

Rectal Prolapse: An Overview of Clinical Features, Diagnosis, and Patient-Specific Management Strategies

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Abstract Rectal prolapse can present in a variety of forms and is associated with a range of symptoms including pain, incomplete evacuation, bloody and/or mucous rectal discharge, and fecal incontinence or constipation. Complete external rectal prolapse is characterized by a circumferential, full-thickness protrusion of the rectum through the anus, which may be intermittent or may be incarcerated and poses a risk of strangulation. There are multiple surgical options to treat rectal prolapse, and thus care should be taken to understand each patient's symptoms, bowel habits, anatomy, and pre-operative expectations. Preoperative workup includes physical exam, colonoscopy, anoscopy, and, in some patients, anal manometry and defecography. With this information, a tailored surgical approach (abdominal versus perineal, minimally invasive versus open) and technique (posterior versus ventral rectopexy +/- sigmoidectomy, for example) can then be chosen. We propose an algorithm based on available outcomes data in the literature, an understanding of anorectal physiology, and expert opinion that can serve as a guide to determining the rectal prolapse operation that will achieve the best possible postoperative outcomes for individual patients.

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Definition and Epidemiology

Rectal prolapse is a full-thickness protrusion of the rectum through the anus. The evolution of a rectal prolapse begins with an (internal) intussusception that can only be seen on defecography, followed by external mucosal prolapse only (Fig. 1a), and eventually a full thickness rectal prolapse (Fig. 1b). Both complete rectal prolapse and internal intussusception can occur independently or can be associated with the descent and dysfunction of other pelvic organs, e.g., rectoceles, uterine or vaginal vault prolapse, cystocele, or enterocele.

The prevalence of external rectal prolapse is relatively low, estimated to occur in less than 0.5 % of the general population overall.¹ It occurs more frequently in the elderly population and in females; an estimated 3 % of women in the United States have some form of pelvic organ prolapse, including rectal prolapse or uterine or vaginal prolapse, rectocele, cystocele, urethrocele, and enterocele.²

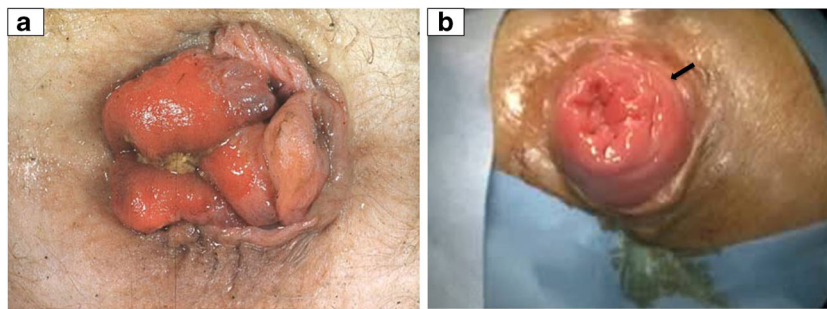


Fig. 1 Rectal prolapse. Rectal prolapse is a full-thickness protrusion of the rectum through the anus. The evolution of a rectal prolapse begins with an (internal) intussusception followed by external mucosal prolapse

only (a), and eventually a full thickness rectal prolapse (b). *Arrow*: Concentric rings of exposed rectal mucosa characteristic of complete rectal prolapse

Clinical Presentation

Patients with external rectal prolapse can present with a myriad of symptoms (Table 1). True complete external prolapse is associated with a large rectal mass or bulge that may or may not spontaneously reduce at the completion of a bowel movement and straining. Although some patients may wait to be assessed until these significant symptoms occur, the majority will usually present with more non-specific complaints.^{3,4} The most common of these complaints include fullness or a lump inside rectum, constipation, fecal incontinence, obstructed defecation, mucus drainage, and/or bleeding. Some patients experience rectal incarceration or even strangulation, which is associated with a large, painful, immobile rectal mass.

Patients with internal intussusception may experience obstructed defecation, severe abdominal pain, and/or symptoms similar to those of patients with external rectal prolapse. However, many patients remain asymptomatic, as internal intussusception has been reported to be present on defecography in 35 % of asymptomatic females.⁵

Anatomy

The anatomy of the pelvic floor is complex, consisting of both superficial and deep muscle layers that separate the pelvic organs from the perineum. The superficial muscles include the internal and external anal sphincters, perineal body, and

transverse perineal muscles and are largely responsible for controlling evacuation of stool from the rectal vault.⁶ The deep muscles include the pubococcygeus, ileococcygeus, and puborectalis, which together form the levator ani and are responsible for maintaining the integrity of the pelvic floor, as well as an anorectal angulation that physically prevents stool flow until the muscles relax and the angle straightens.⁷ Sympathetic and parasympathetic innervation to the pelvic floor is provided by the S2–S4 sacral nerve roots, the pudendal nerves, and the perineal nerves.

The anatomic etiology of rectal prolapse can be varied because of the complexity of the pelvic floor. In general, the most common anatomic features associated with rectal prolapse are a redundant sigmoid colon (Fig. 2a), diastasis of the levator ani, loss of the vertical position of the rectum and its sacral attachments, and/or an abnormally deep cul de sac (Fig. 2b). In addition, concomitant pelvic dyssynergia, paradoxical puborectalis contraction, or sphincter damage can affect the symptoms that a patient experiences.

Diagnosis and Workup

Rectal prolapse is a clinical diagnosis that is suspected on the basis of a patient's history and corroborated by physical exam findings (Fig. 3). In some cases, the prolapse may be easily reproducible when the patient strains while in the lateral or jack-knifed position, while others may require that the patient strain on the commode. Occasionally, when the prolapse cannot be reproduced at the time of the encounter, the patient may have to be encouraged to consider documenting it photographically. At the time of diagnosis a full history of the patient's symptoms should be obtained, including fecal incontinence versus constipation/obstructed defecation symptoms as well as stool consistency, as their presence will help guide selection of an appropriate operative approach. The use of standardized, validated bowel function and/or quality of life questionnaires should be considered at the time of initial assessment. Knowing a patient's anatomy is extremely important to create

Table 1 Symptoms of patients presenting with rectal prolapse^{3,4}

Symptom	Prevalence
Constipation	25–50 %
Mucous diarrhea	15–35 %
Fecal incontinence	50–75 %
Rectal bleeding	75–100 %
Urinary incontinence	25–30 %
Vaginal vault prolapse	15–30 %
Pain	100 %
Decreased quality of life	100 %

Fig. 2 Features of rectal prolapse. In general, the most commonly associated anatomic features found with rectal prolapse are a redundant sigmoid colon (**a**), diastasis of the levator ani, loss of the vertical position of the rectum and its sacral attachments, and/or an abnormally deep cul de sac (**b**)

