GYNECOLOGY

Incidence of adverse events after uterosacral colpopexy for uterovaginal and posthysterectomy vault prolapse

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OBJECTIVE: We sought to describe perioperative and postoperative adverse events associated with uterosacral colpopexy, to describe the rate of recurrent pelvic organ prolapse (POP) associated with uterosacral colpopexy, and to determine whether surgeon technique and suture choice are associated with these rates.

STUDY DESIGN: This was a retrospective chart review of women who underwent uterosacral colpopexy for POP from January 2006 through December 2011 at a single tertiary care center. The electronic medical record was queried for demographic, intraoperative, and postoperative data. Strict definitions were used for all clinically relevant adverse events. Recurrent POP was defined as the following: symptomatic vaginal bulge, prolapse to or beyond the hymen, or any retreatment for POP.

RESULTS: In all, 983 subjects met study inclusion criteria. The overall adverse event rate was 31.2% (95% confidence interval [CI], 29.2—38.6), which included 20.3% (95% CI, 17.9—23.6) of subjects with postoperative urinary tract infections. Of all adverse events, 3.4% were attributed to a preexisting medical condition, while all other events were ascribed to the surgical intervention. Vaginal hysterectomy, age, and operative time were not significantly associated with any adverse event. The intraoperative bladder injury rate was 1% (95% CI, 0.6—1.9) and there were no intraoperative ureteral injuries; 4.5% (95% CI, 3.4—6.0) of cases were complicated by ureteral kinking requiring suture removal. The rates of pulmonary and cardiac complications were 2.3% (95% CI, 1.6—3.5) and 0.8% (95% CI, 0.4—1.6); and the rates of postoperative ileus and small bowel obstruction were 0.1% (95% CI, 0.02—0.6) and 0.8% (95% CI, 0.4—1.6). The composite recurrent POP rate was 14.4% (95% CI, 12.4—16.8): 10.6% (95% CI, 8.8—12.7) of patients experienced vaginal bulge symptoms, 11% (95% CI, 9.2—13.1) presented with prolapse to or beyond the hymen, and 3.4% (95% CI, 2.4—4.7) required retreatment. Number and type of suture used were not associated with a higher rate of recurrence. Of the subjects who required unilateral removal of sutures to resolve ureteral kinking, 63.6% did not undergo suture replacement; this was not associated with a higher rate of POP recurrence.

CONCLUSION: Perioperative and postoperative complication rates associated with severe morbidity after uterosacral colpopexy appear to be low. Uterosacral colpopexy remains a safe option for the treatment of vaginal vault prolapse.

Key words: apical prolapse, uterosacral colpopexy, uterosacral ligament suspension, uterovaginal prolapse, vaginal vault suspension

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Pelvic organ prolapse (POP) is a common problem in women and is associated with considerable morbidity and a decreased quality of life. In the United States, the prevalence of POP is approximately 2.9%[1] and nearly 300,000 women undergo surgery annually for prolapse.[2] As a result, the estimated direct cost of POP surgery is >$1 billion per year.[3,4]

Transvaginal and abdominal procedures exist to treat symptomatic POP. Uterosacral colpopexy is a common transvaginal procedure for vaginal prolapse and can be performed at the time of vaginal hysterectomy or for posthysterectomy vaginal vault prolapse. During this procedure, sutures are placed through the uterosacral ligaments, at or above the ischial spines and then anchored to the vaginal apex.[5] In 2010, Margulies et al[6] published a systematic review that found that uterosacral colpopexy anatomic success rates were favorable: 81.2%, 98.3%, and 87.4% for the anterior, apical, and posterior compartments, respectively. The recently published OPTIMAL trial reported that there were no significant differences in outcomes 2 years after transvaginal uterosacral colpopexy compared to sacrospinous ligament

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colpopexy.[7] While there are a number of studies reporting on subjective and objective efficacy after uterosacral colpopexy,[6,8-10] there are few large studies that specifically address the perioperative and postoperative adverse events of this procedure. Therefore, the primary objective of this study was to describe perioperative and postoperative adverse events associated with uterosacral colpopexy in a large cohort of women undergoing this procedure at a tertiary care center. Secondary aims were to describe the rate of recurrent POP associated with uterosacral colpopexy and to determine whether surgeon technique and suture choice were associated with these rates.

