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Rectocele: pathogenesis and surgical management

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Abstract *Background:* Rectocele is a common finding in patients with intractable evacuatory disorders. Although much rectocele surgery is conducted by gynecologists en passant with other forms of vaginal surgery, many reports lack appreciation of the importance of coincident anorectal symptoms, and do not report functional and clinical outcome data. The pathogenesis of rectocele is still controversial, as is the embryological and anatomical importance of the rectovaginal septum as well as recognizable defects in its integrity and its relevance in formal repair when rectocele is operated upon as the principal condition in patients with intractable evacuatory difficulty. *Discussion:* The investigation and surgical management of rectocele is controversial given the relatively small numbers of operated patients in any single specialist unit and the relative lack of prospective data concerning functional outcome in operated cases. The imaging of rectocele patients is currently in a state of change, and the newer diagnostic modalities including dynamic magnetic resonance imaging frequently display a multiplicity of pelvic floor disorders. When surgery is indicated, coloproctologists most commonly utilize an endorectal defect-specific repair, but there are few controlled randomized data regarding outcome and response criteria of specific symptoms with particular surgical

approaches. A Medline-based literature search was conducted for this review to assess the clinical results of defect-specific rectocele repairs using the endorectal, transvaginal, transperineal, or combined approaches. Only the studies are included that report both pre- and postoperative symptoms including constipation, evacuatory difficulty, pelvic pain, the impression of a pelvic mass, fecal incontinence, dyspareunia or the need for assisted digitation to aid defecation. *Conclusion:* The history of rectocele repair, its clinical and diagnostic features and the advantages, disadvantages and indications for the different surgical techniques are presented in this review. Suggested diagnostic and surgical therapeutic algorithms for management have been included. It is recommended that a multicenter controlled randomized trial comparing surgical approaches for symptomatic evacuatory dysfunction where rectocele is the principal abnormality should be conducted.

Keywords Rectocele · Endorectal repair · Transvaginal repair · Dynamic magnetic resonance imaging

Introduction

A rectocele is a herniation of the anterior rectal wall into the posterior vagina. The true incidence of this anomaly and its pathogenesis remain controversial, as are the indications for surgery when rectocele is the dominant clinical finding in patients who present with the symptom complex of evacuatory difficulty. The clinical difficulty regarding evidence-based management of rectoceles occurs for several reasons. Firstly, much of the surgical management has been reported in the gynecological literature usually in association with other procedures such as cystocele repair, hysterectomy, and levatorplasty. Moreover, most of this literature until relatively recently has not taken account of either the clinical relevance or physiological basis of associated bowel dysfunction in these patients. Secondly, there is still controversy concerning the anatomical and embryological importance (or even the presence) of the rectovaginal septum as well as its involvement in the pathogenesis of middle and low rectoceles presenting to either the gynecologist or the coloproctologist. The introduction of the endoanal approach to rectocele repair independently by Redding [1], Marks [2], and Sullivan et al. [3] defined specific defects in the rectovaginal septum thought to be important in rectocele development which could be approached via the anal canal, en passant with the performance of other local anorectal procedures. This defect-specific view for rectocele repair has recently been reinforced by elegant cadaveric work performed by Richardson [4], who demonstrated a range of simple and complex breaches in the septum worthy of transvaginal repair. The result has been a profusion of relatively short-term follow-up papers of defect-specific transvaginal repairs of middle and low rectoceles [5]. At present much of this literature, although qualitatively taking account of anorectal symptoms and bowel dysfunction, fails formally to assess manometry, coincident anorectal pathology, dynamic evacuation (whether by conventional proctography or magnetic resonance imaging), and quality of life. The result is that there are no existing randomized trials and few available physiological data prospectively assessing rectocele patients undergoing operation comparing the transvaginal and the endorectal approaches [6, 7].

Thirdly, the complexity of clinical presentation of patients with evacuatory dysfunction and coincident incontinence (which represents a relatively common mode of clinical presentation), may specifically require a transperineal approach to both the external anal sphincter and the levator floor. There are few studies assessing this operative technique and its importance in the armamentarium of the coloproctologist [8, 9]. The recent introduction of laparoscopic approaches to rectocele repair has further complicated this issue, as have conditions concomitant with rectocele requiring surgical treatment in their own right, most notably enterocele or the related problem of

vaginal vault prolapse following hysterectomy. Moreover, the controversy regarding the clinical significance of paradoxical puborectalis contraction (anismus) in association with rectocele [10] and whether its preoperative presence contraindicates rectocele repair is at present unresolved. The long-term outcome of biofeedback therapies and their use in the decision tree in this group of patients is simply unknown [11].

Given the multiplicity of pelvic floor and visceral dysfunction in patients presenting with rectocele and other related evacuatory disorders, as well as the fact that each institution has only limited surgical experience of rectocele repair, multi-institutional comparative prospective randomized trials are needed to determine surgical recommendations.

Anatomical aspects of the rectovaginal septum: the concept of the rectocele as a septal defect

There is a long-standing debate concerning the existence and integrity of the rectovaginal septum, with several initial early anatomical studies unable to determine its presence [12, 13]. These frequently quoted studies were entirely histological in nature with no correlative anatomical dissections and were contradicted by the fetal and adult cadaveric work of Uhlenluth et al. [14, 15] and Nichols and Milley [16, 17] who were able to identify a definitive anatomical and histological fascial structure between the rectum and the vagina in all dissections. More recently, Fritsch and colleagues [18, 19, 20, 21], revisiting this area using transparent plastinated fetal and adult pelvic specimens with sectional radiographic (computed tomography, magnetic resonance imaging) correlations, were also unable to demonstrate visceral fasciae surrounding the pelvic organs, suggesting that the disposition of pelvic connective tissue and the designation of potential pelvic spaces bound by visceral and parietal pelvic fascia are actually less complicated than previously reported in classical textbooks of anatomy and embryology [22, 23, 24, 25]. The findings of some of these studies using epoxy resin-impregnated plastination to mimic the in vivo anatomy of the undisturbed pelvis [26, 27, 28] have been conflicting since this technique may not adequately represent the thinner pelvic connective tissue elements [29, 30, 31, 32]. Very recent comparative fetal and adult dissections by Fritsch and her team [33, 34, 35, 36] specifically addressing the rectovaginal septum have confirmed its presence in plastinated specimens, showing it to be completely developed in the newborn.

