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REVIEW ARTICLE

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Surgical management of anterior vaginal wall prolapse: an evidencebased literature review

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Abstract The aim of this review is to summarize the available literature on surgical management of anterior vaginal wall prolapse. A Medline search from 1966 to 2004 and a hand-search of conference proceedings of the International Continence Society and International Urogynecological Association from 2001 to 2004 were performed. The success rates for the anterior colporrhaphy vary widely between 37 and 100%. Augmentation with absorbable mesh (polyglactin) significantly increases the success rate for anterior vaginal wall prolapse. Abdominal sacrocolpopexy combined with paravaginal repair significantly reduced the risk for further cystocele surgery compared to anterior colporrhaphy and sacrospinous colpopexy. The abdominal and vaginal paravaginal repair have success rates between 76 and 100%, however, no randomized trials have been performed. There is currently no evidence to recommend the routine use of any graft in primary repairs, and possible improved anatomical out-comes have to be tempered againstcomplications including mesh erosions, infections and dyspareunia.

Keywords Cystocele · Pelvic organ prolapse · Surgery

Introduction

In 1909, Ahlfelt stated that the only problem left unresolved in plastic gynecology was the permanent cure of cystocele [1]. Nowadays, the surgical management of cystocele remains problematic with a plethora of surgical options available to the clinician. We review here the current literature to provide a contemporary evidence based approach to the surgical management of anterior vaginal compartment prolapse.

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Materials and methods

We conducted a literature review by searching the Medline database from from 1966 to August 2004, the Cochrane central Register of Controlled trials and handsearching of conference proceedings of the International Continence Society and International Urogynecological Association 2001–2004. Keywords included pelvic organ prolapse, vaginal prolapse, cystocele, anterior colporrhaphy, paravaginal repair.

After reviewing the literature, levels of evidence were attributed to all articles and finally grading guideline recommendations were developed on the efficacy of surgery for anterior vaginal wall prolapse. Levels of evidence and grading recommendations are summarized in the Appendix 1 as reported by the International Consultation on Incontinence [2] and Harbour and Miller [3]. Possible limitations to the process include a lack of available data and the inclusion of data from abstracts of the conference proceedings of the International Continence Society and International Urogynecological Association, which may not proceed to full publication in peer reviewed journals.

The definitions of success and failure vary widely among authors. More recently, with the advances made in the standardization and quantification of pelvic organ prolapse (ICS POP-Q, standardization of pelvic organ prolapse of the International Continence Society [4]), stage 1 pelvic organ prolapse is usually considered a successful outcome whereas prolapse stage 2 or more is a failure. In this review, we refer to prolapse "grades" as used by the authors (usually Baden-Walker system or Beecham classification) and to "stages" when the ICS POP-Q was employed.

Review

The literature search revealed 48 original publications on the surgical management of anterior vaginal wall prolapse. In 1913 Kelly [5] described the plication of the sphincter urethral muscle and the *anterior colporrhaphy* was born. The success rates of the anterior colporrhaphy in the management of cystoceles range from 80–100% in retrospective series (Table 1) [6–9]. Colombo et al. [10], in a randomized control trial on women with cystocele and stress urinary incontinence, demonstrated that the anterior colporrhaphy was superior to the Burch colposuspension (success rate 97% vs. 66%) in the management of the cystocele with a long-term follow-up of 14 years. Weber et al. [11] and Sand et al. [12] reported various techniques of the anterior colporrhaphy without the use of mesh to be successful in the management of cystoceles in only 42 and 57%, respectively.

White, as early as 1912, demonstrated the importance of paravaginal defects in anterior compartment prolapse. Richardson et al. [13] in 1976 described a series of defects in the pubocervical fascia explaining why no single repair should be applied indiscriminately to every one with anterior compartment defects. Richardson et al. [13] advocated the *abdominal paravaginal repair*, which has a 75–97% success rate for cystoceles reported in case series (Table 1) [14–18]. The surgical technique of the laparoscopic paravaginal repair is well described but no information is available on the efficacy of this approach.