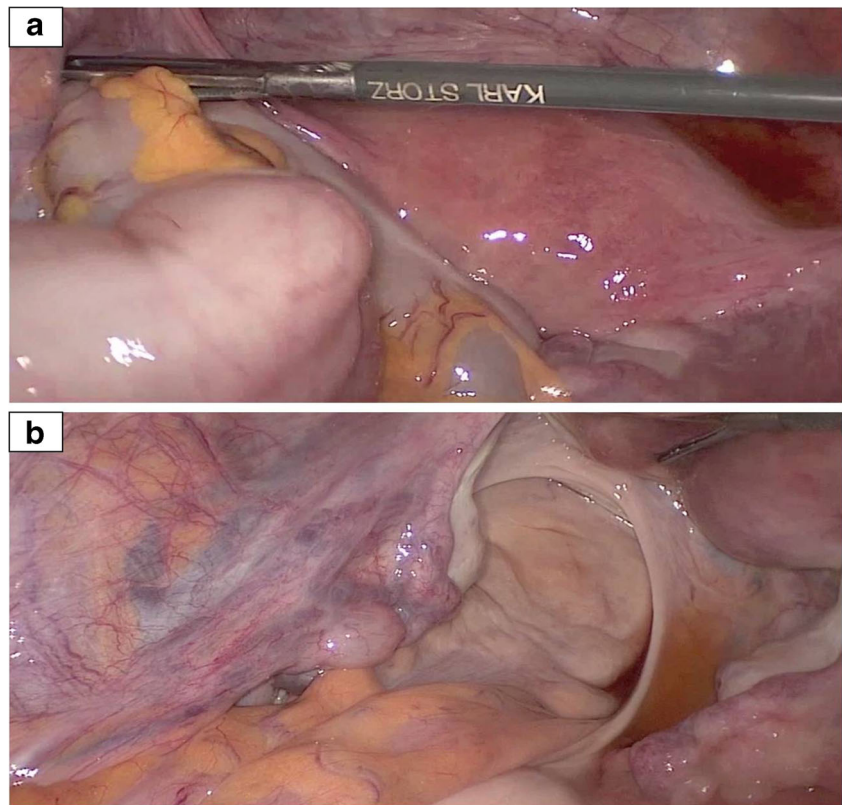
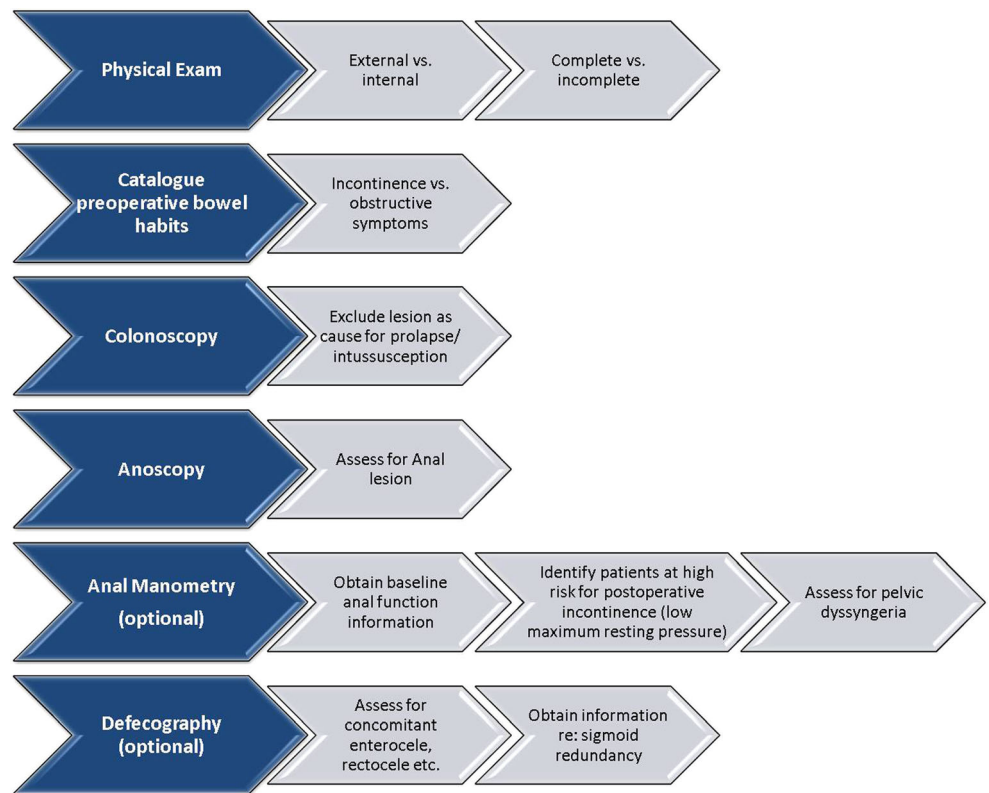


Fig. 3 Diagnosis and workup of rectal prolapse



a management strategy and facilitate operative planning to achieve the best possible outcome for the patient.

Pre-operatively, all patients should undergo colonoscopy and anoscopy. Colonoscopy is used to rule out the presence of a lead point (e.g., mass or other pathology; Fig. 4a) and to assure that there is no other colonic pathology that would take priority. Patients with external rectal prolapse routinely show signs of congested rectal mucosa on endoscopic examination that should not be mistaken as inflammatory bowel disease. Biopsy can be considered to rule out dysplasia or other pathology, but histopathology most commonly shows features of “solitary rectal ulcer syndrome” (Fig. 4b). Similarly, anoscopy may be considered to visualize the anal canal and evaluate for any suspicious lesions not sufficiently characterized on colonoscopy, and to rule out prolapsed internal hemorrhoids as the cause of the patient’s symptoms.⁸

Anorectal manometry and defecography can be considered in selected patients who have concomitant symptoms of constipation and incontinence to allow for a careful choice of surgical techniques that may improve their postoperative functional outcomes. Anal manometry gathers baseline information about a patient’s anal function and avoids the appearance of de novo fecal incontinence or constipation occurring postoperatively after prolapse repair. However, many of the tests are compromised by the prolapse itself and should therefore be interpreted with caution. Patients with complete rectal prolapse generally have lower mean maximum resting anal pressures⁹, which predicts poor postoperative continence in

some studies.^{10,11} Different rectal prolapse repair techniques are associated with different effects on continence (see “Management,” below), and therefore the results of anorectal physiology testing can be useful to stratify patients for certain operative approaches. In addition, patients with internal sphincter defects at baseline could potentially be targeted for postoperative biofeedback in an effort to improve long-term continence.^{10–13} Defecography should be considered to evaluate for internal rectal prolapse and as a screening tool for other associated forms of pelvic organ prolapse (Fig. 4c). It is also a useful tool to aid in the diagnosis of patients with reported prolapse that cannot be reproduced on clinical exam.¹⁴

Elective studies that may be ordered on a case-by-case basis in the workup of rectal prolapse include dynamic pelvic magnetic resonance imaging (for patients with documented or suspicion of additional forms of pelvic organ prolapse); colonic transit studies (for patients with constipation); and electromyography and/or pudendal nerve terminal motor latency (to guide pre-operative counseling on prognosis, as patients with dyssynergy tend to have poorer post-operative outcomes) (Fig. 4d).^{15,16}

Management

For the majority of symptomatic patients with rectal prolapse (see exceptions below), surgical repair is the strategy of choice.