The septum ranges in consistency from a thin, easily perforated translucent structure to a tough fascial layer requiring sharp dissection and containing a fibromuscular layer of dense collagen, abundant smooth muscle, and coarse elastic fibers. These early studies have recently

been confirmed by the cadaveric work of DeLancey [37, 38] who showed the fibers of the rectovaginal septum running vertically and blending with the muscular wall of the vagina. He suggested a multifaceted posterior vaginal support reliant upon the endopelvic fascia, levator ani muscle, and perineal membrane. Distally the perineal membrane fibers are effectively horizontal and become parasagittal in the midvagina, connecting the vaginal channel to the pelvic diaphragm. It is suggested that these structures become important in vaginal support in the pelvis if the main levator muscle is damaged or denervated.

It is believed that anatomically the rectovaginal septum represents the female analogue of the male rectovesical fascia first described by Denonvilliers in 1836 [39, 40] (see also [41, 42, 43]). The importance of this fascia was first recognized by Young [44] during radical perineal prostatectomy for cancer as a surgical landmark for urologists. Its anatomy was confirmed independently at the turn of the century by Cuneo and Veau [45] and Smith [46] and has again been extensively highlighted in the dissection of the extraperitoneal rectum for rectal cancer [47, 48]. It was believed that this fascia is a histologically totipotential, two-layered structure differentiating into connective tissue, smooth muscle, and peritoneal mesothelium, where the ventral peritoneal fusion layer and a dorsal posterior fascial layer are formed akin to the embryological development of the colonic ligaments of Toldt [49, 50, 51].

In recent years Richardson [4, 52] has called attention to the presence of “breaks” within this septum which are anatomically evident using a transvaginal approach to rectoceles, emphasizing the importance of what he describes as “defect-specific” rectocele repairs. In this sense, although short-term follow-up data emerge from the literature of such repair types for symptomatic rectocele, this is actually a gynecological “rediscovery” of the importance of defect-specific repair, which for many years has been the cornerstone of the endorectal route (as advocated by the coloproctological community). In his cadaveric and clinical operative work Richardson [4, 52] describes a taxonomy of fascial breaks with the most common type appearing as a transverse posterior separation above the attachment of the perineal body resulting in a low rectocele. The inferior variant includes an associated obstetric sphincter tear with disruption of the soft tissues of the perineal body. Rarely there is a lateral separation along the edge of the fascia with a combination of L- and U-shaped defects.

Rectocele-clinical presentation and diagnosis

Even the symptoms attributable to rectoceles are debatable since the true prevalence of incidental asymptomatic rectoceles in the general population is uncertain.

Rectoceles have been found in 20–80% of women referred to pelvic floor clinics [53] although this represents a biased sample. It has also been reported that up to one in every nine women require surgery for problems related to defective pelvic organ support [54].

Defecographic studies in normal volunteers have shown that radiologically diagnosed rectoceles are common (as defined by bulging of the anterior rectal wall during defecation and straining beyond the extrapolated line of the anterior margin of the rectum), being found in 80% of women, as well as in 13% of men undergoing proctography. In one-half of these cases the rectocele depth exceeds 1 cm; the study by Shorvon and colleagues [55] defining the size of what are referred to as “pathological” rectoceles. The larger rectocele is believed to be associated with a multitude of symptoms including difficulty in evacuation, constipation, rectal pain, and even rectal bleeding. Patients have a sensation of a vaginal mass during defecation and often describe a low rectal block during evacuation. The need for manual assistance in initiating defecation is common but not universal, occurring in 20–75% of reported cases [56, 57, 58]. It has been reported that this symptom is best correlated with a favorable outcome following surgery, regardless of the way in which this is performed [59, 60].

Constipation is reported in 75–100% of patients, although the series of referred and operated cases are also often biased [61, 62, 63, 64]. The true incidence of the significant rectocele in patients with sustained symptomatic constipation is closer to 15%, which suggests that rectocele has only a limited role in the pathophysiology of chronic constipation. Many of these reported symptoms of excessive straining, a feeling of incomplete evacuation, difficult evacuation, infrequent evacuation, and the need for digitally assisted evacuation are simply not formally evaluated at the time of initial patient consultation and are also reflected in the inherent incidence of such symptoms in observed well populations [65, 66, 67, 68]. Constipation itself is a poorly defined clinical symptom, and although not a definitive diagnosis as such, recent scoring systems are able to differentiate objectively between patients with constipation and healthy controls [69, 70]. The sensitivity and specificity of these constipation questionnaire systems are to some extent in competition, and they as yet provide neither sufficient information regarding constipation severity nor discriminatory differentiation between patients suffering from slow transit constipation and those in whom there is a primary rectal evacuation disorder [71].

Rectal pain is reported in 12–70% of patients presenting with rectocele [58, 72], with rectal bleeding occurring in 20–60% of cases [73, 74]. Long-standing cases may present with progressive fecal incontinence, urgency, tenesmus, and the effects of associated pudendal traction neuropathy regardless of the size of the rectocele. Depending upon the clinical practice the incidence of

incontinence associated with rectocele may be as high as one-third of cases [9, 75]. Coexistent anorectal pathology has been noted in up to 80% of patients, with hemorrhoids being the most commonly encountered finding [61].

Clinical diagnosis of rectoceles is made by formal examination. It is important to insert the digit into the rectum and then to rotate the examining finger to ascertain posterior vaginal wall laxity, reproducing the rectocele often as far as the hymenal ring [76]. The clinical diagnosis should also exclude the possibility of an enterocele either by a standing bimanual examination of the patient during a Valsalva maneuver [77] or with forced straining in the lithotomy position, where the "hernia contents" may manifest themselves as a lowered vaginal vault with a forward curvature of the proximal part of the posterior vaginal wall and occasionally with visible peristaltic movement [78]. The presence of an enterocele is selectively associated with a high rectocele and is more common in posthysterectomy patients [79, 80].

