of a disrupted rectovaginal septum has been described with a significant reduction in the need for digital assistance of defecation and in the size and amount of barium retained in rectoceles.⁸⁷ Controlled clinical trials of this technique need to be performed before the role of this procedure in the management of rectoceles can be determined.

Rectal Intussusception

In the past, rectal intussusception, also called internal procidentia and incomplete or occult rectal prolapse, was considered to be a preliminary stage in the development of complete or overt rectal prolapse and one of the principal causes of obstructed defecation.⁸⁸ Subsequent investigation has shown that occult rectal prolapse progresses to overt rectal prolapse in only 2% of patients,⁸⁹ and that some degree of intussusception of the rectosigmoid and upper rectum into the lower rectum is found on defecography in approximately a third of asymptomatic volunteers.^{90,91}

Fifty percent of patients with rectal intussusception, in addition to the usual symptoms associated with obstructed defecation—evacuatory difficulty, a feeling of incomplete emptying, pelvic pain and pressure, and rectal bleeding—will complain of fecal incontinence.^{92,93} Possible mechanisms for this include an occult defect of the external anal sphincter or a traction pudendal neuropathy resulting from long-standing, excessive straining to defecate.⁹⁴ An overflow incontinence-type mechanism, where distension of the lower rectum by the intussusceptum activates the rectoanal inhibitory reflex resulting in relaxation of the internal anal sphincter, has also been proposed.⁹⁵

Although not all would agree,⁹⁶ it has been suggested that surgical repair of a rectal intussusception is beneficial in those patients with associated incontinence.⁸⁷ Significant improvement in the continence score has been reported in 38 to 55% of incontinent patients who underwent surgical repair of an associated rectal intussusception.^{93,96}

On proctoscopic examination, 49% of patients with an occult rectal prolapse will be found to have hyperemia and edema of the anterior rectal wall, colitis cystica profunda, or a solitary rectal ulcer.⁹⁷ Solitary rectal ulcer syndrome is a difficult clinical problem that is associated with obstructed defecation. Defecography will demonstrate internal rectal prolapse in 45 to 63% and pelvic dyssynergy in 7 to 26% of these patients.^{98–100} The results of dietary measures and pelvic floor retraining using biofeedback are less likely to be successful in patients having a solitary rectal ulcer with healing of the ulcer reported to occur in 20% of patients and a recurrence rate of 30%.^{101,102} Also, despite healing of the ulcer, symptoms will persist in 29%.¹⁰¹ Surgical management of solitary rectal ulcers associated with rectal intussusception has much better results with ulcer healing and symptom

resolution in 74 to 100%; therefore, it is the treatment of choice.^{92,103}

Initial studies reported significant improvement in the symptoms of obstructed defecation with the surgical repair of an associated internal rectal prolapse,^{88,104} but subsequent studies have had disappointing results with complete resolution of symptoms in ~20% of patients and worsening of symptoms in 33 to 48%.^{96,105–107} Currently, most would agree that rectal intussusception is more a consequence of excessive straining to defecate than a cause, and that pelvic floor retraining using biofeedback is a reasonable initial therapy with symptomatic improvement reported in 20 to 90% of patients as discussed earlier. Surgical therapy is considered only for those with an incomplete rectal prolapse that extends distal to the puborectalis sling and is associated with either fecal incontinence or a solitary rectal ulcer.^{92,93,103,106,108} Surgical repair of a rectal intussusception associated with severe, intractable symptoms of obstructed defecation alone, should be considered only as a last resort, if at all.

Surgery

As with overt rectal prolapse, abdominal and perineal approaches have been used to manage rectal intussusception with inconsistent results. The paucity of good comparative studies precludes definite recommendations about the optimal approach. For patients with an incomplete rectal prolapse associated with intractable symptoms of obstructed defecation, the few good results following surgery have occurred after a Delorme procedure.¹⁰⁴

Abdominal approaches with either a suture rectopexy or an Ivalon wrap procedure have been most commonly reported for repair of rectal intussusception associated with incontinence or a solitary rectal ulcer with results as described above.^{92,93,103}

Enterocoele

An enterocoele is a herniation of the peritoneal cavity between the uterosacral ligaments at the apex of the vagina, which extends distally in the rectovaginal septum separating the rectum from the vagina.¹⁰⁹ The herniated peritoneal sac usually contains small intestine, an enterocoele, but may contain the sigmoid colon, a sigmoidocoele. Although an enterocoele may be present alone, the majority are associated with a rectocoele, prolapse of other pelvic organs, and/or abnormal descent of the pelvic floor.^{110,111}

The incidence of symptomatic enteroceles is unknown, but is probably ~18 to 42%.¹¹⁰ They are most common in multiparous women over age 65 and those who have had a hysterectomy.¹⁰⁹ Symptoms of enteroceles are reported to include obstructed defecation with a false sense of the need to defecate and evacuatory difficulty, pelvic pressure, lower abdominal and back pain, and fecal incontinence.¹¹² However, given the usual coexistence with other abnormalities of pelvic support,¹¹⁰ it is difficult to be certain which symptoms are actually attributable to the enterocoele. Rarely, an enterocoele may cause ulceration of the vaginal mucosa and progress to perforation with evisceration.