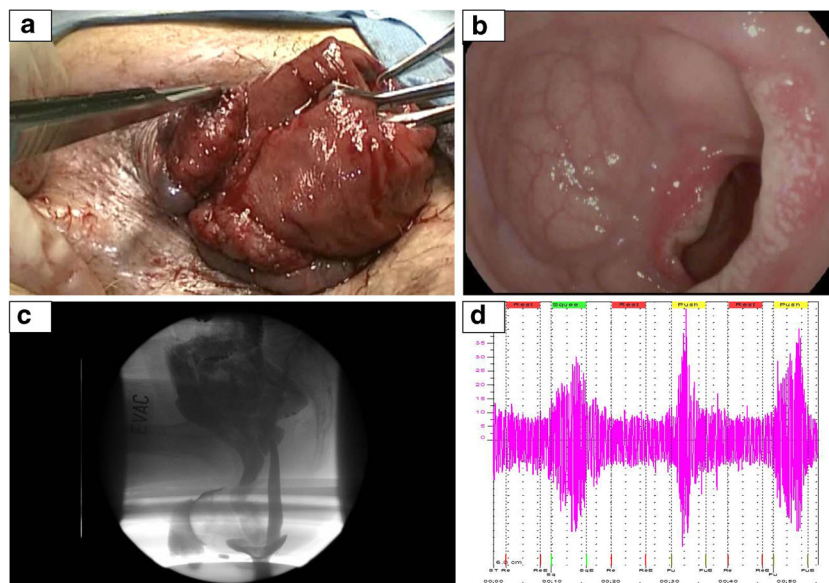


Fig. 4 Pre-operative workup. **a** Pre-operative colonoscopy should be performed to rule out the presence of a lead point (in this case, a rectal adenoma) as the etiology of the prolapse. **b** Frequently, patients with rectal prolapse will have a benign rectal ulcer on endoscopic exam due to congested rectal mucosa (i.e., “solitary rectal ulcer syndrome”). **c** Defecography should be considered to evaluate for internal rectal prolapse and as a screening tool for other associated forms of pelvic organ

prolapse (in this case, rectal prolapse with enterocele). **d** Electromyography and/or pudendal nerve terminal motor latency may be used in some cases to guide pre-operative counseling on prognosis, as patients with dyssynergy tend to have poorer post-operative outcomes. Patients with paradoxical puborectal contraction (as in this case) should not undergo levatorplasty because the resulting postoperative anal pressures put the patient at high risk for prolapse recurrence

This is especially true for the majority of cases of external prolapses or when the internal prolapse/intussusception becomes symptomatic. Earlier repair is ideal, as persistent externalization of the rectal mucosa and/or full rectum may lead to progressively worse symptoms over time. As the prolapse progresses, weakening of the sphincter complex puts the patient at risk for incontinence. In patients with a comparably high sphincter tone, there is a risk of rectal incarceration that, in cases of strangulation, can become a surgical emergency.¹⁷ The goals of rectal prolapse surgery are to correct the prolapse, to alleviate pre-operative complaints of discomfort, and to ameliorate or cure fecal incontinence or constipation. The repair should avoid complications while minimizing risks of recurrence and optimizing the functional result.

To date, there is a paucity of data evaluating the effectiveness and appropriateness of the various surgical techniques for rectal prolapse.¹⁷ Because of the broad nature of presenting complaints associated with rectal prolapse, no single management strategy is right for every patient. Therefore, it is important to understand each patient’s etiology, precise anatomy, and overall health so that management approach can be individualized. Below, we briefly describe the different surgical approaches that are available for the treatment of rectal prolapse, followed by a management algorithm that is, in part, based on patient symptomatology (Fig. 5). The algorithm reflects a combination of limited published evidence, an understanding of rectal anatomy and physiology, and expert opinion. It should therefore be considered as a guide to assist clinicians rather than a definitive recommendation.

Abdominal Approaches

The intra-abdominal approaches to rectal prolapse repair involve two basic tenets: adequate mobilization of the rectum and appropriate fixation of the rectum (i.e., rectopexy). Mobilization of the rectum can be performed with or without preservation of the lateral ligaments, which may affect post-operative constipation symptoms (see “Outcomes and Algorithmic Approach,” below). The rectopexy can be performed using suture and/or mesh, utilizing either a posterior or anterior approach, with or without a concomitant sigmoid resection. The approach and method of fixation (mesh versus sutures) is usually dependant on surgeon preference in combination with specific patient characteristics. The means of performing the procedure, whether open or through a minimally invasive approach (laparoscopic or robotic), is dependent on patient eligibility, and clinician comfort and experience (discussed below).

Posterior Suture Rectopexy For a posterior suture rectopexy, the rectum is mobilized both posteriorly and anteriorly down to the levators, and then elevated cephalad to straighten any redundant bowel distal to the planned pexy point. The mobilized mesorectum is then sutured to the periosteum of the sacral promontory using horizontal mattress sutures (Fig. 6). A tacking apparatus can also be used in the place of suture to secure the rectum.

Posterior Rectopexy with Mesh For a posterior rectopexy with mesh, the rectum is attached to the sacral promontory using posteriorly placed mesh. The rectum is appropriately