The definitive objective diagnosis of rectocele is most commonly made by defecography. This also assesses the size of the rectocele and its overall clinical relevance in defecation. Typically the importance has been placed upon both rectocele size and its failure to empty adequately during simulated defecation. Defecography also shows the presence of anismus and associated occult rectal prolapse, both of which may affect surgical outcome [81, 82, 83, 84]. Most studies, however, have failed to show any clear association between either the rectocele depth, its measured volume (or the completeness of emptying) and the clinical symptoms or outcome following surgical repair [85, 86, 87, 88]. Although studies have shown no real association between measured rectocele depth, area or emptying efficiency, and either manometric parameters or the need for clinical digitations, contrast-retaining rectoceles tend to be larger than nonretaining ones. The need during defecography for more complex techniques including vaginal, introital, vesical, and small bowel opacification as well as occasional simultaneous peritoneography for the diagnosis of enterocele [89, 90, 91, 92, 93] has recently been obviated by the development of high-resolution dynamic magnetic resonance imaging (MRI). This allows more accurate specific pelvic floor measurements, the definition of the complex relationship of other organs to the dynamic movement of the anorectal junction during defecation and straining, and the diagnosis of enterocele [94]. More than one-half of patients with enterocele have been found to have concomitant rectal intussusception and over one-third to have occult or overt rectal prolapse.

Dynamic fast-image sequence magnetic resonance colpocysto-rectography (MR-CCRG) was developed by Lienemann and colleagues [95, 96] to visualize the complex interaction of the pelvic floor during provocative

maneuvers in the assessment of patients primarily presenting with evacuatory difficulty and pelvic floor dysfunction. The technique was first suggested by Yang et al. [97] and Kruyt et al. [98] for the assessment of genital prolapse, using fast gradient recalled acquisition at steady state in the imaging of cystoceles. This type of dynamic imaging has shown particular advantage in the diagnosis of enterocele in patients [99], also permitting a relatively specific classification of peritoneoceles, and it is likely that this modality (when available) will replace the more invasive and cumbersome proctography. For this examination the bladder is filled with a small volume (roughly 60 ml) of isotonic saline, and the urethra is marked with a sterile cotton thread soaked with Magnevist (Schering, Berlin, Germany). The vagina is identified either with sonography gel or barium paste (mixed with Magnevist), and the rectum is filled with sonography gel to a volume at which the patient feels the need to evacuate. The most useful image is the midsagittal slice orientation using fast true imaging with steady-state progression sequences providing a higher frame rate and better in-plane resolution. This view is ideal for the provision of a complete overview of the pelvic floor structures, permitting the drawing of a coordinate system for identification of the anorectal and posterior urethrovesical angles.

There is at present no uniform classification for a pathological peritoneocele or an enterocele (particularly postoperatively) and the literature abounds with confusing terminology. Using defeco-peritoneography, Bremmer [93] reported a peritoneocele as an extension of the pouch of Douglas below the upper one-third of the vagina, which contains liquid, bowel, or rarely omentum, and whose contents may differ at different times in the same patient or during different examinations, a finding confirmed by Timmons and Addison [100]. Although there is no clear association between clinical classifications of pelvic organ prolapse and the radiological interpretations of a peritoneocele and/or an enterocele [101, 102, 103], dynamic MRI assists in delineating the abnormal rectovaginal septum for the purposes of categorization of pelvic floor disorders. In MR-CCRG the relationship between the lowest point of the peritoneal border and the pubococcygeal reference line can define a clear empty peritoneocele and an expanded septum containing small bowel loops [99]. Difficulty still exists, however, in the MR-CCRG definition of this area, where the demographic pelvic floor findings for postoperative patients have yet to be defined [104]. This technique can diagnose enteroceles by the widening of the rectovaginal space or deepening of the pouch of Douglas with or without small bowel loops beyond the pubococcygeal reference line (after both the bladder and rectum have been emptied).

MR-CCRG is the only technique at present which can depict the parietal peritoneum with precision using an appropriately chosen cross-section orientation and which

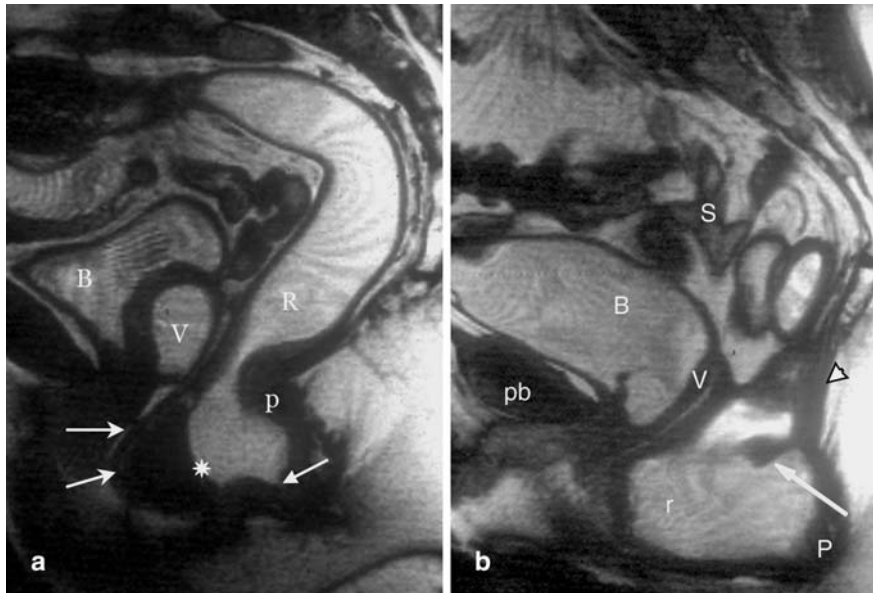


Fig. 1 **a** A 61-year-old woman with a history of urinary incontinence and fecal soiling. Midsagittal T2-weighted true fast imaging with steady-state progression image with the patient straining. During the straining maneuver there was a ventral bulging of the rectal wall together with the lower third of the dorsal vaginal wall (arrows). The classical appearance of an anterior rectocele is shown (star) without relaxation of the puborectalis sling (*P*) and with partial opening of the anal canal (arrowhead). *B* Bladder; *V* vagina (filled with sonogel); *R* rectum. **b** A 56-year-old woman with a long history of evacuatory difficulty. Midsagittal T2-weighted true fast imaging with steady-state progression image with the patient straining. This almost 6-cm-deep anterior rectocele (*r*) developed only after several attempts to defecate. Other findings include the anorectal junction (*p*), which descended well below the level of the inferior pubic rim (*pb*) and the posterior part of the levator ani muscle, which shows a steep angle (arrowhead). In addition, there is a bulging of the posterior rectal wall (arrow). These findings are typical in patients with outlet obstruction/constipation and descending perineum syndrome. *B* Bladder; *V* vagina; *S* small bowel loops

