Anterior or Posterior Sacrospinous Vaginal Vault Suspension: Long-Term Anatomic and Functional Evaluation

Roger P. Goldberg, MD, MPH, Janet E. Tomezsko, MD, Harvey A. Winkler, MD, Sumana Koduri, MD, Patrick J. Culligan, MD, and Peter K. Sand, MD

OBJECTIVE: To compare vaginal anatomy and sexual function after the conventional posterior and anterior sacrospinous vault suspension.

METHODS: A retrospective repeated measures cohort study included all 168 consecutive sacrospinous vault suspension procedures between July 1990 and February 1997. The posterior suspension (n = 92) used a posterior vaginal incision and pararectal dissection. Anterior suspension (n = 76) involved an anterior rather than posterior vaginal incision, retropubic perforation, and dissection of a paravaginal-paravesical rather than pararectal space to accommodate the vaginal vault. Two polytetrafluoroethylene (00) sutures anchored the anterior vaginal cuff (for the anterior sacrospinous suspension) or the posterior vaginal cuff (for the posterior sacrospinous suspension) to the ligament. Postoperative evaluation included an examination using the pelvic organ prolapse quantitative system, assessment of vaginal width and axis, and symptom questionnaire.

RESULTS: Total vaginal length and apical suspension were slightly greater after the anterior suspension, and recurrent anterior vaginal relaxation was less likely. No differences were found in maximal dilator size or apical narrowing between the two groups. New onset dyspareunia was reported by two subjects in the anterior vault suspension group, and two in the posterior vault suspension group. Three of these four cases of de novo dyspareunia were attributable to either severe atrophy or recurrent prolapse, and none to vaginal narrowing or shortening.

CONCLUSION: After anterior sacrospinous vault suspension, vaginal length and apical suspension were slightly increased, and recurrent anterior vaginal prolapse decreased compared with the posterior sacrospinous suspension technique. Upper vaginal caliber and sexual function appear well preserved using either technique. (Obstet Gynecol 2001;98:199–204. © 2001 by the American College of Obstetricians and Gynecologists.)

From Evanston Continence Center, Northwestern University Medical School, Department of Obstetrics and Gynecology, Division of Urogynecology and Reconstructive Pelvic Surgery, Evanston, Illinois.

Sacrospinous vaginal vault suspension is generally regarded as a highly effective and well-tolerated surgical treatment for vaginal vault prolapse. Long-term support of the vaginal apex has been reported in 81–100% of cases after sacrospinous vaginal vault suspension,[1–3] a success rate comparable to abdominal sacral colpopexy, generally with less postoperative morbidity. Advocates of the abdominal approach to vaginal vault suspension have argued, however, that sacral colpopexy may offer a superior anatomic and functional outcome, by more effectively preserving vaginal caliber, length, and midline orientation. We recently described a modification of the sacrospinous vaginal vault suspension ("anterior sacrospinous suspension"), which evolved in an effort to address these shortcomings.

In our experience, the anterior approach appeared to reduce postoperative proximal vaginal narrowing and lateral deviation of the upper vagina, by avoiding passage through the rectal pillars. Subjectively, the anterior modification appeared to result in a capacious and highly functional proximal vagina. We performed this retrospective repeated measures study to compare long-term vaginal anatomy and sexual function in a large cohort of women who underwent either anterior sacrospinous suspension or posterior sacrospinous suspension at our center.

MATERIALS AND METHODS

The sample included 168 women who underwent either posterior or anterior sacrospinous suspension between July 1990 and February 1997, and completed a standardized postoperative physical examination and questionnaire. All subjects undergoing surgery between July 1990 and June 1993 received posterior sacrospinous suspensions. Between June 1993 and January 1997, all had anterior sacrospinous suspensions unless there was no anterior cystocele or enterocele present according to the assessment of the surgical team.