Although physical examination may suggest an enterocoele, it is frequently difficult to distinguish from a rectocoele or vaginal vault prolapse. Most enteroceles are found with colpocystodefecography or dynamic magnetic resonance imaging (MRI) for evaluation of other pelvic floor conditions. Colpocystodefecography, however, is reported to be too sensitive and can lead to a false-positive diagnosis, but does have the advantage of evaluating coexistent pelvic pathology.¹⁸ Dynamic MRI is more specific, but not as readily available.¹¹³

Enteroceles are classified according to their etiology. Congenital enteroceles do occur, but are rare, resulting from abnormal development of the rectovaginal septum and represent less than 1% of enteroceles. Acquired enteroceles result from pelvic surgery, most commonly a bladder neck suspension^{114,115} or a hysterectomy^{116,117} and account for about one fourth of enteroceles. The majority of enteroceles are created when the pelvic cul-de-sac is pulled down by a prolapsing pelvic organ, usually the rectum or uterus. These are considered to be traction enteroceles.¹¹⁶

Treatment of an enterocoele should be undertaken when symptomatic or there is evidence of rectal or vaginal ulceration. As with other pelvic floor conditions, the initial therapy is dietary and lifestyle modification with adequate fluid and fiber intake and the avoidance of straining. Biofeedback may also be helpful. Surgical repair of an enterocoele is indicated rarely for intractable symptoms or rectal or vaginal ulceration. More commonly, prophylactic surgical repair is performed at the time of hysterectomy or in conjunction with the treatment of coexistent pelvic floor pathology, particularly rectal or vaginal vault prolapse.¹¹²

The goal of enterocoele repair is excision or obliteration of the peritoneal sac with approximation of the uterosacral ligaments in the midline.^{111,112,118} This is accomplished by placing sequential purse-string sutures in the peritoneal cul-de-sac with care taken to avoid ureteral injury. This obliteration of the enterocoele sac can be accomplished in conjunction with an abdominal procedure for coexistent pathology or more commonly, via a vaginal approach at the time of hysterectomy, or cystocoele or rectocoele repair. There is only one report directly comparing transvaginal to transabdominal techniques.¹¹⁹ Reviewing this and other published reports, there seems to be less morbidity with the vaginal approaches compared with transabdominal repairs, but relapse rates are increased and dyspareunia related to vaginal shortening and decreased vaginal capacity will occur in 20% of patients.^{112,120,121}

Both transvaginal and transabdominal repairs yield excellent anatomic results with successful obliteration of the defect in over 80% of women.^{111,120,121} Determining functional outcomes are more problematic because the vast majority of enteroceles are associated with other pelvic floor pathology, especially vaginal vault or rectal prolapse. Although rectopexy and vaginal vault suspension are reported to be effective for the treatment of symptomatic enterocoele,^{111,122,123} it is unclear if the reported benefit is related to the repair of the enterocoele or correction of the coexistent pathology. Despite the lack of evidence of improved outcomes

with enterocele repair, given the low risk of complications with these procedures, it would seem reasonable to repair these defects at the time of surgery to correct other defects of pelvic floor support.

Total Pelvic Organ Prolapse

Although the incidence rate is not known, prolapse of all the pelvic organs does occur. The management of the genitourinary prolapse associated with this condition is outside the scope of this article so the discussion will be limited to the posterior components of the syndrome. The management of this condition requires an understanding of urinary, defecatory, and sexual function to achieve optimal outcomes.

The posterior components of this entity include rectocele, enterocele, and rectal intussusception or overt rectal prolapse frequently in combination with pelvic dyssynergy. Although each of these problems has been discussed individually here, they are usually more severe when combined in total pelvic organ prolapse. Symptoms attributed to total pelvic organ prolapse include obstructed defecation, pelvic pain and pressure, and incontinence as described for the individual problems plus the genitourinary symptoms of urinary incontinence and incomplete emptying of the bladder. Physical examination may reveal prolapse of multiple pelvic organs, excessive perineal descent, and other findings such as a solitary rectal ulcer as described for the individual components. Although it is very sensitive and may lead to a false-positive diagnosis, colpocystodefecography is useful to evaluate the full anatomic extent of the problem. A component of this syndrome that has not yet been discussed is abnormal perineal descent. The descending perineum syndrome is defined on defecography as descent of the anorectal junction below a line drawn from the lower border of the pubic symphysis to the tip of the coccyx during defecation.¹²⁴ Abnormal perineal descent is a result of long-standing, excessive straining to defecate.^{5,125} Dynamic MRI, EMG, and urodynamic studies may be useful to determine the degree of pelvic dyssynergy.¹²⁶ Colonic transit studies should be performed if colonic hypomotility cannot be excluded.^{126,127}