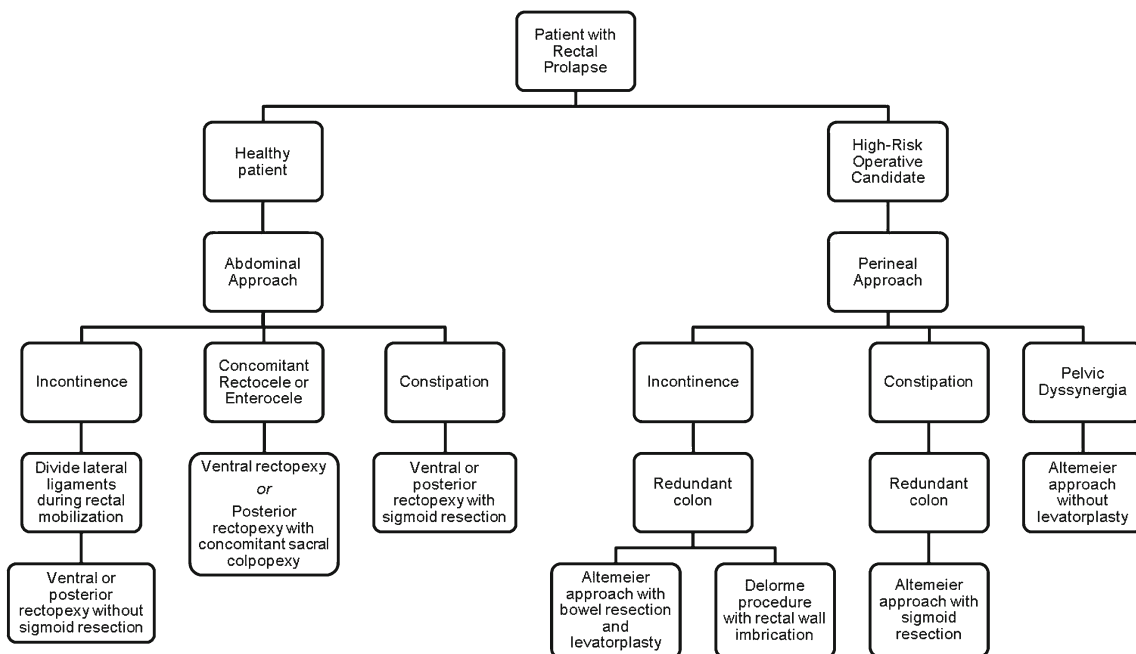
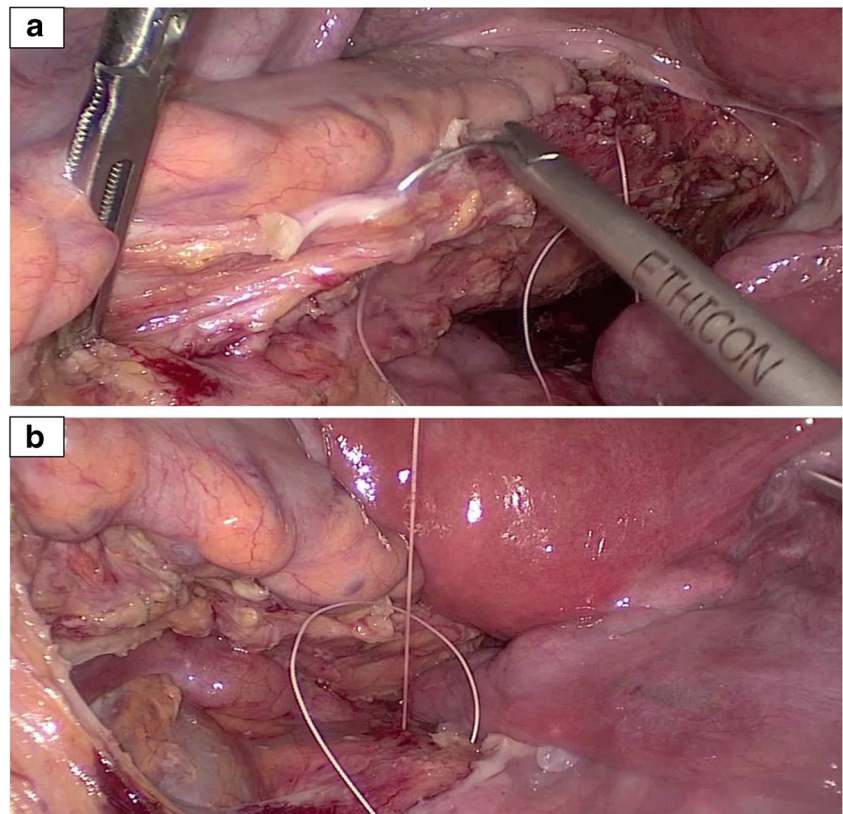


Fig. 5 Proposed algorithm for patient-tailored approach to rectal prolapse repair

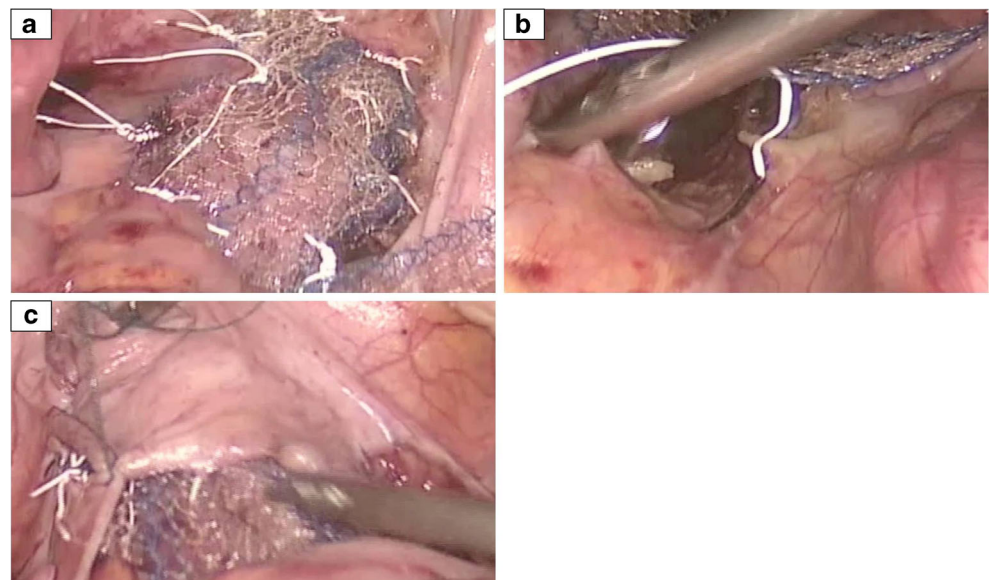
Fig. 6 Suture rectopexy. For a suture rectopexy, the rectum is mobilized down to the levators and then elevated to straighten any redundant bowel distal to the planned pexy point (a). The mobilized mesorectum is then sutured to the periosteum of the sacral promontory (b)



mobilized and shifted to the side to expose the sacral promontory. A piece of prosthetic or biologic mesh measuring 5–10 cm in width is then secured to the periosteum of the sacral promontory using sutures or staples. The rectum is straightened with a small amount of tension, and the mesh is posteriorly wrapped around it, leaving anteriorly at least one third of the circumference free while fixing it laterally to the mobilized and re-suspended rectum.

Ventral Rectopexy The ventral rectopexy was first described by D’Hoore et al.¹⁸ as an alternative to the more traditional posterior approach. In a ventral rectopexy, the rectum is only mobilized anteriorly, and therefore no posterior rectal dissection is performed. Once the rectum is fully separated from the vagina or prostate, the mesh is sutured to the rectum on the anterior side (Fig. 7a). The mesh is also secured to the posterior vagina to close the rectovaginal septum in women. The

Fig. 7 D’Hoore procedure. The D’Hoore Procedure is a ventral rectopexy involving mobilization of the rectum in the anterior plan only. After mobilization, the mesh is sutured to the rectum on the anterior side (a) and then secured to the periosteum of the sacral promontory (b). The mesh is then covered with peritoneum to prevent adhesion formation (c)



rectum is then gently straightened, and the mesh is secured to the periosteum of the sacral promontory using either sutures or staples (Fig. 7b). The mesh is covered with peritoneum at the end of the procedure to minimize adhesive disease long-term (Fig. 7c).