0029-7844/01/$20.00
PII S0029-7844(01)01446-6

Anterior suspension ($n = 76$) was performed as fully described in a previous report,[4] through an anterior vaginal incision, perforation into the right retropubic space, and dissection of the ipsilateral paravaginal space from the level of the bladder neck to the ischial spine, accommodating the vaginal vault. Posterior suspension ($n = 92$) involved a posterior vaginal incision, perforation of the rectal pillars, and blunt dissection of the pararectal space medial to the ligament, as described by Nichols.[5] Two polytetrafluoroethylene (00) pulley sutures were used to anchor the undersurface of the anterior vaginal cuff (anterior sacrospinous suspension) or posterior cuff (posterior sacrospinous suspension) along the sacrospinous ligament medially and laterally. During both techniques, efforts were made to space the medial and lateral fixation sutures at least 2 cm apart along the ligament. Anterior colporrhaphy was performed by dissection of the vaginal epithelium from the underlying endopelvic connective tissue to the level of the pubic rami, followed by plication with interrupted 0-polyglactin mattress sutures, and/or paravaginal repair (vaginal or abdominal). Because the time period of this study preceded the introduction of site-specific posterior colporrhaphy into our practice, rectoceles were repaired with interrupted plicating mattress sutures of 0-polyglactin along the rectovaginal endopelvic connective tissue. Enteroceles were repaired with a series of two nonabsorbable polytetrafluoroethylene sutures incorporating both uterosacral ligaments proximally, and purse-string closure of the parietal peritoneum at the level of the rectal and bladder reflections. Urogynecology fellows, operating under the supervision of a single primary surgeon, performed all operations.

Postoperative evaluation included a standardized pelvic examination, using the pelvic organ prolapse quantitative system,[6] and a visual analog symptom questionnaire completed at each office visit. Members of the surgical team performed all postoperative pelvic examinations. Silicon vaginal dilators were used for estimation of vaginal width. Narrowing of the apex of the vagina was assessed digitally and defined as less than 2 cm in diameter. Vaginal axis was calculated by measuring the angle of the vaginal dilator from the horizontal with a goniometer. The resting cotton swab angle at 6–12 weeks was also calculated, to estimate the axis of the anterior vaginal wall. At each office visit before and after surgery, patients completed a 24-question visual analogue symptom questionnaire, ranking any existing complaints on a 0 to 4 scale. For the purpose of this report, the following constellation of questions was analyzed before and after surgery: Do you have any pain with intercourse? Do you have any pain in your lower abdomen? Do you have any pressure in your lower abdomen? Do you have a backache?

Table 1. Baseline Characteristics

	Anterior sacrospinous suspension ($n = 76$)	Posterior sacrospinous suspension ($n = 92$)	P
Mean age (range)	68 (41–89)	66 (30–82)	.05
Parity	3.09	3.07	.91
Mean weight (pounds)	144.2	152.0	.05
Using ERT	43%	43%	
Cystocele grade 3–4	67 (88%)	71 (77%)	.06
Rectocele grade 3–4	26 (34%)	48 (52%)	.02
Vault prolapse grade 3–4	51 (67%)	53 (58%)	.21
Uterine prolapse grade 3–4	30 (39%)	23 (25%)	.05
Enterocele	34 (44%)	49 (53%)	.27

ERT = estrogen replacement therapy.

Student t test was used for comparing baseline characteristics and the univariate analysis of anatomic outcomes. Multivariable linear and logistic regression models were used to identify the independent effect of sacrospinous suspension type, while controlling for potentially confounding variables. Excel (Microsoft, Seattle, WA) and SPSS for Windows (SPSS, Chicago, IL) were used for data analysis.

RESULTS

Baseline characteristics for the anterior and posterior vault suspension groups are summarized in Table 1. No significant differences were found between the anterior and posterior sacrospinous suspension groups with respect to mean age, parity, use of oral estrogen replacement therapy, or prior vaginal reconstructive or incontinence surgery. Women who underwent anterior sacrospinous vault suspensions had a lower mean weight, lower mean rates of advanced rectoceles, and slightly higher rates of advanced uterine prolapse.