Surgery

The goal of surgical treatment is to restore the various pelvic organs to their appropriate anatomic positions. In the past, this has been accomplished by a combination of resection of the prolapsing organs and/or shortening and repair of supporting tissues. This may be accomplished either transabdominally or transvaginally. Although associated with less morbidity, vaginal approaches did result in a surgically induced perineal neuropathy and worse outcomes.^{128,129} In a direct comparison of the two techniques, the probability of surgical failure requiring reoperation was twice as great with the vaginal approach; the abdominal procedures were associated with improved resolution of symptoms.¹¹⁸

More recently, given the concerns about the integrity of the pelvic soft tissues, prosthetic materials have been used to resuspend and support prolapsing pelvic organs without the necessity of resection.^{126,127,130,131} The results of pelvic

restoration using prosthetics show improvement in symptoms of obstructed defecation and constipation in 83% and 89% of patients, respectively. Continence was improved in 85% of patients with preoperative fecal incontinence. Dyspareunia was reported in 3% of patients. Overall, 74% of patients were either satisfied or very satisfied with the surgical results after 6 years of follow-up.¹²⁶

Although the techniques and materials of prosthetic pelvic restoration differ, in general, they involve excision of the associated enterocele sac, with attachment of one end of a prosthetic mesh to the perineal body with the other end attached to the periosteum of the second sacral vertebrae. The vagina and rectum are sutured to this prosthesis. This technique will reinforce the rectovaginal septum and correct any rectocele, enterocele, vaginal or rectal prolapse, or excessive perineal descent present. Additional strips can be secured between the sacroperineal prosthesis and iliopubic ligaments on either side to provide support for the bladder. This procedure can be combined with a colon resection if there is redundancy or hypomotility of the colon.¹²⁷ Infection or erosion of the prosthesis is a major concern; it occurs in up to 11% of patients,^{126,127,132} requiring either partial or complete removal of the mesh. Additional procedures for persistent, symptomatic low rectocele or rectal mucosal prolapse are necessary for 28% of patients.¹²⁶

With the concerns about the integrity of the pelvic soft tissues, it would seem prudent to manage this complex problem with prosthetic materials. Results from the few studies available suggest that transabdominal techniques are superior to transvaginal approaches and that these procedures have an acceptable complication risk and good outcomes.

Conclusions

Obstructed defecation is a common problem that adversely affects the quality of life for many patients. It is frequently associated with other problems of pelvic support and function. Any therapy that does not address all of the components will result in less than optimal outcomes, which underscores the importance of objectively assessing the symptoms and quality of life as well as measuring bowel, urinary, and sexual function both pre- and posttreatment.

References

- 1 Drossman DA, Li Z, Andruzzi E, et al. U.S. householder survey of functional gastrointestinal disorders. Prevalence, sociodemography, and health impact. *Dig Dis Sci* 1993;38(9):1569–1580
- 2 Stewart WF, Liberman JN, Sandler RS, et al. Epidemiology of constipation (EPOC) study in the United States: relation of clinical subtypes to sociodemographic features. *Am J Gastroenterol* 1999;94(12):3530–3540
- 3 Everhart JE, Go VL, Johannes RS, Fitzsimmons SC, Roth HP, White LR. A longitudinal survey of self-reported bowel habits in the United States. *Dig Dis Sci* 1989;34(8):1153–1162
- 4 Drossman DA, Thompson WG, Talley NJ, et al. Identification of sub-groups of functional bowel disorders. *Gastroenterol Int* 1990;3:159–172