by axial turbo-spin echo sequence, distinguishes sigmoid components from those of the small bowel. Comparative studies between dynamic MRI and defecography have shown only poor correlation for physiological measurements such as anorectal junction movement and anorectal angle determination [105, 106], and the exact place of dynamic MRI in benign pelvic disorders remains to be fully evaluated [107]. The MR-CCRG approach is limited by the plane of view, where rare lateral enteroceles may be overlooked, and where the relatively nonphysiological positioning of the MRI machine for the study of evacuation results in the use of open-architecture MRI systems [108]. There is no doubt that posture differences between defecography and supine MRI contribute to diagnostic variation, particularly in conditions such as rectoanal intussusception and rectal prolapse, which are recognized only at the end of evacuation. There is also

some evidence that rectal (or other visceral) overdistension during the MR-CCRG technique (leading to the so-called “crowded pelvis syndrome”), alters pelvic visceral movement, but it is unclear whether this effect is sufficient to interfere with specific radiological diagnoses in patients with evacuatory disorders [109]. Examples of a moderate-sized and large rectocele as defined using straining MR-CCRG are shown in Fig. 1a and Fig. 1b, respectively.

More recently our group has developed a system of dynamic transperineal ultrasonography for the diagnosis of rectocele, enterocele, and peritoneocele, providing a comprehensive visualization of the interaction of the pelvic floor and viscera in these patients as well as assessing concomitant anterior perineal dysfunction without the hazards of pelvic irradiation [110]. We are presently conducting a comparative study with defecography of the accuracy of this technique in patients presenting to a dedicated pelvic floor unit with evacuatory difficulty as their principal complaint. An example of a rectocele with resting and dynamic straining sagittal transperineal ultrasonography is shown in Fig. 2. It is accepted that the effect of postural differences on diagnostic accuracy with this new technique will need to be prospectively determined [111]. A recommended diagnostic algorithm for patients with evacuatory dysfunction and clinically evident rectoceles is shown in Fig. 3a.

Surgery for rectocele

The surgical indications for rectocele repair are controversial, but most surgeons advocate operative repair when a symptomatic rectocele is large, if it fails to empty sufficiently on defecography, or if it is clinically associated with frequent vaginal or perineal manipulation by