Table 2 summarizes the rates of concomitant surgical

Table 2. Concomitant Prolapse Surgery

	Anterior sacrospinous suspension ($n = 76$)	Posterior sacrospinous suspension ($n = 92$)	P
Vaginal hysterectomy	35 (46%)	26 (25%)	.001
Anterior colporrhaphy	71 (93%)	86 (93%)	
Posterior colporrhaphy	71 (93%)	90 (98%)	.16
Enterocele repair	58 (76%)	51 (55%)	.004
Paravaginal repair	14 (18%)	14 (15%)	.58
Needle suspension	21 (28%)	23 (25%)	.70
Suburethral sling	37 (49%)	38 (41%)	.34
Retropubic urethropexy	1 (1.3%)	5 (5.4%)	.15
Abdominal hysterectomy	1 (1.3%)		.27

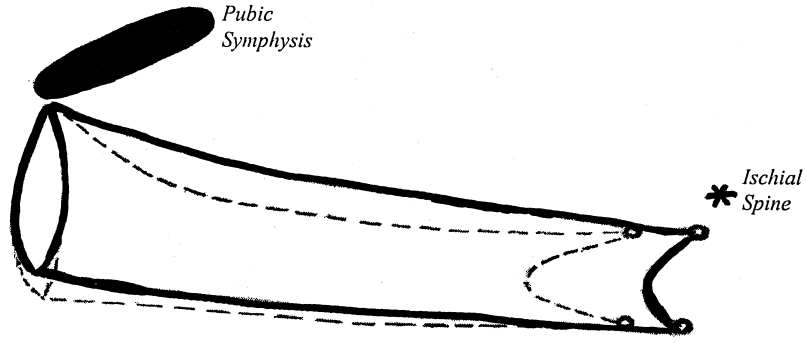

Figure 1. Anterior versus posterior sacrospinous vault suspension: Postoperative comparison based on pelvic organ prolapse quantitative system. Dotted line: posterior sacrospinous vault suspension. Solid line: anterior sacrospinous vault suspension.

Goldberg. Anatomy and Function After Sacrospinous. Obstet Gynecol 2001.

procedures accompanying sacrospinous vault suspension in each group. Vaginal hysterectomy was significantly more frequent in the posterior vault suspension group, and enterocele repairs were less likely. No differences were seen with respect to anterior or posterior colporrhaphy, vaginal paravaginal repair, needle suspension, or suburethral sling placement. The mean time interval to follow-up pelvic examination after posterior vault suspension was 53 months (range 12–72), significantly longer than 39 months for the anterior technique (range 4–37) ($P = .001$).

Quantitative pelvic organ prolapse examinations were performed on all patients. The mean total vaginal length, defined as the distance between vaginal introitus and apex, was significantly greater after anterior suspension (9.08 versus 8.33 cm, $P = .002$). The mean difference in vaginal length was 0.76 cm between the anterior and posterior sacrospinous suspension groups. Point "C" (the position of the cervix or vaginal cuff measured in centimeters from the hymenal ring during straining) was also significantly more proximal after anterior suspension (-8.51 versus -6.60 cm, $P = .04$), suggesting some advantage to the anterior modification in maintaining suspension of the vaginal apex.

A subtle but statistically significant increase in anterior vaginal wall relaxation was demonstrated after posterior suspension, according to two measures from this grading system. "Aa," defined as a point on the midline anterior vaginal wall 3 cm proximal to the hymen (range $\pm$ 3 cm), was significantly "less prolapsed" after the anterior sacrospinous suspension procedure (-2.47 versus -1.77 cm, $P = .001$). Point "Ba," representing the maximum extent of prolapse of the anterior vaginal wall, was also significantly more proximal after anterior sacrospinous suspension (-2.47 versus -1.65 cm, $P = .005$).

In contrast, posterior vaginal wall relaxation appeared to be slightly greater in the anterior group. Point "Ap," defined as a point on the midline posterior vaginal wall 3 cm proximal to the hymen (range $\pm$ 3 cm), demonstrated slightly more descent after anterior sacrospinous suspension (-2.63 versus -2.90 cm, $P = .02$). Point "Bp," representing the maximum extent of prolapse of the posterior vaginal wall during straining, was also more prolapsed (-2.56 versus -2.86 cm, $P = .05$). Figure 1 contrasts the vaginal "profiles" as defined by the pelvic organ prolapse quantitative grading system for the two study groups at long-term evaluation. Figure 2 summarizes results for both types of sacrospinous vault suspension procedures.

