POP SURGERY REVIEW

Surgery for posterior vaginal wall prolapse

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Abstract

Introduction and hypothesis The aim was to review the safety and efficacy of surgery for posterior vaginal wall prolapse.

Methods Every 4 years and as part of the Fifth International Collaboration on Incontinence we reviewed the English-language scientific literature after searching PubMed, Medline, Cochrane library and Cochrane database of systematic reviews, published up to January 2012. Publications were classified as level 1 evidence (randomised controlled trials [RCT] or systematic reviews), level 2 (poor quality RCT, prospective cohort studies), level 3 (case series or retrospective studies) and level 4 (case reports). The highest level of evidence was utilised by the committee to make evidence-based recommendations based upon the Oxford grading system. Grade A recommendation usually depends on consistent level 1 evidence. Grade B recommendation usually depends on consistent level 2 and/or 3 studies, or "majority evidence" from RCTs. Grade C recommendation usually depends on level 4 studies or "majority evidence from level 2/3 studies or Delphi processed expert opinion. Grade D "no recommendation possible" would be used where the evidence is inadequate or conflicting and when expert opinion is delivered without a formal analytical process, such as by Delphi.

Results Level 1 and 2 evidence suggest that midline plication posterior repair without levatorplasty might have superior objective outcomes compared with site-specific posterior reopair (grade B). Higher dyspareunia rates are reported when levatorplasty is employed (grade C). The transvaginal approach is superior to the transanal approach for repair of posterior wall prolapse (grade A). To date, no studies have shown any benefit of mesh overlay or augmentation of a suture repair for posterior vaginal wall prolapse (grade B). While modified abdominal sacrocolpopexy results have been reported, data on how these results would compare with traditional transvaginal repair of posterior vaginal wall prolapse are lacking.

Conclusion Midline fascial plication without levatorplasty is the procedure of choice for posterior compartment prolapse. No evidence supports the use of polypropylene mesh or biological graft in posterior vaginal compartment prolapse surgery.

Keywords Rectocele · Posterior colporrhaphy

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The prevalence of rectocele in women ranges from 12.9 to 18.6 % and the average annual incidence is estimated to be 5.7 cases per 100 women years [1, 2]. Approximately 225,000 operations are performed every year in the United States for pelvic organ prolapse and repair of posterior vaginal wall is performed in between 40 and 85 % [3–5].

Terms used to describe the supportive tissue utilised for posterior wall prolapse repair date back to a publication by Francis and Jeffcoate in 1961 [6]. The concept of site-

specific repair stems from observations by Richardson, who felt that discrete defects in what he termed rectovaginal fascia should be addressed by a directed repair of the defect, thus producing a more anatomical repair in his opinion [7]. In recent years there has been a clearer understanding of the anatomy of the posterior vaginal wall and its support; however, surgical studies in this area continue to utilise terms that are not anatomically based. The goal of this review is to provide a brief overview regarding current understanding of the anatomy of the support of the posterior vaginal wall, discuss various anatomical defects that can clearly contribute to posterior vaginal wall prolapse, and finally update the previous ICI report by citing the various studies that have reported outcomes for the surgical correction of posterior vaginal wall prolapse.

Anatomy of the posterior vaginal wall

Historically, pelvic organ support, as it relates to the anterior and posterior vaginal wall compartments, has been described in relation to supportive tissues termed endopelvic fascia. In the anterior segment this has been called pubocervicovesical fascia and in the posterior segment this has been called rectovaginal fascia. Histological studies have noted that what has previously been termed fascia is actually vaginal muscularis in both the anterior and posterior segments [8]. With respect to the rectovaginal fascia it is now well appreciated that there is no such layer between the posterior vaginal wall and the anterior wall of the rectum. At the level of the mid vagina histological assessment of the posterior vaginal wall from the lumen of the vagina to the lumen of the rectum notes the following layers: the vaginal epithelium, the lamina propria of the vagina, the fibromuscular wall of the vagina (smooth muscle cells, elastin and type II collagen), the adventitia, the outer muscular wall of the rectum, the inner muscular wall of the rectum, the lamina propria of the rectum and the rectal mucosa.