Concomitant Sigmoid Resection In patients with redundant sigmoid colon and/or constipation symptoms, posterior rectopexy using any of the approaches outlined above (posterior suture, posterior mesh) may be appropriately performed with a concomitant sigmoid resection (see “**Outcomes and Algorithmic Approach**,” below). In this technique, the rectum is mobilized as previously described. However, before rectopexy is performed, the redundant sigmoid colon is resected (Fig. 8a). The distal transection margin of the sigmoid should be just at or below the level of the rectosigmoid junction, which is identified by the splaying of the taeniae coli. The superior rectal artery may require ligation prior to transection depending on the patient’s anatomy (and the division of this vessel should be clearly stated in the operative note in the event of prolapse recurrence and need for consideration of re-do repair options). Upon transection of the distal margin, the proximal transection margin should be determined based on where the remaining sigmoid colon can be anastomosed without significant tension or redundancy (Fig. 8b). The lateral sigmoid attachments should not be divided to mobilize the sigmoid. The anastomosis is then performed and tested in the standard fashion, after which a rectopexy can be performed in one of the manners described above.

Perineal Approaches

In general, perineal approaches to rectal prolapse are reserved for patients who cannot tolerate an intra-abdominal approach. Elderly patients, patients with significant comorbidities, patients who are high risk for general anesthesia, select patients

who have previously undergone open repair of rectal prolapse (being aware of the potential vascular issues related to the remaining rectum), or those who have had extensive pelvic surgery or radiation in the past may be appropriate candidates for perineal repair.

Altemeier Perineal Rectosigmoidectomy The Altemeier perineal rectosigmoidectomy technique is the most commonly used perineal approach to repair rectal prolapse in North America.^{19,20} In general, patients need to have a prolapse that measures more than 3 cm in length for this technique to be feasible. After appropriate anesthesia and patient positioning, the rectum is prolapsed through the anal canal and secured using Allis clamps. Lidocaine or other local anesthetics with epinephrine can be injected into the submucosa above the level of the dentate line to assist with hemostasis. A full-thickness circumferential incision is made approximately 1 to 2 cm above the dentate line (distal margin of the resection; Fig. 9a). The rectum is then dissected proximally circumferentially (using any number of mesenteric division techniques; Fig. 9b) until the peritoneal cavity is entered. The redundant and floppy bowel is delivered and transected where no further giving is observed (Fig. 9c). A handsewn coloanal anastomosis is then performed, suturing the proximal margin to the anal canal. A levatorplasty can be performed in conjunction to improve post-operative continence; before the coloanal anastomosis is completed, the levator muscles are sutured together anteriorly to improve support by the pelvic floor and lengthen the anal canal.

Delorme Procedure In contrast to the Altemeier procedure, the Delorme procedure is the most commonly performed perineal approach to rectal prolapse repair in Europe.²⁰ The technique involves mucosal stripping via dissection in the submucosal layer of the rectum followed by muscular plication of the rectal muscularis. Similar to the Altemeier

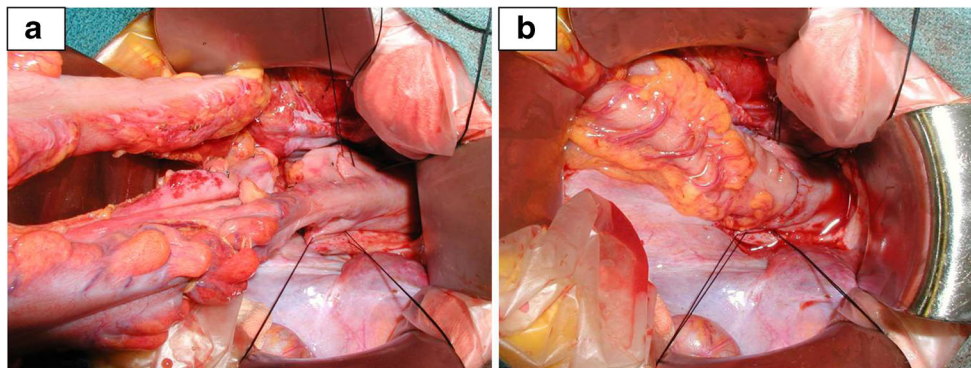
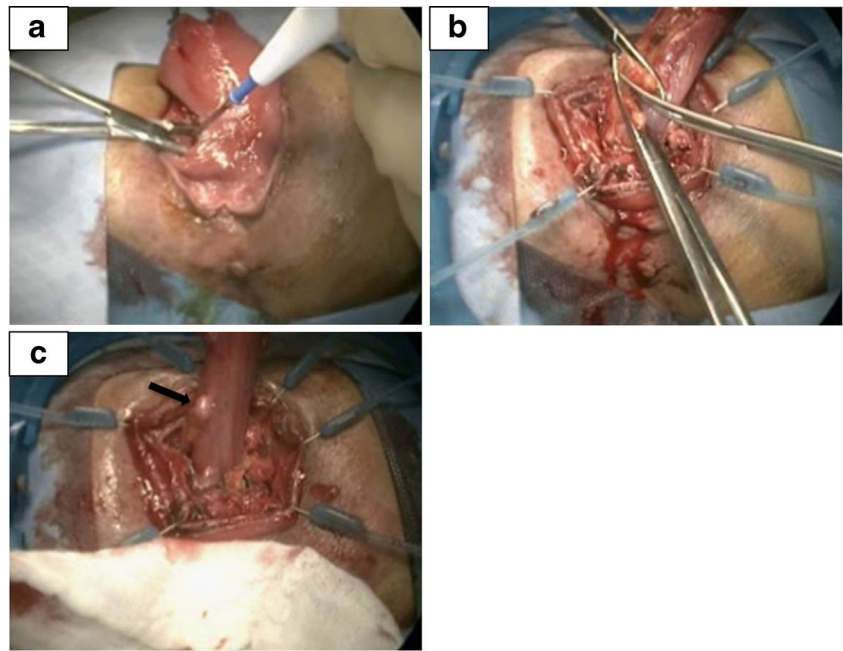


Fig. 8 Posterior rectopexy with concomitant sigmoid resection. In patients with redundant sigmoid colon, posterior rectopexy may be performed with a concomitant sigmoid resection. In this technique, the rectum is mobilized and any redundant sigmoid colon is resected prior to rectopexy (a). Upon transection of the distal margin, the proximal

transection margin should be determined based on where the remaining sigmoid colon can be anastomosed without significant tension or redundancy (b). The anastomosis is then performed and tested in the standard fashion, after which a rectopexy can be performed in one of the manners described herein

Fig. 9 Altemeier perineal rectosigmoidectomy. The Altemeier perineal rectosigmoidectomy technique is a perineal approach to rectal prolapse repair. A full-thickness incision is made circumferentially approximately 1 to 2 cm above the dentate line (**a**). The rectum is then circumferentially dissected proximally to clear the mesentery off the rectum (**b**) until the peritoneal cavity is entered. The redundant and floppy bowel is delivered and transected where no further giving is observed (**c**). Patients should have a 3 cm or greater prolapse in order for this technique to be feasible. *Arrow*: Sigmoid diverticulum



technique, the rectum is prolapsed through the anal canal using Allis clamps and an epinephrine-containing solution is injected above the level of the dentate line to aid in hemostasis (if desired). Approximately 1–2 cm proximal to the dentate line, a mucosal incision is made circumferentially to the level of the submucosa (Fig. 10a). The mucosal layer alone is then dissected off the white muscle layer until no further redundancy is observed (Fig. 10b). Depending on surgeon preference, the rectal wall can be imbricated at this point by plicating the exposed muscularis propria with interrupted sutures (Fig. 10c). Finally, an anastomosis is created between the proximal mucosal layer and the anal canal proximal to the dentate line (Fig. 10d).