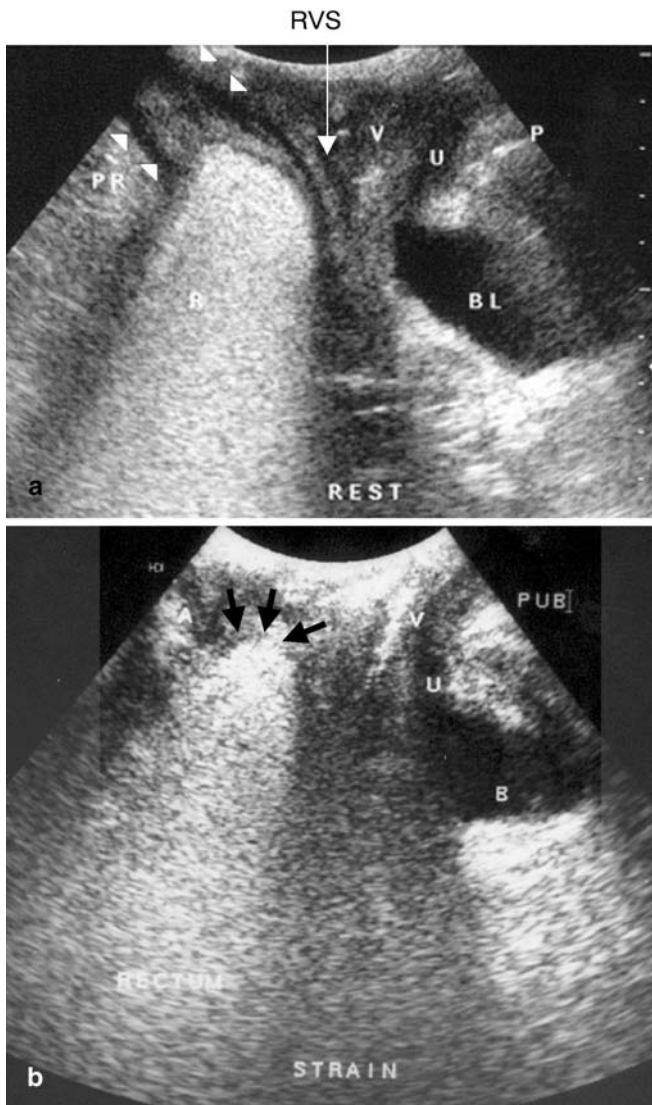


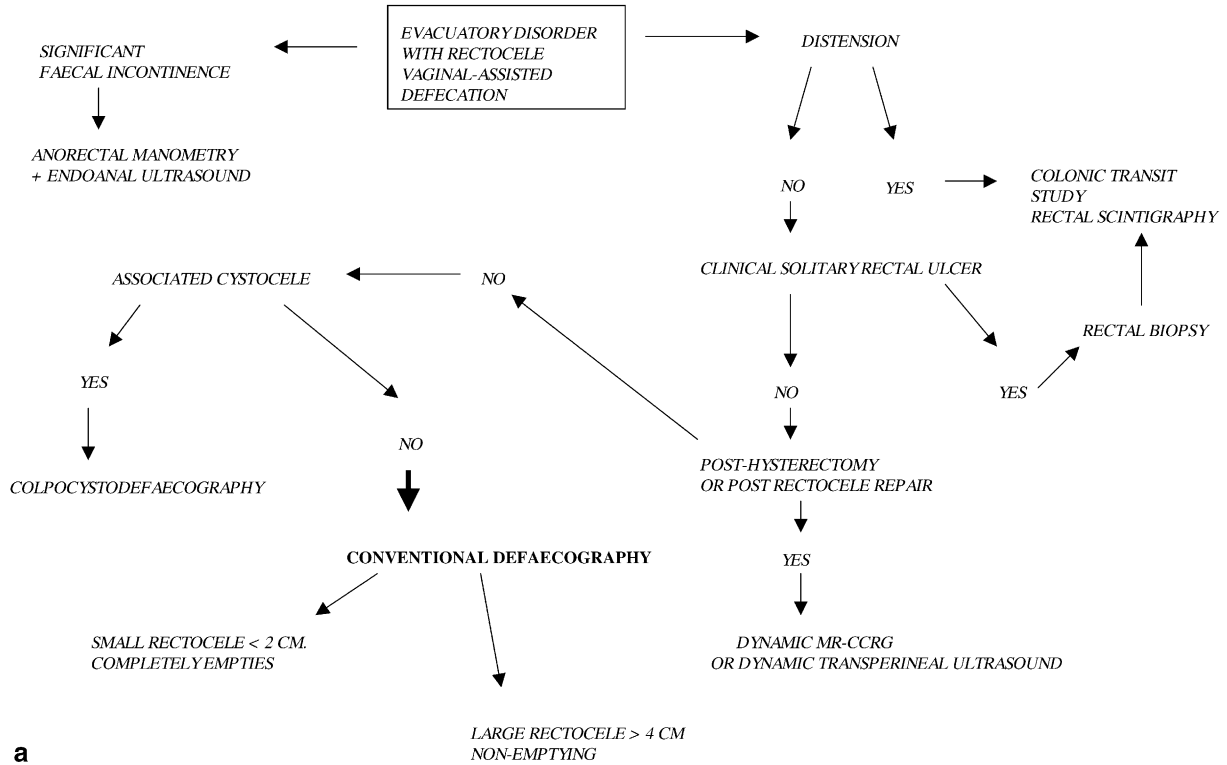
Fig. 2 Sagittal dynamic transperineal ultrasound examination at rest (**a**) and during straining (**b**) of a patient with a rectocele. **a** At rest the anal canal is recognized by the hypoechoic parallel layers of the internal anal sphincter (*arrowheads*). The puborectalis muscle (*PR*) is seen as an echoic structure posterior to the anorectal junction. The rectum (*R*) is filled with contrast. The vagina (*V*), bladder (*BL*), urethra (*U*), rectovaginal septum (*white arrow*, *RVS*), and pubic bone (*P*) are also marked. **b** During straining the anterior portion of the rectum moves forward to form a moderate sized rectocele (*arrows*). Displacement of the vagina (containing ultrasonic gel contrast) is evident. *A* Anal canal

the patient for satisfactory evacuation, often affecting the patient's quality of life. Rectocele repair may also be considered in association with perineoplasty in some cases where there is a low presentation secondary to a postobstetric injury with or without an associated low anovaginal fistula. Rectoceles may be classified according to their position (low, middle, high); size (small <2 cm, medium 2–4 cm, large >4 cm), and degree (type I

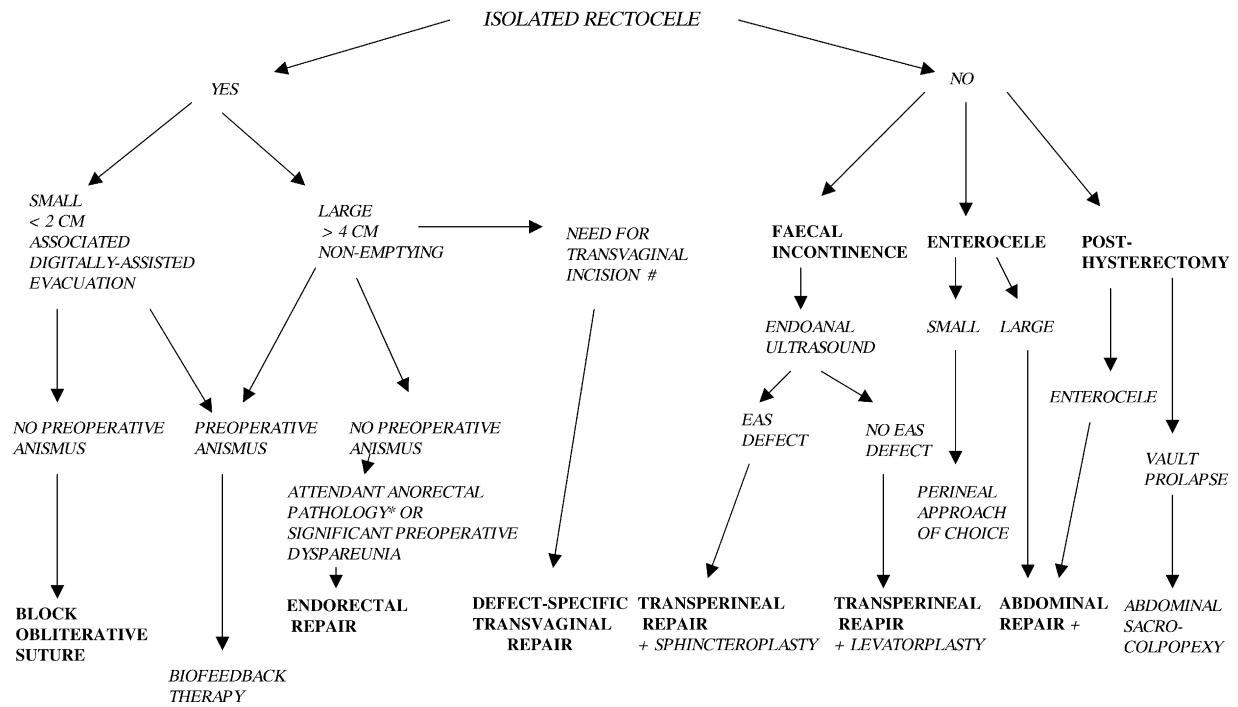
with bulging into the upper vagina, type II extending to the introitus, type III extending beyond the introitus). These classifications are purely descriptive and are not generally decision discriminants for management. As suggested by Nichols and Randall [101], anterior rectocele is further divisible into type I (so-called distension rectocele) where there is normal genital location and Type II (so-called displacement rectocele) where the posterior vaginal wall follows the descent of the vaginal vault. It has been suggested that these two types have different anatomical, clinical, and therapeutic profiles, and Pucciani et al. [112] have shown that type I rectoceles have a higher anal pressure and high-pressure zone length and a shorter total rectoanal inhibitory reflex duration and area with a higher anorectal angle and greater pelvic floor descent. It is believed by this group that this type of rectocele is linked to vaginal vault and uterovaginal prolapse and is correlated with overall pelvic floor dyssynergia as detected by defecography or by electromyography [113, 114, 115]. The displacement (type II) rectocele is associated with a diminished rectoanal inhibitory reflex, enlarged anorectal angle, and lower overall resting and squeeze pressures and is less frequently clinically associated with the need for vagina-assisted defecation and digitations [116]. There is no clear association between these rectocele types (as defined) and colonic or rectal transit. Although it is very tempting to try to use physiology to define a stereotypical rectocele patient in accordance with anatomical classifications, there appears to be little confirmation of this type of categorization in other studies [117]. Consequently there is a limited role at present for the use or predictive value of preoperative physiology for surgical decision making in rectocele [118, 119].