DeLancey performed cross-sections on nulliparous and multiparous cadavers and noted that the support of the posterior compartment was maintained by a complex interaction of connective tissue and levator ani muscle [9]. He went on to note that the support of the posterior vaginal wall was best divided into three separate and distinct levels of support. Level III support, being the most distal portion of the vagina, is provided by the perineal membrane and the rectovaginal septum. This level of support has strong attachments to the levator ani complex and is thus less susceptible to pelvic pressure transmission that may cause prolapse. Level II, or the mid-vagina, is supported by its attachments of the vaginal muscularis laterally to the fascia of the levator ani muscles. Level I support, or the upper vagina, is supported by the cardinal–uterosacral ligament complex.

This same group of investigators recently discussed posterior vaginal wall anatomy in a review article and likened it to an open container. The front wall of the container would be formed by the posterior vaginal wall while the bottom of the container is made up of the perineal body and anal sphincters. The levator ani muscles form the lateral sides of the container and the levator plate where the muscles decussate behind the rectum to create the iliococcygeal raphe form the back wall of the container. The uppermost portion of the container would be that created by the attachment of the posterior vaginal wall to the uterosacral ligament, which extends below the peritoneum. All of these boundaries are subject to defects that can give rise to different structural failures [10].

Anatomical defects that may contribute to prolapse of the posterior vaginal wall

The patient who presents with prolapse of the posterior vaginal wall either in isolation or in conjunction with prolapse of other segments of the pelvic floor could potentially have a posterior enterocele, a rectocele, or a sigmoidocele [11]. These three conditions can occur in isolation or in conjunction with each other and will commonly be accompanied by a perineal defect and/or a widened genital hiatus. While it is beyond the scope of this article to discuss clinical and radiographic mechanisms that can be used to differentiate these various defects, suffice it to say that they can all result in descent of the posterior vaginal wall to various degrees.

The published literature continues to classify posterior vaginal repairs into what has been termed a "traditional technique", which implies that the repair has been supplemented with a levator ani muscle plication in the midline, or a "site-specific technique", which implies that discreet defects in the rectovaginal fascia are identified and repaired and no levator plication is performed. To date we are unaware of any studies that have addressed how often a posterior enterocele and or sigmoidocele coexist with a rectocele and how the presence of these defects impacts on ultimate surgical outcomes. Based on our current understanding of the anatomy of the posterior vaginal wall and perineum it is clear that the defect specific repairs involve plication of the fibromuscular layer of the posterior vaginal wall and based on the initial level of dissection this tissue may be found on the anterior wall of the rectum or may have to be mobilised off the vaginal epithelium to allow an appropriate tension-free plication. In patients with advanced prolapse and a widened genital hiatus the only way to address the gaping vagina is to routinely perform a distal levatorplasty. In the authors' opinion, future surgical studies assessing outcomes of prolapse repair involving the posterior

vaginal wall should take into consideration these points, and realise that these procedures are not mutually exclusive and that a combination of the techniques, especially in cases of advanced prolapse, is commonly required. Other types of repairs that have been reported include transanal repairs, transperineal mesh (biological or synthetic) augmented repairs, and abdominal sacral colpopexy, in which the mesh attachment is extended down to the distal portion of the posterior vaginal wall and/or perineum. The authors have also observed that aggressive reattachment of the uppermost portion of the full thickness of the posterior vaginal wall (level III support) to the uterosacral ligament provides significant support to the posterior vaginal wall in patients with high rectoceles or rectoceles in conjunction with a posterior enterocele (Fig. 1).

Midline plication or traditional posterior colporrhaphy

The mean reported anatomical success rate with this type of repair is 83 % (range 76–96 %) with a mean postoperative dyspareunia rate of 18 % (range 5–45 %) and 26 % using vaginal digitation to defecate. (Table 1)

Site-specific defect repair

This technique is similar to traditional post-repair in terms of dissection. The aim of the repair is for the surgeon to identify and individually correct breaks in the rectovaginal septum.

Traditional levatorplasty is avoided. The mean anatomical success rate is 83 % (range 56–100 %) with 18 % postoperatively needing vaginal digitation to defecate and 18 % experiencing postoperative dyspareunia (Table 2).

Abramov et al. retrospectively compared the midline fascial plication and discrete site-specific repair for rectoceles [25]. They noted a significantly higher recurrence rate of rectoceles following the discrete site-specific repair (32 % vs 13 % following midline fascial plication (P=0.015). The correction of the rectovaginal fascia defect that allows entrapment of faeces on straining in significant rectoceles may be too large to be repaired using the discrete approach [22] and appears to be corrected by the more robust midline fascial plication.