Materials and Methods

This was a retrospective chart review of all women who underwent uterosacral colpopexy with or without hysterectomy for POP from January 2006 through December 2011 at a single tertiary care referral center. Institutional review board approval for the study was obtained. Subjects were identified by their *Current Procedural Terminology* code for intraperitoneal colpopexy (57283). All subjects underwent transvaginal uterosacral colpopexy for either uterovaginal prolapse or posthysterectomy vaginal vault prolapse. At our institution, type of colpopexy (intraperitoneal vs extraperitoneal) is usually determined at the preoperative visit. All subjects who underwent colpopexy for uterovaginal prolapse also underwent vaginal hysterectomy. Subjects were included if they underwent concomitant transvaginal POP procedures or antiincontinence surgery with midurethral sling placement. Subjects were excluded if they underwent extraperitoneal colpopexy (ie, sacrospinous colpopexy) or any laparoscopic prolapse procedure. To account for all patients undergoing uterosacral colpopexy during the designated study period, subjects who were included in the published OPTIMAL[7] and OPUS[11] trials were also included in this study.

Once subjects were identified, the health system-wide electronic medical record was queried for demographic, intraoperative, and postoperative data. Adverse events included intraoperative events, events that occurred within the immediate 30-day postoperative period, and those that occurred within 12 months after the index surgery. All adverse events were identified via a manual chart review performed by 1 individual. Review of the chart included the detailed operative note as well as all postoperative visits and telephone calls leading up to the last day of follow-up. There is no consensus on what constitutes a clinically relevant adverse event, so we defined several adverse events a priori and classified participants using the Clavien-Dindo grading system.[12] Ureteral kinking was defined as transient obstruction of the ureter, relieved with removal of suspension sutures at the time of the index procedure; and ureteral injury was defined as transection or injury of the ureter requiring urologic repair. Postoperative ureteral obstruction was defined as patients who were determined to have hydro-ureter or nephrosis on imaging, attributed to undiagnosed obstruction at the time of surgery. Urinary tract infection (UTI) was recorded if a patient developed an infection within 12 weeks of surgery. Culture-proven UTIs as well as symptomatic UTIs resulting in treatment without cultures obtained were recorded. All patients with suspected UTI were treated with oral antibiotics. In addition to analyzing adverse events independently, we classified a patient as developing a grade $\geq$3 complication using the above-mentioned Clavien-Dindo scale. A grade 3 complication is defined as a complication requiring surgical, endoscopic, or radiologic imaging/intervention (with or without anesthesia). A grade 4 complication is one that is considered life-threatening. Recurrent POP was defined using the following definitions: symptomatic vaginal bulge, any prolapse to or beyond the hymen, or any retreatment (reoperation or pessary) for POP.[13] Data for POP recurrence were analyzed using a composite of these 3 definitions, meaning that subjects were classified as experiencing recurrent POP if they met any of the 3 defined criteria. Follow-up was recorded as the last visit a patient underwent a vaginal examination with the record noting presence or absence of vaginal vault prolapse and stage of prolapse if present. Patients were recorded as having vaginal bulge symptoms if they specifically reported the sensation of bulge in the vagina.