Shull et al. [19] reported on the safety and efficacy of the *vaginal paravaginal repair* in 1994. Although the success rates of the vaginal paravaginal repair for cystoceles in case series vary from 67–100% [19–24], significant complications have been reported recently. Mallipeddi et al. [21] reported on complications in a series of 45 women including 1 bilateral ureteric obstruction, 1 retropubic haematoma requiring surgery,

Table 1 Various surgical options and their success rates in the treatment of cystocele

Authors	Number of patients	Follow-up time[a]	Success rate cystocele[b]	Complications
Anterior colporrhaphy				
Stanton et al. [7]	54	Up to 2 years	85%	
ng1031Macer [8]	109	5–20 years	80%	
Walter et al. [9]	76	1.2 years	100%	
Porges and Smilen[6]	388	2.6 years	97%	
Colombo et al. [10]	33 AC	8–17 years	97%	
	35 colposuspension	8–17 years	66%	
Sand et al. [12]	70 AC	1 year	57%	
	73 AC + mesh	1 year	75%	No mesh complications
Weber et al. [11]	57 AC	23 months	37%	
	26 AC + mesh	23 months	42%	No mesh complications
Vaginal Paravaginal Repair				
White [56]	19	Up to 3 years	100%	
Shull and Baden [14]	62	1.6 years	67%	
Grody [23]	72	0.5–3 years	99%	
Elkins et al. [20]	25	0.5–3 years	92%	
Mallipeddi et al. [21]	35	1.6 years	97%	
Young et al. [22]	100	11 months	78%	
Abdominal Paravaginal Repair				
Richardson et al. [13]	60	1.7 years	97%	
Richardson et al. [15]	213	0.5–6 years	95%	
Shull and Baden [57]	149	0.5–4 years	95%	
Bruce et al. [17]	25 APV	17 months	76%	
	27 APV + sling	17 months	93%	
Scotti et al. [18]	40	39 months	97%	
Sling type support				
Raz et al. [33]	107 AC + NS	2 years	98%	
Raz et al. [34]	50	2.8 years	90%	
Gardy et al. [58]	58 AC +NS	2 years	95%	
Safir et al. [35]	112 Raz type + polyglactin mesh	21 months	92%	
Dmochowski et al. [36]	47 Raz type	47 months	43%	
Cross et al. [59]	36 AC + sling	20 months	92%	
Goldberg et al. [38]	53 AC + sling	1 year	81%	
	90 AC	1 year	58%	
Benirzi et al. [60]	36 AC + sling	17 months	95%	
Meschia et al. [42]	25 AC + EFP	15–31 months	72%	
	25 AC + TVT	15–31 months	76%	

AC anterior colporrhaphy, *APRV* abdominal paravaginal repair, *NS* needle suspension, *EFP* endopelvic fascia plication

[a]Mean or range as provided in the papers

[b]Definitions of success vary between authors

2 vaginal abscesses, and 2 transfusions. In a series of 100 women Young et al. [22] reported 21 major complications in 100 women and a 16% transfusion rate with vaginal paravaginal repairs. A retrospective comparison of vaginal paravaginal repair employing a cadaveric versus porcine dermal graft demonstrated the superiority of the porcine graft with objective success rates (anterior vaginal wall prolapse less than stage 2) of 96% vs. 31% [25]. There are no randomized controlled or case-control trials on the surgical repair of paravaginal defects.

Anterior vaginal wall prolapse after concomitant vaginal reconstructive surgery seems to be very prominent. Paraiso et al. [26] described a 37% cystocele rate after 243 women had undergone sacrospinous colpopexy and suggested that the rate of cystocele may decrease with the iliococcygeous fixation as there is less posterior displacement of the vault. Maher et al. [27] subsequently reported high rates of cystoceles after both sacrospinous (25%) and iliococcygeous fixation (33%). Kohli et al. [28] found that a concomitant transvaginal bladder neck suspension used in conjunction with an anterior colporrhaphy was also problematic. Women undergoing anterior colporrhaphy alone had a 7% recurrence rate as compared to 33% after combined anterior colporrhaphy and needle suspension.