Approaches for rectocele repair include transvaginal colpo-perineorrhaphy, endorectal mucosectomy, transvaginal defect-specific repair, transperineal repair, and laparoscopic repair. As limited prospective data concerning functional outcome, manometry, complications, and recurrences are really available only for endorectal, transvaginal, and transperineal repairs, only the results of these procedures are presented in tabulated form. Figure 3b shows a recommended treatment algorithm for patients with symptomatic rectoceles thought to be the clinically dominant finding in the presentation of evacuatory difficulty.

Fig. 3 a Diagnostic algorithm for patients with a clinically defined rectocele and evacuatory difficulty. Dynamic magnetic resonance colpocysto-rectography and dynamic transperineal ultrasonography may be used to complement defecography. **b** Recommended surgical therapeutic algorithm for patients with symptomatic rectoceles. *EAS* External anal sphincter



a



*Including haemorrhoids or anterior rectal mucosal prolapse

b

Including cystocele, attendant colpoperineorrhaphy, need for vaginal hysterectomy, anovaginal fistula or limited sacrocolpop + Plus perineal defect-specific repair of choice

The traditional transvaginal approach: posterior colpo-perineorrhaphy

Until the early 1980s the history of rectocele surgery was one written by gynecologists, who performed posterior colporrhaphy with vaginal mucosectomy combined with anterior levator plication and some form of perineorrhaphy. Posterior colporrhaphy was an operation devised in the early nineteenth century largely to deal with perineal tears incurred during vaginal delivery. This type of perineal closure evolved into the elytorrhaphy devised specifically for prolapse and deliberately designed to denude and narrow the caliber of the vaginal introitus [120].

This operation developed further into the standard posterior colporrhaphy as described by Simon [121] in 1867 with a more aggressive plication of the inferior vaginal wall, creating a rigid inferior compartment which supported or held the cervix. The procedure was converted by Helgar into the posterior colpo-perineorrhaphy which has been extensively performed by most gynecologists until today, where the perineal body is denuded, creating a tight band just inside the vaginal introitus [122]. Posterior colpo-perineorrhaphy has been used for all forms of genital and related rectal prolapse and rectocele without any real understanding of the uterine and vaginal supports. The levator which was regarded as a purely vaginal and/or perineal support, was consequently plicated to narrow the vaginal introitus, to develop a perineal shelf, and to partially close the genital hiatus. This levatorplasty became part and parcel of the traditional transvaginal approach towards rectocele and was not part of any specific attention toward the surgical management of bowel dysfunction.

It is not surprising that this approach, which is fundamentally nonanatomical (although successful at preventing vaginal bulging on straining in about 80% of cases), has generally overall poor clinical results in objective follow-up [123]. What has become clear from the early work of Francis and Jeffcoate [124] (and other recent studies) is that this approach is associated with a high incidence of postoperative sexual dysfunction, a frequent need for reoperation, and frequent failure to alleviate important related evacuatory difficulty and attendant lower rectal symptoms [125]. These nonrandomized studies suggest that there is at least a 25% incidence of postoperative dyspareunia following reduction in vaginal and introital caliber, with up to one-third of patients still experiencing postoperative evacuatory difficulty. Over two-thirds of patients who require digital assistance or perineal pressure to evacuate before surgery do, however, appear to be cured of this symptom.

In the absence of comparative studies it is difficult to be dogmatic concerning the role of isolated transvaginal repair for symptomatic rectocele. In our institutions we recommend this approach with reconstruction of the at-

tenuated rectovaginal septum (see below) if there is the need for a transvaginal incision. This occurs if the patient requires vaginal hysterectomy or has a small associated enterocele [126], a coincident cystocele needing repair, or an anovaginal fistula [127].

Endorectal rectocele repair

Treatment of rectocele, in the way that it presents to coloproctologists, has developed as an endorectal procedure. Marks [2] was one of the first to note persistent anorectal symptoms following conventional transvaginal repair of rectoceles. These initial reports, however, were associated with very high rectal morbidity and a high incidence of postoperative rectovaginal fistula. Sullivan et al. [3] popularized the endorectal approach for rectocele and provided a plication of the rectal muscularis akin to an "internal" Delorme's procedure. The improved understanding of the nature of the rectovaginal septum and its disruption in rectocele along with the complications and poor results in terms of bowel function and evacuation afforded by transvaginal approaches have prompted considerable literature on this rediscovered endorectal approach [57, 74, 128]. This procedure has been reported independently in comparatively large series, although many studies are nonrandomized and report only limited follow-up.

Table 1 summarizes reports of the endorectal approach, its outcome for individual colorectal symptoms, and its complications where data are interpretable for the main pre- and postoperative symptoms. The technique of endorectal rectocele repair has been well described [129]. Briefly, after infiltration of the mucosa and submucosa overlying the lax rectocele a mucosal flap is raised until reaching the rectocele apex. The defect in the rectovaginal septum is usually defined by a longitudinally interrupted plication closure of the anterior rectal musculature using 3/0 vicryl sutures, although fewer sutures are generally needed if the anterior anal canal is relatively foreshortened. The excess mucosa and submucosa should be trimmed to prevent postoperative tenesmus and the mucosal flap is closed similar to an advancement anoplasty [75]. Its advantages include the ability to deal with coincident anorectal pathology (in particular hemorrhoids and/or anterior mucosal rectal prolapse), with a definitive defect-specific septal repair and excision of the redundant rectal mucosa.