Medical Management

Although the mainstay of therapy for true rectal prolapse is surgery, some patients may be poor operative candidates or choose to avoid an operative approach. Medical management strategies can be used in these patients (as well as pre-operative prolapse patients) to minimize prolapse-related symptoms and attempt to prevent progression of the disease.

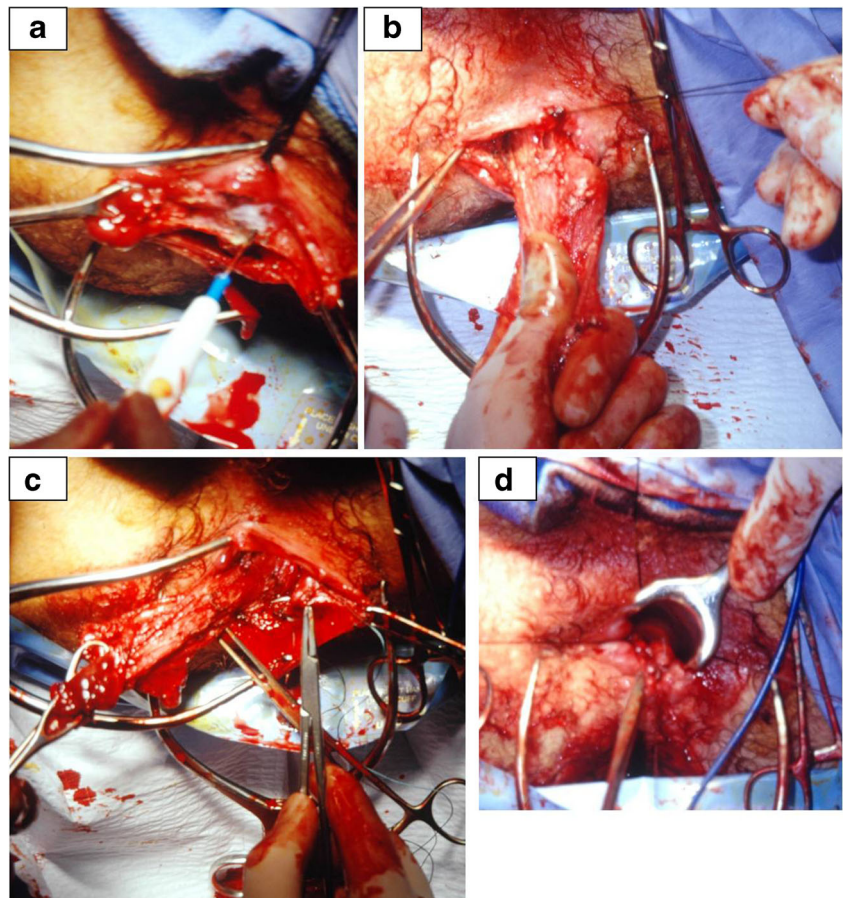
Basic medical advice involves the daily incorporation of adequate fluids and fiber in a patient's diet. Approximately 2 liters of fluid and 30 g of fiber per day are recommended to maintain regular bowel movements and prevent straining and seepage.²¹ Patients with symptoms of obstructed defecation or chronic constipation may benefit from suppositories and/or enemas as well. Biofeedback training has been shown to be effective in some cases^{22,23} and may be considered as a first-line strategy in patients with intussusception without external prolapse. Pelvic floor muscle exercises (for example, Kegel

exercises) may improve symptoms in patients with pelvic organ prolapsed, although the efficacy of this approach for rectal prolapse specifically is unknown.²⁴

Outcomes and Algorithmic Approach

Published outcomes following rectal prolapse repair surgery are mostly descriptive. Although the American Society of Colon and Rectal Surgeons has published guidelines for management of rectal prolapse⁴, there are few clinical trials to date, most of which are small with varied comparisons.^{25–35} A 2008 Cochrane Review of 12 randomized or quasi-randomized trials with 380 total participants comparing operative approaches for rectal prolapse was unable to show a clear advantage for any of the surgical approaches offered.¹⁷ However, other studies have shown that ventral rectopexy and posterior rectopexy with bowel resection appears to be associated with less constipation and an overall improvement in obstructed defecation syndrome.¹⁸ In contrast, abdominal approaches involving mobilization-only, mobilization-resection-pxy or mobilization-pxy have not been shown to have a significant effect on recurrence rates, which may be as high as 29 % over 10 years.³⁶ Division of the lateral ligaments at the time of rectal mobilization prior to rectopexy has been associated with a lower recurrence rate but more constipation.^{27,31,32} Laparoscopic rectopexy procedures were associated with less morbidity and shorter hospital stays than open procedures, but method of the fixation had no apparent effect on outcomes.¹⁷ Among the perineal approaches, continence may be improved with rectal wall imbrication in the Delorme procedure or

Fig. 10 Delorme procedure. The Delorme Procedure is another perineal approach to rectal prolapse repair. Approximately 1–2 cm proximal to the dentate line, a mucosal incision is made circumferentially to the level of the submucosa (**a**). The mucosal layer alone is then dissected off the white muscle layer until no further redundancy is observed (**b**). Depending on surgeon preference, the rectal wall can be imbricated at this point by plicating the exposed muscularis propria with interrupted sutures (**c**). Finally, an anastomosis is created between the proximal mucosal layer and the anal canal proximal to the dentate line (**d**)



concomitant levatorplasty in the Altemeier procedure, although randomized data are lacking.^{37,38} Overall, existing data demonstrate no detectable differences in recurrence rates comparing abdominal and perineal approaches, although there appears to be a trend toward improved continence with abdominal techniques.³⁹

Based on these and our expert opinion, we suggest the following algorithmic approach to treating patients with rectal prolapse (Fig. 5). Patients with constipation should be considered for bowel resection during their repair in an effort to avoid worsening post-operative constipation. In contrast, patients with low resting pressures (clinically or on anal manometry), with or without established incontinence, may benefit from rectopexy with division of the lateral ligaments, which reduces frequency of defecation.²⁷ Patients with rectal prolapse and concomitant rectocele or enterocele may be better candidates for rectopexy with concomitant sacral colpopexy (with or without sigmoidectomy depending on preoperative continence issues) or ventral rectopexy with mesh. If a perineal approach is chosen for the prolapse repair, patients with constipation may benefit from an Altemeier approach with resection of redundant sigmoid colon. In contrast, an Altemeier approach with levatorplasty or a Delorme procedure might be suited for patients with incontinence

because the resulting elongation of the anal canal and improved pelvic floor support provides protection against seepage and frequency. Patients with pelvic floor dyssynergy are recommended physical therapy and biofeedback training.