Table 3 summarizes the remaining anatomic and functional outcomes obtained at long-term follow-up, relating to vaginal width, vaginal axis, and occurrence of postoperative dyspareunia. There were no measurable differences between the anterior and posterior groups in the mean maximal dilator size, or in the risk of a postoperative vaginal apex measuring less than 2 cm wide. The angle of the inserted silicon dilator from the horizontal was nearly identical in the anterior and posterior groups. However, as estimated by the resting cotton-swab angle, the distal portion of anterior vaginal wall was more posteriorly deviated after posterior suspension ($\times 7.7°$ versus $+0.5°$, $P = .001$).

Sexual outcomes were assessed in 133 women: 76 after posterior sacrospinous suspension, and 57 after anterior suspension, at a median interval of 41.3 months. Before surgery, 19 (33%) were sexually active in the anterior vault suspension group, and 0% reported dyspareunia; 28 (37%) were sexually active in the posterior vault suspension group, with nine (13%) reporting dyspareunia. At long-term follow-up, two women (8%) in each group reported dyspareunia. One of these four women had severe atrophy, another had recurrent grade 3 cystocele, and one had grade 3 enterocele, which was believed to be the primary cause of their dyspareunia. In contrast, five women (all in the posterior sacrospinous suspension group) reported dyspareunia at their initial visit, which was fully relieved after surgery.

In terms of lower abdominal and lower back symptoms, we found no significant differences between the two groups. Abdominal pressure was reduced in 17 of 54

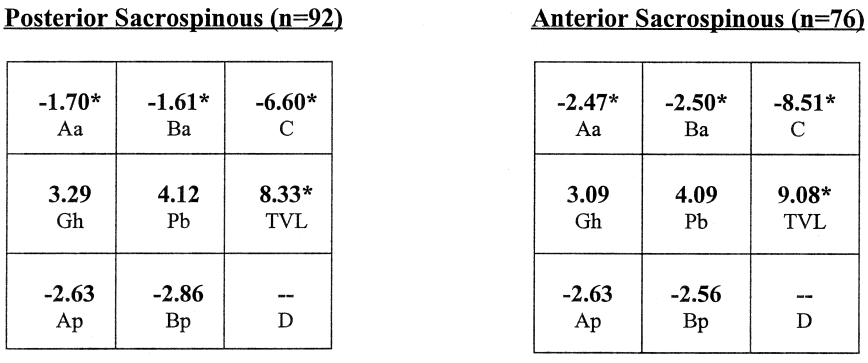

Figure 2. Long-term pelvic organ prolapse quantitative evaluation.[6] Aa: Position of midline anterior vaginal wall 3 cm proximal to the hymen (range ± 3). Ba: Maximum extent of prolapse of the anterior vaginal wall. Ap: Position of midline posterior vaginal wall 3 cm proximal to the hymen (range ± 3). Bp: Maximum extent of prolapse of the posterior vaginal wall. C: Distance of the cervix or vaginal cuff measured in centimeters from the hymen. D: Posterior fornix. TVL: Total vaginal length, distance from hymenal ring to vaginal apex. Gh: Genital hiatus, distance from external urethral meatus to posterior midline hymen. Pb: Perineal body, distance from posterior midline hymen to midanal opening. $*P < .05$.

Goldberg. Anatomy and Function After Sacrospinous. Obstet Gynecol 2001.

women after anterior vault suspension, and 22 of 70 women after the posterior technique (31% versus 31%). Lower abdominal pain was decreased after nine of 54 anterior suspensions, closely similar to nine of 70 women after posterior suspension (17% versus 13%, $P = .52$); lower abdominal pain was increased in a nearly equal subset (8.1% versus 8.4%, $P = .84$). Back pain was reportedly better in 25% and worse in 13% after posterior suspension, not significantly different from 36% and 16% after the anterior approach ($P = .23$). The overall reoperation rate was 3.9% (three of 76) after anterior sacrospinous vault suspension, significantly lower than 15.2% (14 of 92) among women who underwent posterior suspension ($P = .01$).

Table 3. Vaginal Width, Orientation, and Sexual Function

	Posterior technique	Anterior technique	*P*
Narrowing at vaginal apex*	12 (26%)	14 (23%)	.46
Maximum vaginal dilator (cm)	3.24	3.16	.22
Vaginal dilator angle (degrees)	17.5	16.1	.39
Resting cotton swab angle	−7.7°	+0.5°	.001
Postoperative dyspareunia	8%	8%	

* Proportion of women with apical width measuring less than 2 cm.