During the study time period, 6 surgeons performed uterosacral colpopexy for uterovaginal or posthysterectomy vaginal vault prolapse. Uterosacral colpopexy was performed using 3 techniques that differed based on surgeon suture choice and placement. Surgeon choice of technique was based solely on surgeon experience and preference during the study period, and was not related to patient characteristics such as extent of prolapse or previous POP surgery. In the first technique, a no. 0 polydioxanone and a no. 0 polypropylene suture were placed through the uterosacral ligament at the level of the ischial spine bilaterally for a total of 4 sutures (2 on each side, 1 permanent and 1 delayed-absorbable)[5,7]; in the second technique, 3 no. 0 polydioxanone sutures were placed through the uterosacral ligament at the level of ischial spine bilaterally for a total of 6 sutures (3 on each side, all delayed-absorbable).[14] The third technique was a modified high McCall culdoplasty: a no. 0 polydioxanone suture was placed bilaterally through the uterosacral ligament at the level of the ischial spine, followed by placement of 1 McCall suture using no. 0 polypropylene, or 2 McCall sutures using no. 0 polydioxanone and no. 0 polypropylene. Concomitant procedures, besides vaginal hysterectomy, included salpingo-oophorectomy, cystocele repair, rectocele repair, anal sphincter repair, and midurethral sling placement.

The primary analysis looking at perioperative and postoperative adverse events was descriptive and statistics were reported for all groups as n/N (%) with 95% confidence intervals (CIs) for categorical variables and as mean $\pm$ SD and median (range) for all continuous variables. For the secondary analysis, comparisons of outcomes were performed using a Student *t* test for parametric continuous outcomes, the Mann Whitney U test for nonparametric outcomes,

TABLE 1
Demographic data

Variable	All subjects N = 983	No adverse event (n = 671)	Any adverse event (n = 312)	*P* value
Age, y, mean (±SD)	60 (11)	60 (11)	61 (11)	.38
BMI, mean (±SD)	28.1 (5.2)	28.1 (5)	28.1 (5.4)	.90
Vaginal parity, median [range]	3 [0–10]	3 [0–10]	3 [0–10]	.64
POP stage, median [range]	3 [2–4]	3 [2–4]	3 [2–4]	.78
Menopausal, %	82.2	82.6	81.9	.78
Tobacco use, %	7.5	7.5	7.5	.68
Previous POP surgery, %	6.8	6.4	7.2	.63

BMI, body mass index; *POP*, pelvic organ prolapse.

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and a χ^2 test for all categorical outcomes. Associations between outcomes were measured using Pearson correlation. All tests were 2-sided and were considered significant at .05 level. Low event rates for most adverse events resulted in unstable logistic regression models, therefore, multivariate analyses were not possible for many adverse events reported. JMP 10.0 (SAS Institute Inc., Cary, NC) was used for all statistical analyses.

RESULTS

In all, 1038 subjects were identified and 983 met study inclusion criteria. Concomitant procedures included the following: vaginal hysterectomy (88%), unilateral salpingo-oophorectomy (5.2%), bilateral salpingo-oophorectomy (9.8%), cystocele repair (80%), rectocele repair (58.1%), anal sphincter repair (1.1%), and midurethral sling placement (58.8%). Of subjects, 46.2% (454/983) underwent uterosacral ligament suspension with 2 sutures on each side (1 permanent and 1 delayed-absorbable), 36.7% (361/983) underwent suspension with 3 sutures on each side (all delayed-absorbable), and 17.2% (168/983) underwent a combined uterosacral and McCall suspension procedure. Subjects who underwent uterosacral colpopexy without hysterectomy (subjects with posthysterectomy vaginal vault prolapse) were more likely to undergo colpopexy with 2 sutures on each side (1 permanent and 1 delayed-absorbable), rather than 3 sutures (all delayed-absorbable) (90.5% vs 9.5%, $P < .001$). Mean case time (skin incision to closure) and median postoperative day of discharge for all cases were 146 (SD±46) minutes and 1 (range, 0–7) days, respectively. The median follow-up time for this cohort was 6.9 (range, 0.2–93.8) months.