In a randomised control trial Paraiso et al. compared three techniques for rectocele repair in a prospective randomised trial [26]. Patients were randomised to receive either a traditional repair (n=37), a site-specific repair (n=37) or a site-specific repair augmented with porcine small intestine mucosa (n=32). Preoperatively, all patients had stage II or greater posterior vaginal wall prolapse. The objective anatomical failure rate was highest in the graft-augmented group (12 out of 26) at 1 year, which was statistically significantly worse than results in the site-specific group (6 out of 27) and traditional repair (4 out of 28). There was no significant difference in subjective symptoms (worsening prolapse or colorectal symptoms) or dyspareunia among the three groups.
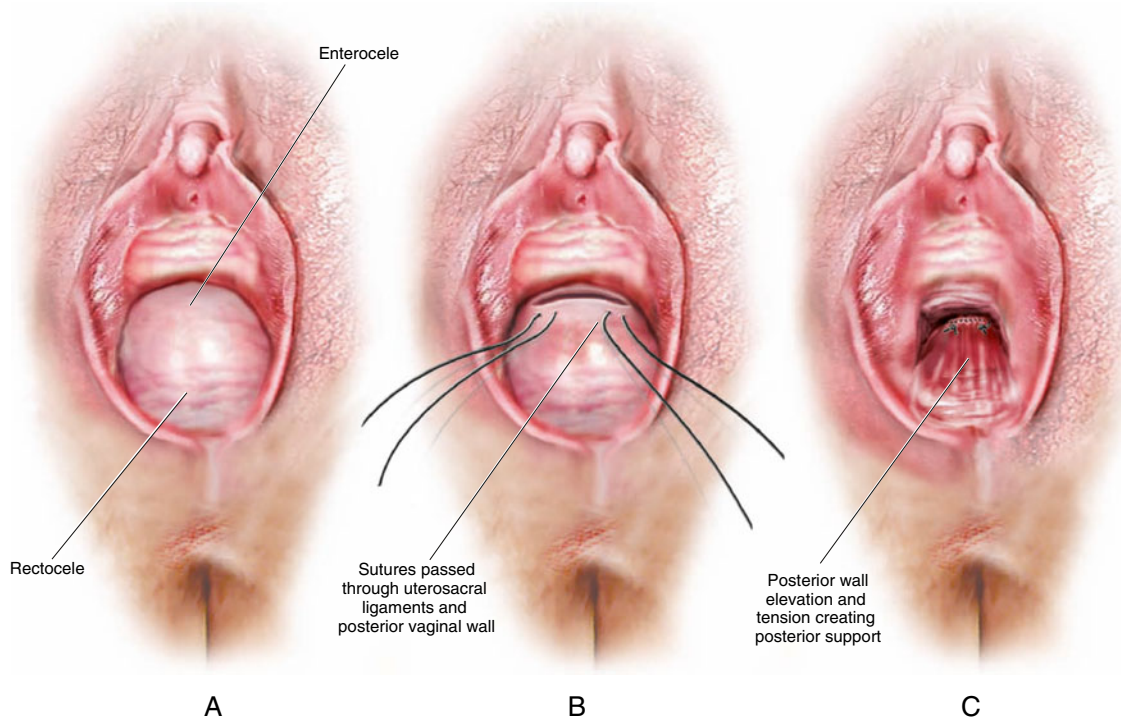

Fig. 1 Demonstrates that the rectocele (**a**) is corrected with suspension of the posterior vaginal wall to the uterosacral ligaments