- 5 Snooks SJ, Setchell M, Swash M, Henry MM. Injury to innervation of pelvic floor sphincter musculature in childbirth. *Lancet* 1984;2(8402):546–550
- 6 Sultan AH, Monga AK, Stanton SL. The pelvic floor sequelae of childbirth. *Br J Hosp Med* 1996;55(9):575–579
- 7 DeLancey JOL. Anatomic aspects of vaginal eversion after hysterectomy. *Am J Obstet Gynecol* 1992;166(6 Pt 1):1717–1724, discussion 1724–1728
- 8 Peschers UM, Schaer GN, DeLancey JOL, Schuessler B. Levator ani function before and after childbirth. *Br J Obstet Gynaecol* 1997;104(9):1004–1008
- 9 Gill EJ, Hurt WG. Pathophysiology of pelvic organ prolapse. *Obstet Gynecol Clin North Am* 1998;25(4):757–769
- 10 Norton PA, Baker JE, Sharp HC, Warenski JC. Genitourinary prolapse and joint hypermobility in women. *Obstet Gynecol* 1995;85(2):225–228
- 11 Smith AR. Role of connective tissue and muscle in pelvic floor dysfunction. *Curr Opin Obstet Gynecol* 1994;6(4):317–319
- 12 Olson AL, Smith VJ, Bergstrom JO, Colling JC, Clark AL. Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. *Obstet Gynecol* 1997;85:501–506
- 13 Preston DM, Lennard-Jones JE. Anismus in chronic constipation. *Dig Dis Sci* 1985;30(5):413–418
- 14 Wald A, Caruana BJ, Freimanis MG, Bauman DH, Hinds JP. Contributions of evacuation proctography and anorectal manometry to evaluation of adults with constipation and defecatory difficulty. *Dig Dis Sci* 1990;35(4):481–487
- 15 Kuijpers HC, Bleijenberg G. The spastic pelvic floor syndrome. A cause of constipation. *Dis Colon Rectum* 1985;28(9):669–672
- 16 Roberts JP, Womack NR, Hallan RI, Thorpe AC, Williams NS. Evidence from dynamic integrated proctography to redefine anismus. *Br J Surg* 1992;79(11):1213–1215
- 17 Fleshman JW, Dreznik Z, Cohen E, Fry RD, Kodner IJ. Balloon expulsion test facilitates diagnosis of pelvic floor outlet obstruction due to nonrelaxing puborectalis muscle. *Dis Colon Rectum* 1992;35(11):1019–1025
- 18 Whitehead WE, Wald A, Diamant NE, Enck P, Pemberton JH, Rao SS. Functional disorders of the anus and rectum. *Gut* 1999;45(Suppl 2):II55–II59
- 19 Lau CW, Heymen S, Alabaz O, Iroatulam AJ, Wexner SD. Prognostic significance of rectocele, intussusception, and abnormal perineal descent in biofeedback treatment for constipated patients with paradoxical puborectalis contraction. *Dis Colon Rectum* 2000;43(4):478–482
- 20 Enck P. Biofeedback training in disordered defecation. A critical review. *Dig Dis Sci* 1993;38(11):1953–1960
- 21 Rao SS, Enck P, Loening-Baucke V. Biofeedback therapy for defecation disorders. *Dig Dis* 1997;15(Suppl 1):78–92
- 22 Diamant NE, Kamm MA, Wald A, Whitehead WE. AGA technical review on anorectal testing techniques. *Gastroenterology* 1999;116(3):735–760
- 23 Chiarioni G, Whitehead WE, Pezza V, Morelli A, Bassotti G. Biofeedback is superior to laxatives for normal transit constipation due to pelvic floor dyssynergia. *Gastroenterology* 2006;130(3):657–664
- 24 Rao SSC, Seaton K, Miller M, et al. Randomized controlled trial of biofeedback, sham feedback, and standard therapy for dyssynergic defecation. *Clin Gastroenterol Hepatol* 2007;5(3):331–338
- 25 Chiarioni G, Salandini L, Whitehead WE. Biofeedback benefits only patients with outlet dysfunction, not patients with isolated slow transit constipation. *Gastroenterology* 2005;129(1):86–97
- 26 Heymen S, Scarlett Y, Jones K, Ringel Y, Drossman D, Whitehead WE. Randomized, controlled trial shows biofeedback to be superior to alternative treatments for patients with pelvic floor dyssynergia-type constipation. *Dis Colon Rectum* 2007;50(4):428–441