No randomized control studies have evaluated the *abdominal or vaginal approach* to repair cystoceles in isolation. Benson et al. [29] and Maher et al. [30] have reported randomized controlled trials on upper vaginal prolapse comparing abdominal sacral colpopexy and vaginal sacrospinous colpopexy. In both trials, an abdominal paravaginal repair was performed in the abdominal group if required, and an anterior colporrhaphy in the vaginal group; without or without vaginal paravaginal repair in Benson's trial. Women with urodynamic stress urinary incontinence underwent Burch colposuspension irrespective of their group allocation in Maher's trial. Cumulative anterior vaginal wall and vault prolapse was significantly higher after vaginal sacrospinous colpopexy with or without Burch colposuspension (45% vs. 13%; $P=0.01$) [30]. In Benson's trial, 12/42 women (29%) in the vaginal group required re-operation for cystoceles as compared to 4/38 (11%) in the abdominal group [29]. Maher et al.'s cystocele-re-operation numbers were 2/43 (5%) in the vaginal group and 0/46 in the abdominal group. These results analyzed together, show that abdominal sacrocolpopexy with paravaginal repair with or without Burch colposuspension significantly reduced the risk for further cystocele surgery (RR 0.27; 95%CI 0.09–0.85).

Transabdominal internal anterior repair (excision of a triangular wedge from anterior vaginal wall) in combination with Burch colposuspension for patients with grade 1 or 2 cystoceles and stress incontinence has been described by Quadri et al. [31] and later by Lovatsis and Drutz [32]. While the success rates for grade 1 cystoceles were excellent at 96% [31] and 89% [32], preoperative grade 2 cystoceles were cured in only 75% [31]. There was also a considerable deterioration over time with failure rates of 30% after 2 years and 61% after 5 years [32].

Raz et al. [33, 34] developed a four-corner and *4-defect repair* using a needle suspension type procedure for cystoceles. Success rates in their case series vary from 90% to 98%. In their most recent series, polyglycolic mesh was added to the repair of grade 4 cystoceles to reduce herniation of a central cystocele with a success rate of 92% [35]. Dmochowski et al. [36] however, were not able to reproduce these excellent results (Table 1). In a randomized controlled trial comparing the 4-defect repair with porcine dermis xenograft or polyglactin mesh overlay for anterior vaginal wall prolapse stage III, the cystocele success rate was significantly better in the porcine dermis group (90% vs. 69%; $P=0.002$) [37].

Goldberg et al. [38] demonstrated in a case control study of women with cystocele and stress urinary incontinence that the *addition of the pubovaginal sling* to the anterior colporrhaphy significantly reduced the recurrence rate of cystocele from 42% in the control group to 19% in the anterior colporrhaphy and sling group ($P < 0.05$) (Table 1). This finding was confirmed in a logistic regression analysis with data from this group's randomized controlled trial [12]. Another group published their results of a cadaveric cystocele repair with a pubovaginal sling [39, 40]. Of 132 patients, 11% had a grade 1 and 2% a grade 2 cystocele (Baden-Walker classification) at a minimum followup of 6 months (up to 28 months, median 15 months) [40]. While Chung et al. [41] reported similar success rates they also had to remove an autolyzed and infected graft. The *addition of a tension-free vaginal tape (TVT)* procedure to endopelvic fascia plication in women with cystocele and stress urinary incontinence did not provide better results in terms of recurrent cystocele [42].

In line with our surgical colleagues there has been a move towards the use of prosthesis to augment the native tissue repair in reconstructive gynecology. Given the relatively high failure rates of the anterior vaginal compartment at prolapse surgery it seems likely that anterior vaginal wall repair would benefit most from the use of prosthesis.

A variety of *polypropylene mesh* overlays have been evaluated for the management of cystocele. The anatomical success rates vary from 75% to 100% (Table 2) [43–50]. Julian [48] demonstrated in a prospective case-control study that in women who had undergone at least two previous vaginal repairs, the overlaying of a Marlex mesh to the anterior colporrhaphy reduced the recurrence rate of cystocele from 33 to 0%. However, the Marlex mesh was associated with a mesh erosion rate of 25% [48]. Flood et al. [49] in a retrospective review of 142 women with Marlex mesh augmentation of an anterior colporrhaphy did not detect any cystoceles beyond stage 2 (halfway to the hymen) at 3.2 years and a mesh erosion rate of 2% requiring excision of the exposed mesh.