DISCUSSION

The best choice of operation for vaginal vault prolapse remains a subject of debate. Proponents of sacrospinous vaginal vault fixation highlight its safety and speed, typically short recovery period, lack of an abdominal incision, and avoidance of a graft. On the other hand, advocates of abdominal sacral colpopexy claim a superior anatomic outcome in the upper vagina because of better preservation of length, caliber, and midline vaginal orientation.

The majority of outcomes reported after sacrospinous vaginal vault fixation have focused on rates of recurrent apical and anterior vaginal prolapse. Few studies have addressed anatomical outcomes more directly relevant to vaginal function, such as length, caliber, axis, and sexual satisfaction. Elkins et al[7] reported an average vaginal length of 8.3 cm after sacrospinous ligament suspension, similar to 8.2 cm reported by Given et al.[8] Paraiso et al[9] evaluated a variety of outcomes after sacrospinous suspension, at a mean follow-up interval of 98.8 months. Vaginal length averaged 8.0 cm, and vaginal caliber was less than two fingerbreadths in 17%; new onset vaginal constriction was reported in 7.4%. Sexual dysfunction was reported in 14% of patients; however, less than half of these represented de novo cases after

surgery. Surprisingly, the authors observed that vaginal length and caliber, and the presence of specific support defects, were not significantly associated with reported sexual activity. Holley et al,[10] on the other hand, concluded that postoperative vaginal narrowing was a significant predictor of sexual activity, with 25% of patients in the series reporting postoperative sexual dysfunction. When vaginal narrowing did not occur after sacrospinous suspension and vaginal reconstruction, sexually active partners reported either unchanged or improved sexual function. These authors concluded that maintaining vaginal caliber during vault suspension is most often related to aggressive colporrhaphy and enterocele repair, rather than the vaginal vault suspension itself.

The anterior sacrospinous suspension technique was developed in an effort to address the relative limitations of the conventional sacrospinous suspension. The vertical anterior vaginal incision and retropubic entry facilitates dissection of a paravaginal and paravesical space, in contrast to the pararectal dissection used for the conventional posterior vault suspension. It has been our observation that the anterior suspension technique positions the vaginal vault in a more capacious anatomic space, in comparison to the relatively narrow pararectal area occupied by the upper vagina after posterior sacrospinous vault suspension.

Within our study sample, the anterior suspension procedure resulted in a small but statistically significant increase in vaginal length and depth of cuff suspension. Anterior vaginal wall prolapse was slightly less pronounced after anterior sacrospinous suspension, in contrast to a very small apparent increase in posterior vaginal wall relaxation when compared to the posterior sacrospinous technique. Despite these statistical differences found, considering the small absolute differences in mean pelvic organ prolapse quantitative values, their clinical significance is not certain. Finally, the type of suspension did not significantly influence postoperative vaginal caliber according to maximal dilator size, or narrowing of the vaginal apex over the fixation sutures. Wide spacing of the medial and lateral sutures at least 2 cm apart along the ligament was emphasized during both sacrospinous fixation techniques, and may have been the most important determinant of preserving apical width in both groups.

It is not fully clear to us why the anterior sacrospinous vault suspension technique should have resulted in less prolapse of the vaginal apex according to the pelvic organ prolapse quantitative system; in theory, the distance from introitus to apex should not differ between the two surgical methods. One possibility is that the posterior technique involves the creation of a relatively distal defect through the rectal pillar to gain access to the sacrospinous ligament. As a result, the proximal vagina may be more likely to assume a downward angle towards the ligament, shortening the effective length for coitus and also the length measured during examination. An alternative explanation might be that the paravesical (rather than pararectal) dissection used for the anterior sacrospinous technique resulted in more consistent exposure of the proximal portion of ligament and underlying muscle, and facilitated suture placement at that level. In contrast, the posterior approach may have promoted the placement of sutures more distally.