- 27 Heymen S, Jones KR, Scarlett Y, Whitehead WE. Biofeedback treatment of constipation: a critical review. *Dis Colon Rectum* 2003;46(9):1208–1217
- 28 Burnett C, Whitehead WE, Drossman D. Psychological distress and impaired quality of life in patients with functional anorectal disorders. *Gastroenterology* 1998;114:A729
- 29 Heymen S, Wexner SD, Gullledge AD. MMPI assessment of patients with functional bowel disorders. *Dis Colon Rectum* 1993;36(6):593–596
- 30 Nehra V, Bruce BK, Rath-Harvey DM, Pemberton JH, Camilleri M. Psychological disorders in patients with evacuation disorders and constipation in a tertiary practice. *Am J Gastroenterol* 2000;95(7):1755–1758
- 31 Dykes S, Smilgin-Humphreys S, Bass C. Chronic idiopathic constipation: a psychological enquiry. *Eur J Gastroenterol Hepatol* 2001;13(1):39–44
- 32 Koutsomanis D, Lennard-Jones JE, Roy AJ, Kamm MA. Controlled randomised trial of visual biofeedback versus muscle training without a visual display for intractable constipation. *Gut* 1995;37(1):95–99
- 33 Jones KR, Heymen S, Whitehead WE. Biofeedback for anorectal disorders. In: Drutz HP, Hershorn S, Diamant NE, eds. *Urogynaecology and Reconstructive Pelvic Surgery*. London: Springer-Verlag; 2003:313–325
- 34 Joo JS, Agachan F, Wolff B, Nogueras JJ, Wexner SD. Initial North American experience with botulinum toxin type A for treatment of anismus. *Dis Colon Rectum* 1996;39(10):1107–1111
- 35 Hallan RI, Williams NS, Melling J, Waldron DJ, Womack NR, Morrison JFB. Treatment of anismus in intractable constipation with botulinum A toxin. *Lancet* 1988;2(8613):714–717
- 36 Yu DH, Cui FD. Surgical treatment of puborectalis syndrome. *J Pract Surg* 1990;10:1599–1600
- 37 Barnes PRH, Hawley PR, Preston DM, Lennard-Jones JE. Experience of posterior division of the puborectalis muscle in the management of chronic constipation. *Br J Surg* 1985;72(6):475–477
- 38 Kamm MA, Hawley PR, Lennard-Jones JE. Lateral division of the puborectalis muscle in the management of severe constipation. *Br J Surg* 1988;75(7):661–663
- 39 Richardson AC. The anatomic defects in rectocele and enterocele. *J Pelvic Surg* 1995;1:214–221
- 40 Bartolo DC, Roe AM, Virjee J, Mortensen NJ, Locke-Edmunds JC. An analysis of rectal morphology in obstructed defaecation. *Int J Colorectal Dis* 1988;3(1):17–22
- 41 Turnbull GK, Bartram CI, Lennard-Jones JE. Radiologic studies of rectal evacuation in adults with idiopathic constipation. *Dis Colon Rectum* 1988;31(3):190–197
- 42 Sarles JC, Arnaud A, Selezneff I, Olivier S. Endo-rectal repair of rectocele. *Int J Colorectal Dis* 1989;4(3):167–171
- 43 Pfeifer J, Agachan F, Wexner SD. Surgery for constipation: a review. *Dis Colon Rectum* 1996;39(4):444–460
- 44 Arnold MW, Stewart WRC, Aguilar PS. Rectocele repair. Four years' experience. *Dis Colon Rectum* 1990;33(8):684–687
- 45 Sehpayak S. Transrectal repair of rectocele: an extended armamentarium of colorectal surgeons. A report of 355 cases. *Dis Colon Rectum* 1985;28(6):422–433
- 46 van Dam JH, Huisman WM, Hop WCJ, Schouten WR. Fecal continence after rectocele repair: a prospective study. *Int J Colorectal Dis* 2000;15(1):54–57
- 47 Ayabaca SM, Zbar AP, Pescatori M. Anal continence after rectocele repair. *Dis Colon Rectum* 2002;45(1):63–69
- 48 Ting KH, Mangel E, Eibl-Eibesfeldt B, Müller-Lissner SA. Is the volume retained after defecation a valuable parameter at defecography? *Dis Colon Rectum* 1992;35(8):762–767
- 49 Halligan S, Bartram CI. Is barium trapping in rectoceles significant? *Dis Colon Rectum* 1995;38(7):764–768