Table 1 Midline plication or traditional posterior colporrhaphy

Reference	Number	Review months	Anatomic cure (%)	Vaginal bulge, %	Vaginal digitation (%)	Defecatory dysfunction (%)	Dyspareunia (%)
Arnold et al. [12]							
Preoperative	29				20		
Postoperative	24		19/24 (80)			9/24(36)	6/24 (23)
Mellgren et al. [13].							
Preoperative	25			21	50	8	
Postoperative	25	12	24/25 (96)	4	0/25 (0)	2/25(8)	2/25 (8)
Kahn and Stanton [14]							
Preoperative	231			64		4	
Postoperative	171	42	130/171 (76)	31	56/171 (33)	19/171(11)	27/171 (16)
Weber et al. [15]. (15)							
Preoperative	53	12					
Postoperative	53						14/53 (26)
Sand et al. [16]. (16)							
Preoperative	70	12					
Postoperative	67		67/70 (90)				
Maher et al. [17].							
Preoperative	38			100	100	3	37
Postoperative	38	12	33/38 (87)	5	6/38 (16)	6/38 (16)	2/38 (5)
Abramov et al. [18].							
Preoperative	183			100		17	8
Postoperative	183	>12	150/183 (82)	4		33/183 (18)	31/183 (17)
Paraiso et al. [19].							
Preoperative	37	17.5				80	56
Postoperative	28		24/28 (86)			9/28 (32)	13/28 (45)
Total			447/539 (83)		61/234 (26 %)	78/469 (17)	95/522 (18)

Recently, Sung et al. reported on a double blind multicentre randomised control trial comparing native tissue repair (70) or native tissue porcine subintestine submucosal (SIS) graft (67) for symptomatic grade 2 rectocele [27]. The native tissue repair involved either a midline plication or a site-specific repair, with the majority undergoing site-specific repair. In the graft group this repair was augmented with porcine SIS overlay. At 1 year there was no difference between the groups in objective and subjective success rates or in resolution of defecatory symptoms. Postoperative dyspareunia rates were not significantly different at 7 % in the native tissue group and 12.5 % in the graft group.

In a single trial Vijaya [28] reported at 6 months' follow-up that superior support of the posterior vaginal wall was attained after the fascial plication compared with levator ani repair. Block randomisation was performed with 26 women randomised to each operation. Allocation concealment, power analysis and status of reviewers were not reported. Anatomical outcomes were reported via Pop-Q point AP and a variety of quality of life assessments were performed without reporting of the data.

Transanal repair of rectocele

Three trials have evaluated transanal vs transvaginal repairs of rectoceles [29–31]. Each trial had slightly different inclusion criteria. Kahn and Stanton included women who had symptoms of prolapse or impaired rectal evacuation with incomplete emptying on isotope defaecography and normal compliance on anorectal manometry [29]. Nieminen et al.'s included women with symptomatic rectoceles not responding to conservative therapy. Importantly, women with compromised anal sphincter function and other symptomatic genital prolapse were excluded. In both trials the vaginal repair was performed by gynaecologists and the transanal repair by colorectal surgeons. In Kahn and Stanton's trial the posterior vaginal wall repair was performed using levator plication and in Nieminen's trial the rectovaginal fascia was plicated. Farid et al.'s inclusion criteria required women to have a rectocele larger than 2 cm on defaecography with symptoms including digitation, incomplete evacuation, excessive straining and dyspareunia. Women with a compromised anal sphincter complex or

Table 2 Site-specific posterior vaginal repair

Reference	Number	Review (months)	Anatomical cure (%)	Vaginal bulge (%)	Vaginal digitation (%)	Defecatory dysfunction (%)	Dyspareunia (%)
Cundiff et al. [20]							
Preoperative	69	12		100	39	13	29
Postoperative	61		50/61 (82)	11/61 (18)	11/61(18)	5/61 (8)	12/61 (19)
Porter et al. [21]							
Preoperative	125	6		38	24	24	67
Postoperative	72		59/72 (82)	10/72 (14)	15/72 (21)	15/72 (21)	33/72 (46)
Kenton et al. [22]							
Preoperative	66	12		86	30	30	28
Postoperative	46		41/46 (90)	4/46 (9)	7/46 (15)		4/46 (8)
Glavind and Madsen [23]							
Preoperative	67	3					12
Postoperative	67		67/67 (100)				2/67 (3)
Singh et al. [24]							
Preoperative	42	18		78		9	31
Postoperative	33		30/33 (92)	2/33 (7)		2/33 (5)	5/33 (15)
Abramov et al. [25]							
Preoperative	124			100		15	8
Postoperative	124	>12	69/124 (56)	14/124 (11)		24/124 (19)	20/124 (16)
Paraiso et al. [26]							
Preoperative	37	17.5			58		48
Postoperative	27		21/23 (78)		6/27 (21)		8/27 (28)
Sung et al. [27]							
Preoperative	80	12	63/70 (90)				
Postoperative	70			4/58 (7)	9/58 (15.5)	12/57 (21)	4/57 (7)
Total			410/496 (83)	45/394 (11.4)	48/264 (18)	58/347 (17)	88/487 (18)

recurrent prolapse, rectal prolapse, intussusception, or anismus were excluded. The surgery was performed within the surgery department and blinded examiners utilised defaecography, anal manometry and a modified obstructed defecation syndrome patient questionnaire to report outcomes.