This endorectal approach, however, is unable to deal with an attendant separation of the levator hiatus or an external anal sphincter defect in those also presenting with incontinence. Indeed some recent studies conclude that it is contraindicated in patients who present with combined fecal incontinence and rectocele because of its deleterious effects on internal sphincter function and resting anal pressures [130]. Variations in the orientation of

Table 1 Reported studies of endorectal rectocele repair; papers are listed in order of their referencing (– no available data in any given article concerning this parameter)

Study	<i>n</i>	Constipation (%)	Evacuatory difficulty (%)	Pelvic pain, pressure (%)	Vaginal “lump” (%)	Vaginal digitation (%)	Incontinent
Sullivan et al. [3]	117						
Preoperative		–	–	70	–	–	39
Postoperative		–	65	43	–	–	–
Van Dam et al. [6]	89						
Preoperative		56	82	–	77	23	10
Postoperative		29	24	–	19	0	16
Ayabaca et al. [9]	60						
Preoperative		83	–	–	–	18	34
Postoperative		32	–	–	–	–	14
Capps [56]	50						
Preoperative		76	–	–	–	39	–
Postoperative		24	–	–	–	–	–
Arnold et al. [73]	35						
Preoperative		75	–	–	–	–	–
Postoperative		46	–	17	–	–	34
Marti et al. [75]	150						
Preoperative		62	–	–	–	–	32
Postoperative		18	–	–	–	–	29
Ho et al. [130]	21						
Preoperative		–	90	–	–	76	0
Postoperative		–	14	–	–	0	0
Murthy et al. [136]	33						
Preoperative		35	–	–	61	58	9
Postoperative	16	–	–	12	–	–	–
Van Laarhoven et al. [137]	26						
Preoperative		–	73	–	–	50	–
Postoperative		–	38	–	–	23	–

the rectal mucosal incision and design of the mucosal flaps have been described by several authors, depending upon the size and exact location of the rectocele [56]. The partial internal plication of the muscularis during some of these procedures has the aim of reconstructing the rectovaginal septum and foreshortening the vagina [131].

Overall between 35% and 84% of patients have improved evacuatory difficulty and about 75% claim to be cured of either vaginally or rectally assisted evacuation following this surgical approach, although results are somewhat selected. In the only available randomized study comparing transvaginal with endorectal rectocele repair, by Arnold et al. [73], there is a significantly higher incidence of postoperative dyspareunia in the sexually active cohort after transvaginal surgery, although the two groups were not strictly comparable in this study. The endorectal approach described by Block [132] using an obliterative suture to incorporate the redundant mucosa and submucosa of small rectoceles is advocated where anterior prolapse is minimal (i.e., not exceeding beyond

the dentate line on maximal straining), and where the rectocele is distally located (i.e., not extending more than 5 cm above the dentate line). Although the results of this procedure are relatively satisfactory in terms of evacuatory improvement, there are no available controlled randomized trials comparing its use with other procedures, and many of Block's original patients were relatively asymptomatic before surgery. This procedure has a potential risk of soft tissue necrosis and sepsis or rectovaginal fistula formation, but it is a relatively easy procedure to perform since it does not require the construction of mucosal flaps. It is advisable to perform this simpler procedure in patients with initially good sphincter function as in these cases there is minimal concern that relatively prolonged endoanal manipulation will compromise long-term anal function [9]. This operation has subsequently been facilitated by the use of a GIA-disposable endoanal stapler [133, 134].

Although controversial, multivariate analyses in mixed studies have shown that endoanal mucosectomy is

Table 2 Reported studies of “defect-specific” transvaginal rectocele repair; papers are listed in order of their referencing (– no available data in any given article concerning this parameter)

Study	<i>n</i>	Constipation (%)	Evacuatory difficulty (%)	Pelvic pain, pressure (%)	Vaginal “lump” (%)	Vaginal digitation (%)	Incontinent	Dyspareunia
Cundiff et al. [5]	69							
Postoperative		46	–	–	–	39	13	29
Preoperative		13	–	16	15	25	8	19
Porter et al. [53]	125							
Preoperative		60	61	67	38	24	24	67
Postoperative		50	44	43	14	14	21	46
Kahn and Stanton [123]	231							
Preoperative		22	27	–	64	–	–	18
Postoperative		33	38	22	36	33	–	27
Kenton et al. [146]	66							
Preoperative		46	52	–	85	24	–	26
Postoperative		29	30	–	10	9	–	2
Glavind and Madsen [147]	67							
Preoperative		–	40	–	–	–	–	12
Postoperative		–	15	–	–	–	–	3

more successful if the rectocele is relatively large, and there is a preoperative need for vaginal digitations to assist evacuation [135, 136].

Some studies (as noted above) have failed to show a correlation between outcome and measured rectocele width or area, or the presence on defecography of barium entrapment by the rectocele [68, 69, 137]. There is also considerable debate regarding the importance of preoperative anismus (which has been reported in up to 60% of rectocele patients) in contributing to poor outcomes for rectocele repair when approached via the endorectal route [8, 138]. Many studies have, however, been unable to distinguish a necessarily poorer outcome in those with preoperative anismus [139, 140, 141, 142], although there are conflicting reports [143].

Recent studies have shown good surgical results in combined endoanal/transvaginal surgery to restore the rectovaginal septal anatomy, with clinical improvement in over 70% of cases and no recurrence after short-term follow-up [6, 144]. The expected incidence of troublesome postoperative rectovaginal fistula with this approach appears to be low. A study by van Dam et al. [145] using this combined approach with coincident perineorrhaphy showed poor outcome only in those patients who presented without a daily urge to defecate (or who had a stool frequency of less than once per week), along with radiological evidence of delayed colonic transit [145]. None of the other rectocele-related parameters such as digitations, barium entrapment, and rectocele size affected outcome.