- 50 Infantino A, Masin A, Melega E, Dodi G, Lise M. Does surgery resolve outlet obstruction from rectocele? *Int J Colorectal Dis* 1995;10(2):97-100
- 51 Mellgren A, Anzén B, Nilsson BY, et al. Results of rectocele repair. A prospective study. *Dis Colon Rectum* 1995;38(1):7-13
- 52 Murthy VK, Orkin BA, Smith LE, Glassman LM. Excellent outcome using selective criteria for rectocele repair. *Dis Colon Rectum* 1996;39(4):374-378
- 53 Karlhom U, Graf W, Nilsson S, Pahlman L. Does surgical repair of a rectocele improve rectal emptying? *Dis Colon Rectum* 1996;39(11):1296-1302
- 54 van Dam JH, Ginai AZ, Gosselink MJ, et al. Role of defecography in predicting clinical outcome of rectocele repair. *Dis Colon Rectum* 1997;40(2):201-207
- 55 Tjandra JJ, Ooi BS, Tang CL, Dwyer P, Carey M. Transanal repair of rectocele corrects obstructed defecation if it is not associated with anismus. *Dis Colon Rectum* 1999;42(12):1544-1550
- 56 Janssen LW, van Dijke CF. Selection criteria for anterior rectal wall repair in symptomatic rectocele and anterior rectal wall prolapse. *Dis Colon Rectum* 1994;37(11):1100-1107
- 57 van Dam JH, Hop WC, Schouten WR. Analysis of patients with poor outcome of rectocele repair. *Dis Colon Rectum* 2000;43(11):1556-1560
- 58 Jeffcoate TN. Posterior colpoperineorrhaphy. *Am J Obstet Gynecol* 1959;77(3):490-502
- 59 Kahn MA, Stanton SL. Posterior colporrhaphy: its effects on bowel and sexual function. *Br J Obstet Gynaecol* 1997;104(1):82-86
- 60 Glavind K, Madsen H. A prospective study of the discrete fascial defect rectocele repair. *Acta Obstet Gynecol Scand* 2000;79(2):145-147
- 61 Kenton K, Shott S, Brubaker L. Outcome after rectovaginal fascia reattachment for rectocele repair. *Am J Obstet Gynecol* 1999;181(6):1360-1363, discussion 1363-1364
- 62 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(6):1353-1358, discussion 1358-1359
- 63 Cundiff GW, Weidner AC, Visco AG, Addison WA, Bump RC. An anatomic and functional assessment of the discrete defect rectocele repair. *Am J Obstet Gynecol* 1998;179(6 Pt 1):1451-1456, discussion 1456-1457
- 64 Kahn MA, Stanton SL. Techniques of rectocele repair and their effects on bowel function. *Int Urogynecol J Pelvic Floor Dysfunct* 1998;9(1):37-47
- 65 Ryhammer AM, Laurberg S, Sørensen FH. Effects of age on anal function in normal women. *Int J Colorectal Dis* 1997;12(4):225-229
- 66 Zbar AP, Lienemann A, Fritsch H, Beer-Gabel M, Pescatori M. Rectocele: pathogenesis and surgical management. *Int J Colorectal Dis* 2003;18(5):369-384
- 67 Khubchandani IT, Sheets JA, Stasik JJ, Hakki AR. Endorectal repair of rectocele. *Dis Colon Rectum* 1983;26(12):792-796
- 68 Kahn MA, Stanton SL, Kumar DA. Randomized prospective trial of posterior colporrhaphy vs transanal repair of rectocele: preliminary findings. *Int Urogynecol J* 1997;8:246-247
- 69 Pitchford CA. Rectocele: a cause of anorectal pathologic changes in women. *Dis Colon Rectum* 1967;10(6):464-466
- 70 Sullivan ES, Leaverton GH, Hardwick CE. Transrectal perineal repair: an adjunct to improved function after anorectal surgery. *Dis Colon Rectum* 1968;11(2):106-114
- 71 Khubchandani IT, Clancy JP III, Rosen L, Riether RD, Stasik JJ Jr. Endorectal repair of rectocele revisited. *Br J Surg* 1997;84(1):89-91
- 72 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(3):354-358