Based on these three trials we can conclude that the results for transvaginal repair of rectocele are superior to those of transanal repair of rectocele, in terms of subjective and objective outcomes. In women with rectocele alone recurrent rectocele occurred in 2 out of 39 women in the vaginal group and 7 out of 48 following the transanal repair, a difference that did not reach statistical significance. Postoperative enterocele was, however, significantly less common following vaginal surgery compared with the transanal group.

Farid et al. [31] reported on outcomes of three types of rectocele repair comparing transperineal repair using levatorplasty with transanal repair and noted conclusions similar to the two previously discussed trials. The rectocele on defaecography was significantly smaller in the transperineal group (with or without levatorplasty) compared

with the transanal repair. Also, functional outcome based on a modified obstruction defecation syndrome patient questionnaire was better after transperineal repair than after transanal repair.

Puigdollers et al. reported results from a prospective cohort of women with rectocele and constipation who underwent surgery via either an endorectal or a transperineal approach based on surgeon preference [32]. At the end of 1 year an overall subjective improvement in constipation was reported in 43 % ($P<0.001$) and the need to splint decreased in 52 % ($P=0.001$).

Thornton et al. [33] reported in a single non-randomised study outcomes for a cohort of women with symptomatic rectocele who were treated laparoscopically ($n=40$) vs transanally ($n=40$). Level 2B evidence from this study supports the superiority of the transanal approach for symptom relief (55 % vs 28 %, $P<0.02$), but lower postoperative dyspareunia rates (22 % vs 36 %) using the laparoscopic approach.

Van Dam et al. [34] performed a combined transvaginal and transanal repair in 89 women who were evaluated at a

Table 3 Abdominal repair (posterior extension of colpopexy mesh)

Reference	n	Follow-up in months	Success, %	Dyspareunia pre-operatively, %	Post-operatively, %
Baessler et al. [36]	33	26	45	39	13
Fox and Stanton [37].	29	14	90	38	17
Su et al. [38]	122	12	90	–	–
Lyons and Winer [39]	20	12	80	–	–
Marinkovic and Stanton [40]	12	39	91	29	None

follow-up of 52 months. The anatomical success rate was 71 % (defined as no persistent or recurrent rectocele on defaecography at 6 months). However, de novo dyspareunia was reported in 41 % of women and there was a deterioration in faecal maintenance in 7 patients.

Graft augmented rectocele

Sand et al. [16] compared posterior repair with and without mesh and noted that rectocele recurrence appeared equal with and without polyglactin (vicryl) mesh augmentation (7 out of 67 vs 6 out of 65). Neither Paraiso et al. or Sung et al. noted any benefit to augmenting a native tissue repair with a porcine subintestine submucosal graft overlay [26, 27]. Mesh exposure was not reported in these trials. Altman et al. reported on a prospective evaluation of insertion of a 7×4cm porcine dermis graft at 3 years and found a 40 % recurrence rate on examination ,and while there was a significant decrease in rectal emptying difficulties compared with preoperatively less than 50 % reported cure of rectal emptying issues [35]. There was no change in the rate of anal incontinence or dyspareunia post-intervention.

Modified sacrocolpopexy

The abdominal route has been employed in the correction of posterior vaginal wall prolapse when a co-existing apical defect requires surgery. The technique is a modification of sacrocolpopexy with extension of the posterior mesh down to the distal posterior vaginal wall and/or the perineal body. The procedure has been reported completely abdominally or as a combined abdominal and vaginal approach. Table 3 summarises a series of studies that have reported on extended posterior fixation of sacrocolpopexy mesh.