Defect-specific transvaginal rectocele repair

The endorectal concept of “defect-specific” repair of the rectovaginal septum has recently given way in the literature to the discrete defect transvaginal repair for rectoceles, accepting that the pathogenesis of rectocele as a distortion of the rectovaginal septum is correct and applying the surgical lessons learned from an endorectal approach to the transvaginal procedure. The results of such discrete defect vaginal repairs have accrued only in short-term follow-up, but some recent large series are shown in Table 2. The impression from this early literature is that the procedure is highly successful in preventing recurrent clinical rectocele and reducing the need for digitally assisted evacuation. The improvement in the clinical symptom of constipation is seen in over 80% of cases although no data are currently available on prospective manometry or rectal transit. At least 25% of patients can expect significant postoperative dyspareunia worth reporting to their clinician [5, 123, 146, 147, 148]. Controlled randomized prospective trials comparing transvaginal with endorectal routes are clearly required where possible since transvaginal surgery is not the definitive solution in such a heterogeneous population, and fecal incontinence following transvaginal surgery has been reported in up to 36% of cases [124, 125, 149].

This “new” transvaginal approach may also provide adequate access to the lower pouch of Douglas in patients with an enterocele. It has increasingly been recognized that following hysterectomy the failure to reapproximate the pubocervical fascia to the rectovaginal fascia during vaginal cuff closure results in a fascial defect generally located at the posterior vaginal apex,

where the peritoneum comes into direct contact with the vaginal vault. This can result in an enterocele and the potential for vault apical prolapse. The condition of vaginal vault prolapse should thus be considered as a related defect-specific problem, clinically and anatomically relevant to that of both rectocele and enterocele; both of which are more common following hysterectomy [88]. In these patients either an isolated transvaginal or an abdominotransvaginal approach can be used for the resuspension of the vaginal vault if necessary in patients undergoing rectocele repair [150, 151, 152, 153, 154, 155].

Transperineal rectocele repair

There are few data concerning the use and outcome of transperineal surgery for rectocele. Watson et al. [156] and Parker and Phillips [157] have described the use of transperineally inserted mesh for the anatomical restoration of the disrupted rectovaginal septum, and initial results are encouraging with successful reduction in digital assistance for evacuation and proctographic reduction both in rectocele size and barium entrapment. Although the insertion of transvaginal prosthetic materials has been extensively described in the literature, this has been used only very little for transperineal surgery [126, 158]. We recommend that the role of transperineal prosthetic surgery for rectocele be limited at this stage to the realm of the controlled clinical trial. We do however, advocate a transperineal approach towards rectocele management combined (where appropriate) with a conventional overlapping sphincteroplasty and/or levatorplasty for the patient presenting with a symptomatic rectocele and incontinence. Preliminary data using this approach from our group and others show clinical improvement in evacuation and incontinence in about three-quarters of the operated patients, with improvement in digitation in most cases [8, 9, 159]. Furthermore, the transperineal approach provides adequate access to the lower peritoneum of the pouch of Douglas (for low "Douglassorrhaphy") as well as the potential for culdosuspension in some cases presenting with coincident vault prolapse following hysterectomy. The etiology of incontinence associated with rectocele is multifactorial, and it may be secondary to preexisting morphological defects in both the internal and external anal sphincters or to global sphincteric damage and attenuation as a result of occult associated rectoanal intussusception. In long-standing cases there is likely to be a traction pudendal neuropathy from repeated straining, and in large rectoceles it has been suggested that the anterior anal canal is asymmetrically foreshortened, resulting in an overflow-type incontinence when the rectocele is filled [75, 131].

Laparoscopic(-assisted) rectocele repair

The role of laparoscopic-assisted rectal mobilization specifically for rectocele and enterocele repair is presently unknown. Such a procedure may be supplemented by laparoscopically inserted mesh for rectovaginal reinforcement [160, 161]. Thanks to laparoscopic magnification there may be a better view of the rectovaginal space with the advantages of laparoscopically guided insufflation and hydrodissection. This is offset by technical difficulty relatively specific to laparoscopy, depending upon the extent of intraperitoneal adhesions, patient morphology, the need for additional intra-abdominal procedures, and the difficulty of dissection of a foreshortened vagina. This type of approach could be combined with a laparoscopic equivalent of a Moschcowitz [162] procedure to imbricate a redundant peritoneal pouch as well as with laparoscopic uterosacral suspension, levatorplasty, and/or sacral colpopexy for vault prolapse [163, 164]. It is hard to understand the enthusiasm for this route given the limited morbidity of transperineal and transvaginal approaches, as opposed perhaps to its more justifiable use in laparoscopic-guided culdosuspension for recurrent prolapse of the vaginal vault [165].

Summary

The pathogenesis and surgical management of rectocele remains controversial. Although it is a clinical diagnosis, an improved understanding of the complex interplay between the pelvic viscera during straining and evacuation has only recently been demonstrated using dynamic MRI and newer techniques such as dynamic transperineal ultrasonography. While these technologies are not widely available, they have shown the complexity and multiplicity of pelvic floor disorders in these patients in whom rectocele is somewhat arbitrarily regarded as the dominant clinical finding. They may prove to be especially useful in patients in whom there are discordant clinical and proctographic findings [166], in postoperative patients presenting with complex symptoms [167], and for delineating a coincident enterocele, the presence and size of which have a significant impact on determining the surgical approach [168]. Recent studies have shown that patients with mixed rectocele plus enterocele tend to have more advanced uterovaginal prolapse. Although the clinical bowel symptoms in these patients appears to be nondiscriminatory for the diagnosis of the coincident enterocele, these data confirm that some form of more advanced preoperative imaging is mandatory in patients in whom there is a clinical suspicion of mixed pelvic floor pathology and in rectocele patients who also have uterovaginal prolapse [169].

The lack of controlled data assessing the clinical, proctographic, and functional outcome of different types of

rectocele repair is problematic for the coloproctologist. Multi-institutional trials are needed to support an evidence base for the best form of surgical treatment in clinically defined subgroups; however, these would go only part of the way towards informing clinical practice. There is a bias towards easier procedures such as Block obliteration in smaller symptomatic rectoceles accompanied by other anorectal pathology and to transperineal levatorplasty or

sphincteroplasty when the rectocele is of some size and accompanied by significant incontinence. At this stage it does not appear that preoperative specialized investigations including conventional and vector volumetric assessment or transit studies influence the surgical approach. The advantages and disadvantages of and the recommendations for some of the different styles of operative approaches and their reported results are outlined in this review.

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