- 73 Schouten WR, Gordon PH. Constipation. In: Gordon PH, Nivatvongs S, eds. *Principles and Practice of Surgery for the Colon, Rectum, and Anus*. St. Louis, MO: Quality Medical Publishing; 1999:1214-1218
- 74 Ellis CN. Anterior levatoroplasty for the treatment of chronic anterior anal fissures in women with an associated rectocele. *Dis Colon Rectum* 2004;47:1170-1174
- 75 Marti MC, Roche B, Deléaval J. Rectoceles: value of video-defecography in selection of treatment policy. *Colorectal Dis* 1999;1:324-329
- 76 Van Laarhoven CJ, Kamm MA, Bartram CI, Halligan S, Hawley PR, Phillips RK. Relationship between anatomic and symptomatic long-term results after rectocele repair for impaired defecation. *Dis Colon Rectum* 1999;42(2):204-210, discussion 210-211
- 77 Block IR. Transrectal repair of rectocele using obliterative suture. *Dis Colon Rectum* 1986;29(11):707-711
- 78 Pescatori M, Favetta U, Dedola S, et al. Transanal stapled excision of rectal mucosal prolapse. *Tech Coloproctol* 1997;1:96-98
- 79 Altomare DF, Rinaldi M, Veglia A, Petrolino M, De Fazio M, Sallustio P. Combined perineal and endorectal repair of rectocele by circular stapler: a novel surgical technique. *Dis Colon Rectum* 2002;45(11):1549-1552
- 80 Longo A. Obstructed defecation because of rectal pathologies. Novel surgical treatment: stapled transanal resection (STARR). Paper presented at: The Annual Cleveland Clinic Foundation Colorectal Disease Symposium 2004; February 12-14, 2004; Ft. Lauderdale, FL
- 81 Boccasanta P, Venturi M, Stuto A, et al. Stapled transanal rectal resection for outlet obstruction: a prospective, multicenter trial. *Dis Colon Rectum* 2004;47(8):1285-1296, discussion 1296-1297
- 82 Boccasanta P, Venturi M, Salamina G, Cesana BM, Bernasconi F, Roviato G. New trends in the surgical treatment of outlet obstruction: clinical and functional results of two novel transanal stapled techniques from a randomised controlled trial. *Int J Colorectal Dis* 2004;19(4):359-369
- 83 Jayne DG, Schwandner O, Stuto A. Stapled transanal rectal resection for obstructed defecation syndrome: one-year results of the European STARR Registry. *Dis Colon Rectum* 2009;52(7):1205-1212, discussion 1212-1214
- 84 Titu LV, Riyad K, Carter H, Dixon AR. Stapled transanal rectal resection for obstructed defecation: a cautionary tale. *Dis Colon Rectum* 2009;52(10):1716-1722
- 85 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(3):148-153
- 86 Pescatori M, Dodi G, Salafia C, Zbar AP. Rectovaginal fistula after double-stapled transanal rectotomy (STARR) for obstructed defecation. *Int J Colorectal Dis* 2005;20(1):83-85
- 87 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(3):257-261
- 88 Hoffman MJ, Kodner IJ, Fry RD. Internal intussusception of the rectum. Diagnosis and surgical management. *Dis Colon Rectum* 1984;27(7):435-441
- 89 Mellgren A, Schultz I, Johansson C, Dolk A. Internal rectal intussusception seldom develops into total rectal prolapse. *Dis Colon Rectum* 1997;40(7):817-820
- 90 Freimanis MG, Wald A, Caruana B, Bauman DH. Evacuation proctography in normal volunteers. *Invest Radiol* 1991;26(6):581-585
- 91 Shorvon PJ, McHugh S, Diamant NE, Somers S, Stevenson GW. Defecography in normal volunteers: results and implications. *Gut* 1989;30(12):1737-1749
- 92 van Tets WF, Kuipers JHC. Internal rectal intussusception—fact or fancy? *Dis Colon Rectum* 1995;38(10):1080-1083
- 93 Brown AJ, Anderson JH, McKee RF, Finlay IG. Surgery for occult rectal prolapse. *Colorectal Dis* 2004;6(3):176-179