Role of Minimally Invasive Surgery

As mentioned above, there is some evidence to suggest that laparoscopic rectopexy procedures are associated with less morbidity and shorter hospital stays than open procedures.^{40,41} Frequently cited problems with laparoscopy include longer operating times, a high learning curve, the need for specialized equipment, and limited patient eligibility.^{42,43} In pelvic organ prolapse surgery, lack of three-dimensional vision and limited ability to assess the level of tension for the pelvic organ resuspension have hampered the wide-spread implementation of a minimally invasive approach. However, use of 3D-laparoscopic equipment or robotic technology are emerging as a means of avoiding large incisions and decreasing postoperative recovery time without compromising surgical technique.^{44–46} To date, there are minimal data on the efficacy of this approach for rectal prolapse. Robotic surgery is inherently

expensive, time-consuming, and requires specialized equipment and technical training.⁴⁷ Whether the proposed post-operative benefits of the robotic minimally invasive approach outweighs the disadvantages remains to be determined.

Conclusions

Patients with rectal prolapse require a tailored surgical approach. Pre-operative planning should involve consideration of their anatomic defects, comorbidities, symptoms, and anorectal physiology testing (constipation versus incontinence) to determine whether they are a surgical candidate and which approach is best (perineal versus abdominal approaches). Although existing outcomes data are limited, post-operative problems with fecal incontinence or obstructed defecation and recurrence of rectal prolapse should be considered when determining an operative approach. Patients that receive indiscriminate procedures without appropriate pre-operative testing are particularly at risk of experiencing incomplete resolution of their symptoms and/or iatrogenic incontinence or constipation. Quality of life can likely be improved by approaching operative repair of rectal prolapse from a systematic, algorithmic approach and may allow for standardization based on results from controlled randomized trials in the future.

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References

- Kairaluoma MV and Kellokumpu IH. Epidemiologic aspects of complete rectal prolapse. *Scand J Surg* 94: 3: 207-210, 2005.
- Nygaard I, Barber MD, Burgio KL, Kenton K, Meikle S, Schaffer J, Spino C, Whitehead WE, Wu J, Brody DJ and Pelvic Floor Disorders Network. Prevalence of symptomatic pelvic floor disorders in US women. *JAMA* 300: 11: 1311-1316, 2008.
- Bordeianou L, Rockwood T, Baxter N, Lowry A, Mellgren A and Parker S. Does incontinence severity correlate with quality of life? Prospective analysis of 502 consecutive patients. *Colorectal Dis* 10: 3: 273-279, 2008.
- Vama M, Rafferty J, Buie WD and Standards Practice Task Force of American Society of Colon and Rectal Surgeons. Practice parameters for the management of rectal prolapse. *Dis Colon Rectum* 54: 11: 1339-1346, 2011.
- Dvorkin LS, Gladman MA, Epstein J, Scott SM, Williams NS and Lunniss PJ. Rectal intussusception in symptomatic patients is different from that in asymptomatic volunteers. *Br J Surg* 92: 7: 866-872, 2005.
- Schey R, Cromwell J and Rao SS. Medical and surgical management of pelvic floor disorders affecting defecation. *Am J Gastroenterol* 107: 11: 1624-33; quiz p.1634, 2012.
- Liu J, Guaderrama N, Nager CW, Pretorius DH, Master S and Mittal RK. Functional correlates of anal canal anatomy: puborectalis muscle and anal canal pressure. *Am J Gastroenterol* 101: 5: 1092-1097, 2006.
- Felt-Bersma RJ, Tiersma ES and Cuesta MA. Rectal prolapse, rectal intussusception, rectocele, solitary rectal ulcer syndrome, and enterocele. *Gastroenterol Clin North Am* 37: 3: 645-68, ix, 2008.
- Harmston C, Jones OM, Cunningham C and Lindsey I. The relationship between internal rectal prolapse and internal anal sphincter function. *Colorectal Dis* 13: 7: 791-795, 2011.
- Glasgow SC, Birnbaum EH, Kodner IJ, Fleshman JW and Dietz DW. Preoperative anal manometry predicts continence after perineal proctectomy for rectal prolapse. *Dis Colon Rectum* 49: 7: 1052-1058, 2006.
- Bordeianou L, Lee KY, Rockwood T, Baxter NN, Lowry A, Mellgren A and Parker S. Anal resting pressures at manometry correlate with the Fecal Incontinence Severity Index and with presence of sphincter defects on ultrasound. *Dis Colon Rectum* 51: 7: 1010-1014, 2008.
- Woods R, Voyvodic F, Schlotthe AC, Sage MR and Wattoo DA. Anal sphincter tears in patients with rectal prolapse and fecal incontinence. *Colorectal Dis* 5: 6: 544-548, 2003.
- Williams JG, Wong WD, Jensen L, Rothenberger DA and Goldberg SM. Incontinence and rectal prolapse: a prospective manometric study. *Dis Colon Rectum* 34: 3: 209-216, 1991.
- Mellgren A, Bremmer S, Johansson C, Dolk A, Uden R, Ahlback SO and Holmstrom B. Defecography. Results of investigations in 2,816 patients. *Dis Colon Rectum* 37: 11: 1133-1141, 1994.
- Kaufman HS, Buller JL, Thompson JR, Pannu HK, DeMeester SL, Genadry RR, Bluemke DA, Jones B, Rychcik JL and Cundiff GW. Dynamic pelvic magnetic resonance imaging and cystocolpoproctography alter surgical management of pelvic floor disorders. *Dis Colon Rectum* 44: 11: 1575-83; discussion 1583-4, 2001.
- Maglinte DD, Bartram CI, Hale DA, Park J, Kohli MD, Robb BW, Romano S and Lappas JC. Functional imaging of the pelvic floor. *Radiology* 258: 1: 23-39, 2011.
- Tou S, Brown SR, Malik AI and Nelson RL. Surgery for complete rectal prolapse in adults. *Cochrane Database Syst Rev* (4): CD001758. doi: 4: CD001758, 2008.
- D'Hoore A and Penninckx F. Laparoscopic ventral recto(colpo)pepy for rectal prolapse: surgical technique and outcome for 109 patients. *Surg Endosc* 20: 12: 1919-1923, 2006.
- Altemeier WA, Culbertson WR, Schowengerdt C and Hunt J. Nineteen years' experience with the one-stage perineal repair of rectal prolapse. *Ann Surg* 173: 6: 993-1006, 1971.
- Lindsey I. Commentary: best practice in rectal prolapse. *Colorectal Dis* 12: 6: 512-514, 2010.
- Ternent CA, Bastawrous AL, Morin NA, Ellis CN, Hyman NH, Buie WD and 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* 50: 12: 2013-2022, 2007.
- Jorge JM, Habr-Gama A and Wexner SD. Biofeedback therapy in the colon and rectal practice. *Appl Psychophysiol Biofeedback* 28: 1: 47-61, 2003.
- Khaikin M and Wexner SD. Treatment strategies in obstructed defecation and fecal incontinence. *World J Gastroenterol* 12: 20: 3168-3173, 2006.
- Kashanian M, Ali SS, Nazemi M and Bahasadi S. Evaluation of the effect of pelvic floor muscle training (PFMT or Kegel exercise) and assisted pelvic floor muscle training (APFMT) by a resistance device (Kegelmaster device) on the urinary incontinence in women: a randomized trial. *Eur J Obstet Gynecol Reprod Biol* 159: 1: 218-223, 2011.
- Boccasanta P, Venturi M, Barbieri S and Roviario G. Impact of new technologies on the clinical and functional outcome of Altemeier's procedure: a randomized, controlled trial. *Dis Colon Rectum* 49: 5: 652-660, 2006.