Summary

- Transvaginal repair of posterior vaginal wall prolapse continues to be reported as a traditional repair with levatorplasty, midline fascial plication without levatorplasty or site-specific repair. Level 1 and 2 evidence suggest that midline plication posterior repair without levatorplasty has superior objective outcomes compared with site-specific posterior repair (grade B).
- Higher dyspareunia rate reported when levatorplasty is employed (grade C).
- Transvaginal approach is superior to the transanal approach for repair of posterior wall prolapse (grade A).
- To date no studies have shown any benefit of mesh overlay or augmentation of a suture repair for posterior vaginal wall prolapse (grade B).
- While modified abdominal sacrocolpopexy results have been reported, data on how these results would compare with traditional transvaginal repair of posterior vaginal wall prolapse are lacking.

References

1. Handa VL, Garrett E, Hendrix S, Gold E, Robbins J (2004) Progression and remission of pelvic organ prolapse: a longitudinal study of menopausal women. Am J Obstet Gynecol 190(1):27–32
2. Hendrix SL, Clark A, Nygaard I, Aragaki A, Barnabei V, McTiernan A (2002) Pelvic organ prolapse in the Women's Health Initiative: gravity and gravidity. Am J Obstet Gynecol 186(6):1160–1166
3. Boyles SH, Weber AM, Meyn L (2003) Procedures for pelvic organ prolapse in the United States, 1979–1997. Am J Obstet Gynecol 188(1):108–115
4. Olsen AL, Smith VJ, Bergstrom JO, Colling JC, Clark AL (1997) Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. Obstet Gynecol 89(4):501–506
5. Whiteside JL, Weber AM, Meyn LA, Walters MD (2004) Risk factors for prolapse recurrence after vaginal repair. Am J Obstet Gynecol 191(5):1533–1538

6. Francis WJA, Jeffcoate TNA (1961) Dyspareunia following vaginal operations. J Obstet Gynaecol Br Commonw 68:1–10

7. Richardson AC (1993) The rectovaginal septum revisited: its relationship to rectocele and its importance in rectocele repair. Clin Obstet Gynecol 36(4):976–983

8. Farrell SA, Dempsey T, Geldenhuys L (2001) Histologic examination of "fascia" used in colporrhaphy. Obstet Gynecol 98(5 Pt 1):794–798

9. DeLancey JO (1999) Structural anatomy of the posterior pelvic compartment as it relates to rectocele. Am J Obstet Gynecol 180(4):815–823

10. Lewicky-Gaupp C, Brincat C, Trowbridge ER et al (2009) Racial differences in bother for women with urinary incontinence in the Establishing the Prevalence of Incontinence (EPI) study. Am J Obstet Gynecol 201(5):510e1–510e6

11. Fenner DE (1996) Diagnosis and assessment of sigmoidoceles. Am J Obstet Gynecol 175(6):1438–1441; discussion 1441–1442

12. Arnold MW, Stewart WR, Aguilar PS (1990) Rectocele repair. Four years' experience. Dis Colon Rectum 33:684–687

13. Mellgren A, Anzen B, Nilsson BY et al (1995) Results of rectocele repair. A prospective study. Dis Colon Rectum 38(1):7–13

14. Kahn MA, Stanton SL (1997) Posterior colporrhaphy: its effects on bowel and sexual function. Br J Obstet Gynaecol 104:82–86

15. Weber AM, Walters MD, Piedmonte MR (2000) Sexual function and vaginal anatomy in women before and after surgery for pelvic organ prolapse and urinary incontinence. Am J Obstet Gynecol 182(6):1610–1615

16. Sand PK, Koduri S, Lobel RW et al (2001) Prospective randomized trial of polyglactin 910 mesh to prevent recurrence of cystoceles and rectoceles. Am J Obstet Gynecol 184(7):1357–1362

17. Maher CF, Qatwneh A, Baessler K, Schluter P (2002) Midline rectovaginal fascial plication for repair of rectocele and obstructed defecation. Int Urogynecol J Pelvic Floor Dysfunct 13(1). Abstract 166

18. Abramov Y, Kwon C, Gandhi S, Goldberg R, Sand PK (2003) Long-term anatomic outcome of discrete site-specific defect repair versus standard posterior colporrhaphy for the correction of advanced rectocele: a 1 year follow-up analysis. Neurourol Urodyn 22(5):520–521

19. Paraiso MF, Jelovsek JE, Frick A, Chen CC, Barber MD (2011) Laparoscopic compared with robotic sacrocolpopexy for vaginal prolapse: a randomized controlled trial. Obstet Gynecol 118(5):1005–1013