According to the pelvic organ prolapse quantitative system, recurrent anterior vaginal prolapse was less common after anterior suspension; posterior vaginal wall relaxation, on the other hand, was more common after anterior suspension in this series. These anterior compartment findings were particularly noteworthy, considering the high rates of postoperative cystocele formation typically accompanying the conventional posterior suspension procedure over the long term. The higher rates of recurrent cystocele we observed in the posterior suspension group could reflect a greater "exposure" of the anterior vaginal wall to intraperitoneal pressures.

There are several limitations to our study, including its observational nature, and use of historic controls rather than prospective randomization. In addition, we were challenged by the fact that there are no universally accepted standards for quantifying vaginal axis, caliber, or position after reconstructive surgery. An ideal measure would take into consideration the width and orientation of the upper, mid, and lower vagina. We combined several measures–including dilator angle, resting cotton swab angle for the distal anterior vagina, dilator width, and measured width between the sacrospinous sutures–in an effort to characterize the entire vaginal profile postoperatively. According to the mean resting dilator angle, vaginal vault orientation relative to the horizontal axis was no different between the two groups. However, this estimate was likely to be influenced by differences in levator muscle tone and degree of perineal support. Furthermore, in cases involving narrowing or lateral deviation of the upper vagina, the vaginal dilator may not have reached the apex, and thus may not have accurately reflected its orientation or width.

Sexual function was well preserved regardless of the sacrospinous suspension technique, with equally low rates of postoperative dyspareunia in both groups. All but one of the four patients who developed de novo dyspareunia had other factors likely accounting for their painful intercourse, including severe vaginal atrophy and advanced recurrent prolapse. Therefore, the type of suspension procedure did not influence the likelihood of postoperative dyspareunia within this study sample.

Similarly, there were no observed differences between the two groups with respect to abdominal pain or back pain after surgery.

Both the anterior and posterior vault suspension techniques represent effective surgical alternatives with good functional outcomes. Future prospective comparison of these alternative vault suspension techniques is warranted to explore these preliminary findings.

REFERENCES

1. Sze EHM, Karram MM. Transvaginal repair of vault prolapse: A review. Obstet Gynecol 1997;89:466–75.
2. Morley GW, DeLancey JOL. Sacrospinous ligament fixation for eversion of the vagina. Am J Obstet Gynecol 1988;158:872–81.
3. Hardiman PJ, Drutz HP. Sacrospinous vault suspension and abdominal colposacropexy: Success rates and complications. Am J Obstet Gynecol 1996;175:612–6.
4. Winkler HA, Tomeszko JE, Sand PK. Anterior sacrospinous vaginal vault suspension for prolapse. Obstet Gynecol 2000;95:612–5.
5. Nichols DH. Sacrospinous fixation for massive eversion of the vagina. Am J Obstet Gynecol 1982;142:901–4.
6. Bump RC, Mattiasson A, Bo K, Brubaker LP, DeLancey JOL, Klarskov P, et al. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. Am J Obstet Gynecol 1996;175:10–7.
7. Elkins TE, Hopper JB, Goodfellow K, Gasser R, Nolan TE, Schexnayder MC. Initial report of anatomic and clinical comparison of the sacrospinous ligament fixation to the high McCall culdeplasty for vaginal cuff fixation at hysterectomy for uterine prolapse. J Pelvic Surg 1995;1:12–7.
8. Given FT, Muhlendorf IK, Browning GM. Vaginal length and sexual function after colpopexy for complete uterovaginal eversion. Am J Obstet Gynecol 1993;169:284–7.
9. Paraiso MF, Ballard LA, Walters MD, Chi Lee J, Mitchinson AR. Pelvic support defects and visceral and sexual function in women treated with sacrospinous ligament suspension and pelvic reconstruction. Am J Obstet Gynecol 1996;175:1423–31.
10. Holley RL, Varner RE, Gleason BP, Apffel LA, Scott S. Sexual function after sacrospinous ligament fixation for vaginal vault prolapse. J Reprod Med 1996;41:355–8.

Address reprint requests to: Roger P. Goldberg, MD, MPH, Division of Urogynecology and Reconstructive Pelvic Surgery, Department of Obstetrics and Gynecology, Evanston Continence Center, Northwestern University Medical School, 1000 Central Avenue, Suite 730, Evanston, IL 60201; E-mail: rgoldberg@enh.org.

Received November 30, 2000. Received in revised form April 6, 2001. Accepted April 12, 2001.