26. Deen KI, Grant E, Billingham C and Keighley MR. Abdominal resection rectopexy with pelvic floor repair versus perineal rectosigmoidectomy and pelvic floor repair for full-thickness rectal prolapse. *Br J Surg* 81: 2: 302-304, 1994.
27. Mollen RM, Kuijpers JH and van Hoek F. Effects of rectal mobilization and lateral ligaments division on colonic and anorectal function. *Dis Colon Rectum* 43: 9: 1283-1287, 2000.
28. Luukkonen P, Mikkonen U and Jarvinen H. Abdominal rectopexy with sigmoidectomy vs. rectopexy alone for rectal prolapse: a prospective, randomized study. *Int J Colorectal Dis* 7: 4: 219-222, 1992.
29. McKee RF, Lauder JC, Poon FW, Aitchison MA and Finlay IG. A prospective randomized study of abdominal rectopexy with and without sigmoidectomy in rectal prolapse. *Surg Gynecol Obstet* 174: 2: 145-148, 1992.
30. Novell JR, Osborne MJ, Winslet MC and Lewis AA. Prospective randomized trial of Ivalon sponge versus sutured rectopexy for full-thickness rectal prolapse. *Br J Surg* 81: 6: 904-906, 1994.
31. Selvaggi F, Scotto di Carlo E, Silvestri L, Festa L and Piegari V. Surgical treatment of rectal prolapse: a randomized study. *British Journal of Surgery* 80: S89, 1993.
32. Speakman CT, Madden MV, Nicholls RJ and Kamm MA. Lateral ligament division during rectopexy causes constipation but prevents recurrence: results of a prospective randomized study. *Br J Surg* 78: 12: 1431-1433, 1991.
33. Solomon MJ, Young CJ, Evers AA and Roberts RA. Randomized clinical trial of laparoscopic versus open abdominal rectopexy for rectal prolapse. *Br J Surg* 89: 1: 35-39, 2002.
34. Winde G, Reers B, Nottberg H, Berns T, Meyer J and Bunte H. Clinical and functional results of abdominal rectopexy with absorbable mesh-graft for treatment of complete rectal prolapse. *Eur J Surg* 159: 5: 301-305, 1993.
35. Galili Y and Rabau M. Comparison of polyglycolic acid and polypropylene mesh for rectopexy in the treatment of rectal prolapse. *Eur J Surg* 163: 6: 445-448, 1997.
36. Raftopoulos Y, Senagore AJ, Di Giuro G, Bergamaschi R and Rectal Prolapse Recurrence Study Group. Recurrence rates after abdominal surgery for complete rectal prolapse: a multicenter pooled analysis of 643 individual patient data. *Dis Colon Rectum* 48: 6: 1200-1206, 2005.
37. Glasgow SC, Birnbaum EH, Kodner IJ, Fleshman JW, Jr and Dietz DW. Recurrence and quality of life following perineal proctectomy for rectal prolapse. *J Gastrointest Surg* 12: 8: 1446-1451, 2008.
38. Kohler A and Athanasiadis S. The value of posterior levator repair in the treatment of anorectal incontinence due to rectal prolapse—a clinical and manometric study. *Langenbecks Arch Surg* 386: 3: 188-192, 2001.
39. Bachoo P, Brazzelli M and Grant A. Surgery for complete rectal prolapse in adults. *Cochrane Database Syst Rev* (2): 2: CD001758, 2000.
40. Schwenk W, Haase O, Neudecker J and Muller JM. Short term benefits for laparoscopic colorectal resection. *Cochrane Database Syst Rev* (3): 3: CD003145, 2005.
41. Sileri P, Franceschilli L, de Luca E, Lazzaro S, Angelucci GP, Fiaschetti V, Pascecenic C and Gaspari AL. Laparoscopic ventral rectopexy for internal rectal prolapse using biological mesh: postoperative and short-term functional results. *J Gastrointest Surg* 16: 3: 622-628, 2012.
42. Sammour T, Kahokehr A, Srinivasa S, Bissett IP and Hill AG. Laparoscopic colorectal surgery is associated with a higher intraoperative complication rate than open surgery. *Ann Surg* 253: 1: 35-43, 2011.
43. Purkayastha S, Tekkis P, Athanasiou T, Aziz O, Paraskevas P, Ziprin P and Darzi A. A comparison of open vs. laparoscopic abdominal rectopexy for full-thickness rectal prolapse: a meta-analysis. *Dis Colon Rectum* 48: 10: 1930-1940, 2005.
44. Germain A, Thibault F, Galifet M, Scherrer ML, Ayav A, Hubert J, Brunaud L and Bresler L. Long-term outcomes after totally robotic sacrocolpopexy for treatment of pelvic organ prolapse. *Surg Endosc* 27: 2: 525-529, 2013.
45. Makela-Kaikkonen J, Rautio T, Klintrup K, Takala H, Vierimaa M, Ohtonen P and Makela J. Robotic-assisted and laparoscopic ventral rectopexy in the treatment of rectal prolapse: a matched-pairs study of operative details and complications. *Tech Coloproctol* 2013.
46. Munz Y, Moorthy K, Kudchadkar R, Hernandez JD, Martin S, Darzi A and Rockall T. Robotic assisted rectopexy. *Am J Surg* 187: 1: 88-92, 2004.
47. Heemskerck J, de Hoog DE, van Gemert WG, Baeten CG, Greve JW and Bouvy ND. Robot-assisted vs. conventional laparoscopic rectopexy for rectal prolapse: a comparative study on costs and time. *Dis Colon Rectum* 50: 11: 1825-1830, 2007.

CME Questions

1. A patient presents to clinic with an intermittent, reducible rectal mass involving only rectal mucosa that is associated with mucous discharge. Assuming internal hemorrhoids have been ruled out as the cause, he/she most likely has:

- Complete rectal prolapse
- Intussusception
- Incomplete rectal prolapse
- Enterocoele

2. Most patients with rectal prolapse complain of:

- Constipation or fecal incontinence
- Rectal protrusion
- Rectal bleeding or mucous drainage
- All of the above

3. Which of the following pre-operative tests is most essential prior to performing surgery for rectal prolapse?

- Pelvic MRI
- Sitz marker study
- Colonoscopy
- Electromyography

4. The single “best” surgery for rectal prolapse is:

- Altemeier procedure
- Delorme procedure
- Ventral rectopexy
- It depends on the patient

Answers

- c
- d
- c
- d