20. Cundiff GW, Weidner AC, Visco AG, Addison WA, Bump RC (1998) An anatomic and functional assessment of the discrete defect rectocele repair. Am J Obstet Gynecol 179(6 Pt 1):1451–1456

21. Porter WE, Steele A, Walsh P, Kohli N, Karram MM (1999) The anatomic and functional outcomes of defect-specific rectocele repair. Am J Obstet Gynecol 181:1353–1359

22. Kenton K, Shott S, Brubaker L (1999) Outcome after rectovaginal fascia reattachment for rectocele repair. Am J Obstet Gynecol 181(6):1360–1363

23. Glavind K, Madsen H (2000) A prospective study of the discrete fascial defect rectocele repair. Acta Obstet Gynecol Scand 79(2):145–147

24. Singh K, Cortes E, Reid WM (2003) Evaluation of the fascial technique for surgical repair of isolated posterior vaginal wall prolapse. Obstet Gynecol 101(2):320–324

25. Abramov Y, Gandhi S, Goldberg RP, Botros SM, Kwon C, Sand PK (2005) Site-specific rectocele repair compared with standard posterior colporrhaphy. Obstet Gynecol 105(2):314–318

26. Paraiso MFR, Barber MD, Muir TW, Walters MD (2006) Rectocele repair: a randomized trial of three surgical techniques including graft augmentation. Am J Obstet Gynecol 195(6):1762–1771

27. Sung VW, Rardin CR, Raker CA, Lasala CA, Myers DL (2012) Porcine subintestinal submucosal graft augmentation for rectocele repair: a randomized controlled trial. Obstet Gynecol 119(1):125–133

28. Vijaya G, Dell'Utri C, Derpapas A et al (2011) Prospective randomised trial comparing two surgical techniques for posterior vaginal wall prolapse using subjective and objective measures. International Continence Society; 2011; Glasgow

29. Kahn MA, Stanton SL, Kumar D, Fox SD (1999) Posterior colporrhaphy is superior to the transanal repair for treatment of posterior vaginal wall prolapse. Neurourol Urodyn 18(4):70–71

30. Nieminen K, Hiltunen KM, Laitinen J, Oksala J, Heinonen PK (2004) Transanal or vaginal approach to rectocele repair: a prospective, randomized pilot study. Dis Colon Rectum 47(10):1636–1642

31. Farid M, Madbouly KM, Hussein A, Mahdy T, Moneim HA, Omar W (2010) Randomized controlled trial between perineal and anal repairs of rectocele in obstructed defecation. World J Surg 34(4):822–829

32. Puigdollers A, Fernandez-Fraga X, Azpiroz F (2007) Persistent symptoms of functional outlet obstruction after rectocele repair. Colorectal Dis 9(3):262–265

33. Thornton MJ, Lam A, King DW (2005) Laparoscopic or transanal repair of rectocele? A retrospective matched cohort study. Dis Colon Rectum 48(4):792–798

34. Van Dam JH, Huisman WM, Hop WC, Schouten WR (2000) Fecal continence after rectocele repair: a prospective study. Int J Colorectal Dis 15(1):54–57

35. Altman D, Zetterstrom J, Mellgren A, Gustafsson C, Anzen B, Lopez A (2006) A 3-year prospective assessment of rectocele repair using porcine xenograft. Obstet Gynecol 107(1):59–65

36. Baessler K, Schuessler B (2001) Abdominal sacrocolpopexy and anatomy and function of the posterior compartment. Obstet Gynecol 97(5 Pt 1):678–684

37. Fox SD, Stanton SL (2000) Vault prolapse and rectocele: assessment of repair using sacrocolpopexy with mesh interposition. BJOG 107(11):1371–1375

38. Su KC, Mutone MF, Terry CL, Hale DS (2007) Abdominovaginal sacral colpoperineopexy: patient perceptions, anatomical outcomes, and graft erosions. Int Urogynecol J Pelvic Floor Dysfunct 18(5):503–511

39. Lyons TL, Winer WK (1997) Laparoscopic rectocele repair using polyglactin mesh. J Am Assoc Gynecol Laparosc 4(3):381–384

40. Marinkovic SP, Stanton SL (2003) Triple compartment prolapse: sacrocolpopexy with anterior and posterior mesh extensions. BJOG 110(3):323–326