Salvatore et al. [50] reported worrying functional outcomes after a prolene mesh overlay including a

Table 2 Review of prosthetic surgical grafts in the management of cystoceles

Author	Type of mesh	Number of patients	Follow-up time[a]	Success rate cystocele[b]	Mesh complications
Synthetic mesh					
Julian [48]	Marlex	12	2 years	100%	25% erosion, infection
	Control	12	2 years	66%	
Nicita [43]	Polypropylene (Prolene)	44	14 months	100%	
Flood et al. [49]	Marlex	142	3.2 years	100%	Three erosions
Migliari and Usai [45]	Mixed fiber	15	23 months	93%	
Migliari et al. [44]	Polypropylene	12	20 months	75%	
Natale et al. [47]	Polypropylene	138	19 months	97%	13 erosions, 9 dyspareunia
Sand et al. [12]	Polyglactin	73	1 year	75%	No mesh complications
	AC (no mesh)	70	1 year	57%	
Weber et al. [11]	Polyglactin	26	23 months	42%	No mesh complications
	AC (no mesh)	57	23 months	37%	
Salvatore et al. [50]	Polypropylene (Prolene)	32	17 months	87%	13% erosions
Dwyer and O'Reilly [46]	Polypropylene (Atrium)	81	28 months	88%	No erosions
Biological grafts					
Cosson et al. [52]	Autologous Vaginal patch	47	16 months	93%	None
Kobashi et al. [40]	cadaveric	132	6–28 months	98%	None
Chung et al. [41]	cadaveric + pubovaginal sling	19	28 months	81%	One infected graft removed
Gandhi et al. [53]	Fascia lata (Tutoplasta)	66	≥1 year	82%	
	AC (no graft)	68	≥1 year	71%	

AC anterior colporrhaphy, *APRV* abdominal paravaginal repair, *EFP* endopelvic fascia plication [a]Mean or range as provided in the papers [b]Definitions of success vary between authors

mesh erosion rate of 13%, increase of overactive bladder symptoms from 28 to 56% and increasing dyspareunia from 18 to 38% postoperatively. Visco et al. [51] suggested that the mesh erosion or infection rate was increased fourfold when mesh was introduced vaginally as compared to the abdominal route during a sacral colpopexy.

Weber et al. [11] in a randomized control trial compared the anterior colporrhaphy ($n=33$), ultra-wide anterior colporrhaphy ($n=24$) or anterior colporrhaphy with *polyglactin 910* (Vicryl) 910 mesh ($n=26$) for the management of cystoceles. At a mean follow-up of nearly 2 years there were no significant differences between the groups with 30, 46 and 42%, respectively, having satisfactory or optimal anatomic results (stage 0 or 1 according to the ICS pelvic organ prolapse quantification). There were no significant adverse effects [11]. Sand et al. [12] in a larger RCT, randomly allocated patients to receive an anterior colporrhaphy alone ($n=70$) or an anterior colporrhaphy plus polyglactin mesh augmentation ($n=73$). The success rate in the mesh group was 75% and significantly greater than the 57% success rate in the anterior repair only group ($P=0.02$). Concurrent paravaginal defects were present in 11 women and concomitant paravaginal repair was significantly associated with a lower recurrence of cystocele overall ($P=0.02$). These two studies analyzed together show that polyglactin mesh augmentation significantly improves the outcome for cystoceles (RR 1.48, 95% CI 1.07–2.04).

Alternatively to synthetic prosthetic grafts, autologous material like fascia lata or rectus sheath may have a lower risk of host rejection or infection. Cosson et al. [52] described an *autologous* 6–8-cm long and 4 cmwide vaginal patch suspended from the arcus tendinous of the pelvic fascia and tucked under the anterior repair. The success rate was 93% at a mean follow-up of 16 months (Table 2).