- 94 Kelvin FM, Maglinte DD, Benson JT. Evacuation proctography (defecography): an aid to the investigation of pelvic floor disorders. *Obstet Gynecol* 1994;83(2):307-314
- 95 Farouk R, Duthie GS, MacGregor AB, Bartolo DC. Rectoanal inhibition and incontinence in patients with rectal prolapse. *Br J Surg* 1994;81(5):743-746
- 96 Briel JW, Schouten WR, Boerma MO. Long-term results of suture rectopexy in patients with fecal incontinence associated with incomplete rectal prolapse. *Dis Colon Rectum* 1997;40(10):1228-1232
- 97 Rutter KRP. Solitary rectal ulcer syndrome; its relation to mucosal prolapse. *Clin Gastroenterol* 1985;4:505-530
- 98 Goei R, Baeten C, Arends JW. Solitary rectal ulcer syndrome: findings at barium enema study and defecography. *Radiology* 1988;168(2):303-306
- 99 Kuijpers HC, Schreve RH, ten Cate Hoedemakers H. Diagnosis of functional disorders of defecation causing the solitary rectal ulcer syndrome. *Dis Colon Rectum* 1986;29(2):126-129
- 100 Halligan S, Nicholls RJ, Bartram CI. Evacuation proctography in patients with solitary rectal ulcer syndrome: anatomic abnormalities and frequency of impaired emptying and prolapse. *AJR Am J Roentgenol* 1995;164(1):91-95
- 101 Tjandra JJ, Fazio VW, Church JM, Lavery IC, Oakley JR, Milsom JW. Clinical conundrum of solitary rectal ulcer. *Dis Colon Rectum* 1992;35(3):227-234
- 102 Binnie NR, Papachrysostomou M, Clare N, Smith AN. Solitary rectal ulcer: the place of biofeedback and surgery in the treatment of the syndrome. *World J Surg* 1992;16(5):836-840
- 103 Halligan S, Nicholls RJ, Bartram CI. Proctographic changes after rectopexy for solitary rectal ulcer syndrome and preoperative predictive factors for a successful outcome. *Br J Surg* 1995;82(3):314-317
- 104 Berman IR, Harris MS, Rabeler MB. Delorme's transrectal excision for internal rectal prolapse. Patient selection, technique, and three-year follow-up. *Dis Colon Rectum* 1990;33(7):573-580
- 105 Christiansen J, Zhu BW, Rasmussen OO, Sørensen M. Internal rectal intussusception: results of surgical repair. *Dis Colon Rectum* 1992;35(11):1026-1028, discussion 1028-1029
- 106 Sielezneff I, Malouf A, Cesari J, Brunet C, Sarles JC, Sastre B. Selection criteria for internal rectal prolapse repair by Delorme's transrectal excision. *Dis Colon Rectum* 1999;42(3):367-373
- 107 Graf W, Karlhom U, Pählman L, Nilsson S, Ejerblad S. Functional results after abdominal suture rectopexy for rectal prolapse or intussusception. *Eur J Surg* 1996;162(11):905-911
- 108 McCue JL, Thomson JPS. Rectopexy for internal rectal intussusception. *Br J Surg* 1990;77(6):632-634
- 109 Mellgren A, Bremmer S, Johansson C, et al. Defecography. Results of investigations in 2,816 patients. *Dis Colon Rectum* 1994;37(11):1133-1141
- 110 Mellgren A, Johansson C, Dolk A, et al. Enterocoele demonstrated by defecography is associated with other pelvic floor disorders. *Int J Colorectal Dis* 1994;3:121-124
- 111 Tulikangas PK, Piedmonte MR, Weber AM. Functional and anatomic follow-up of enterocoele repairs. *Obstet Gynecol* 2001;98(2):265-268
- 112 Kobashi KC, Leach GE. Pelvic prolapse. *J Urol* 2000;164(6):1879-1890
- 113 Vanbeckevoort D, Van Hoe L, Oyen R, Ponette E, De Ridder D, Deprest J. Pelvic floor descent in females: comparative study of colpocystodefecography and dynamic fast MR imaging. *J Magn Reson Imaging* 1999;9(3):373-377
- 114 Wiskind AK, Creighton SM, Stanton SL. The incidence of genital prolapse after the Burch colposuspension. *Am J Obstet Gynecol* 1992;167(2):399-404, discussion 404-405
- 115 Chaliha C, Stanton SL. Complications of surgery for genuine stress incontinence. *Br J Obstet Gynaecol* 1999;106(12):1238-1245
- 116 Zimmern PE, Leach GE, Ganabathi K. The urological aspects of vaginal vault prolapse. Diagnosis and surgical aspects. *AUA Update Series* 1993;XII:193-212
- 117 Timmons MC, Addison WA, Addison SB, Cavenar MG. Abdominal sacral colpopexy in 163 women with posthysterectomy vaginal vault prolapse and enterocele. Evolution of operative techniques. *J Reprod Med* 1992;37(4):323-327
- 118 Zimmern PE, Leach GE. Repair of enterocele and rectocele, perineal repair, and vault suspension. *Atlas Urol Clin North Am* 1994;2:47-60
- 119 Benson JT, Lucente V, McClellan E. Vaginal versus abdominal reconstructive surgery for the treatment of pelvic support defects: a prospective randomized study with long-term outcome evaluation. *Am J Obstet Gynecol* 1996;175(6):1418-1421, discussion 1421-1422
- 120 Miklos JR, Kohli N, Lucente V, Saye WB. Site-specific fascial defects in the diagnosis and surgical management of enterocele. *Am J Obstet Gynecol* 1998;179(6 Pt 1):1418-1422, discussion 1822-1823
- 121 Gosselink MJ, van Dam JH, Huisman WM, Ginai AZ, Schouten WR. Treatment of enterocele by obliteration of the pelvic inlet. *Dis Colon Rectum* 1999;42(7):940-944
- 122 Jean F, Tanneau Y, Le Blanc-Louvry I, Leroi AM, Denis P, Michot F. Treatment of enterocele by abdominal colpoproctosacropexy - efficacy on pelvic pressure. *Colorectal Dis* 2002;4(5):321-325
- 123 Mellgren A, Dolk A, Johansson C, Bremmer S, Anzén B, Holmström B. Enterocoele is correctable using the Ripstein rectopexy. *Dis Colon Rectum* 1994;37(8):800-804
- 124 Oettle GJ, Roe AM, Bartolo DC, Mortensen NJ. What is the best way of measuring perineal descent? A comparison of radiographic and clinical methods. *Br J Surg* 1985;72(12):999-1001
- 125 Lubowski DZ, Jones PN, Swash M, Henry MM. Asymmetrical pudendal nerve damage in pelvic floor disorders. *Int J Colorectal Dis* 1988;3(3):158-160
- 126 Sullivan ES, Longaker CJ, Lee PYH. Total pelvic mesh repair: a ten-year experience. *Dis Colon Rectum* 2001;44(6):857-863
- 127 Lahr SJ, Lahr CJ, Srinivasan A, Clerico ET, Limehouse VM, Serbezov IK. Operative management of severe constipation. *Am Surg* 1999;65(12):1117-1121, discussion 1122-1123
- 128 Welgoss JA, Vogt VY, McClellan EJ, Benson JT. Relationship between surgically induced neuropathy and outcome of pelvic organ prolapse surgery. *Int Urogynecol J Pelvic Floor Dysfunct* 1999;10(1):11-14
- 129 Benson JT, McClellan E. The effect of vaginal dissection on the pudendal nerve. *Obstet Gynecol* 1993;82(3):387-389
- 130 Benson JT. Defect approach to pelvic organ prolapse surgery. In: Stanton SL, Zimmern PE, eds. *Female Pelvic Reconstructive Surgery*. London: Springer-Verlag; 2003:365-368
- 131 Silvis R, Gooszen HG, Kahraman T, et al. Novel approach to combined defaecation and micturition disorders with rectovagino-vesicopexy. *Br J Surg* 1998;85(6):813-817
- 132 Iglesia CB, Fenner DE, Brubaker L. The use of mesh in gynecologic surgery. *Int Urogynecol J Pelvic Floor Dysfunct* 1997;8(2):105-115