Allografts from postmortem tissue banks have been used for many years in orthopedic surgery and decrease the risk associated with harvesting autologous rectus sheath or fascia lata. Cadaveric fascia lata has been successfully used to augment native tissue anterior vaginal repairs with only one report of an infected graft being removed. Gandhi et al. [53] have reported results of a randomized controlled trial comparing anterior colporrhaphy, alone and augmented with fascia lata graft (Tutoplasta) for cystoceles stage 2 or more. They were not able to demonstrate that the addition of the fascial lata graft improved outcomes. The success rate after anterior colporrhaphy alone was 71% as compared to 77% in those augmented with the fascia lata graft ($P=0.38$) [53].

Concerns regarding prion transmission causing infectious diseases after use of cadaveric tissues [54], or residual antigenicity that may cause host–graft reactions have encouraged the use of porcine or bovine xenografts. Early reports on the use of porcine (Pelvicol) xenografts have been encouraging, with a success rate of 87% after a followup of at least 12 months [55]. Graft-related complications were not reported.

Conclusion

The surgical management of anterior vaginal prolapse remains controversial with limited and often conflicting levels 1 and 2 data available. In reconstructive pelvic organ prolapse surgery level 1 evidence suggests the combined use of abdominal sacral colpopexy with Burch colposuspension and paravaginal repair as required is superior to the vaginal approach including sacrospinous colpopexy and anterior colporrhaphy with or without vaginal paravaginal repair in the management of anterior vaginal wall prolapse (grade B recommendation).

Levels 1 and 2 evidence indicate that the use of absorbable mesh to augment an anterior colporrhaphy offers a superior anatomical outcome for anterior wall prolapse as compared to anterior colporrhaphy alone, although the evidence is limited. These findings cannot be simply transferred to the use of permanent mesh and have to be tempered against levels 2 and 3 evidence, suggesting that significant complications are associated with the employment of non-absorbable meshes at the time of vaginal reconstructive surgery. From the literature available no recommendation can be made on the efficacy and safety of the use of synthetic mesh overlay in the vaginal approach to anterior vaginal prolapse.

Level 2 evidence shows that in women with stress urinary incontinence and cystocele the addition of slings to the anterior colporrhaphy offers a superior anatomical outcome as compared to anterior colporrhaphy alone or in combination with other continence surgery. Grade C recommendation is made as this evidence arises from one institution and one sample of women is reported twice.

Significant further research is required into the surgical management of anterior vaginal wall prolapse including but not limited to: anterior colporrhaphy and vaginal paravaginal repair; anterior colporrhaphy with and without synthetic or biological grafts; vaginal paravaginal repair and abdominal (open or laparoscopic) paravaginal repair.

Appendix 1

Hierarchy of study types, levels of evidence and grading recommendations

Hierarchy of study types

- Systematic reviews and meta-analyses of randomised controlled trials
- Randomised controlled trials
- Non-randomised intervention studies
- Observational studies
- Non-experimental studies
- Expert opinion

Levels of Evidence

Level 1. meta-anaylsis of randomized controlled trials (RCTs) or good quality randomized controlled trial or ‘all or none’ studies in which no treatment is not an option.

Level 2. “low” quality RCT (e.g. <80% followup) or meta-analysis (with homogeneity) of prospective ‘cohort studies’ or well conducted case-control studies with a low risk of confounding and bias.

Level 3. retrospective ‘case-control studies’ or good quality ‘case series’.

Level 4. expert opinion.

The Delphi process can be used to give ‘expert opinion’ greater authority: a series of questions are posed to a panel; the answers are collected into a series of ‘options’ that are serially ranked; if a 75% agreement is reached then a Delphi consensus statement can be made.

Grades of Recommendation

Grade A. usually depends on consistent level 1 evidence; can follow from level 2 evidence if there is a large and consistent body of evidence.

Grade B. usually depends on consistent level 2 and/or 3 studies or ‘majority evidence’ or extrapolated evidence from randomized controlled trials.

Grade C. usually depends on level 4 studies or ‘majority evidence’ or extrapolated evidence from level 2/3 studies or Delphi processed expert opinion.

Grade D. “No recommendation possible” if evidence is inadequate or conflicting.

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