Table 1 displays demographic data for all subjects. There were no statistical differences between those subjects who experienced an adverse event and those who did not. Table 2 displays the rates of perioperative and postoperative adverse events associated with uterosacral colpopexy at the time of vaginal hysterectomy. The overall adverse event rate was 31.2% (95% CI, 29.2–38.6), which included 20.3% (95% CI, 17.9–23.6) of subjects who were treated postoperatively for symptomatic UTI. The overall adverse event rate excluding UTI was 11.4% (95% CI, 10.1–14.4). Of subjects, 29.8% (95% CI, 27.3–33.4) experienced a Dindo grade 3 or 4 adverse event; however, 69.3% (203/293) of these events involved radiologic imaging only without intervention; and overall, the rate of complications requiring additional surgical intervention for management in the cohort was 3.5%. Additionally, the rate of adverse events attributed to preexisting comorbidities was 3.4%, and all remaining events were ascribed to the index surgical intervention. Vaginal hysterectomy, age, and operative time were not significantly associated with the overall complication rate or individual adverse events.

Five subjects (0.5%; 95% CI, 0.1–0.8) required reoperation <30 days from their index surgery: 2 for management of a small bowel obstruction, 2 for management of postoperative ureteral obstruction, and 1 for management of voiding dysfunction after midurethral sling placement. The intraoperative bladder injury rate was 1% (95% CI, 0.6–1.9). There were no intraoperative ureteral injuries; however, 4.5% (95% CI, 3.4–6.0) of cases were complicated by ureteral kinking, all of which were resolved without subsequent sequelae with intraoperative suture removal with or without replacement of the vault suspension stitches. Suture type and number used on each side were not associated with the rate of ureteral kinking. The rate of postoperative ureteral obstruction was 0.5% (95% CI, 0.2–1.2) in spite of normal intraoperative cystoscopy with bilateral flow of indigo carmine (false-negative cystoscopy): 4 patients presented with postoperative flank pain, pelvic pain, fever, and/or lower urinary tract symptoms and were found on imaging to have hydroureter with or without hydronephrosis and required retrograde ureteral stenting; and 1 patient was asymptomatic but was incidentally found to have hydroureter on imaging, which resolved with expectant management. Uterosacral suspension technique was not associated with the rate of ureteral kinking or postoperative ureteral obstruction.

The rate of neurologic injury/neuropathic pain was 1.1% (95% CI, 0.6–2.0). The majority of injuries were localized to the femoral or sciatic nerve, resulting in a combination of pain, weakness, and sensory deficits. All patients were successfully treated with either expectant or conservative management and returned to baseline by 12 weeks. The rates of pulmonary and cardiac complications were 2.3% (95% CI, 1.6–3.5) and 0.8% (95% CI, 0.4–1.6), respectively. Subjects with chronic obstructive pulmonary disease (COPD) were more likely to experience postoperative pulmonary (23.0% vs 2.2%; adjusted odds ratio [adjOR], 14.8; 95% CI, 2.8–77.9; $P \leq .001$) and cardiac (14.3% vs 0.7%;

TABLE 2
Perioperative and postoperative adverse events for all subjects, N = 983

Variable	Adverse event	n/N	% (95% CI)
Intraoperative events	Bladder injury	10	1.0 (0.6–1.9)
	Ureteral kinking	44	4.5 (3.4–6.0)
	Ureteral injury	0	–
	Bowel injury	1	0.1 (0.02–0.6)
	Estimated blood loss >500 mL	14	1.4 (0.9–2.4)
Postoperative events	Reoperation <30 d	5	0.5 (0.1–0.9)
	Transfusion	16	1.6 (1.0–2.6)
	Hematoma	24	2.4 (1.6–3.6)
	Vaginal cuff cellulitis	15	1.5 (0.9–2.5)
	Pelvic abscess	5	0.5 (0.2–1.2)
	Ileus	1	0.1 (0.02–0.6)
	Small bowel obstruction	8	0.8 (0.4–1.6)
	Pulmonary	23	2.3 (1.6–3.5)
	Cardiac	8	0.8 (0.4–1.6)
	Deep vein thrombosis/pulmonary embolism	2	0.2 (0.06–0.7)
	Neurologic injury	11	1.1 (0.6–2.0)
	Postoperative ureteral injury/ obstruction	5	0.5 (0.2–1.2)
	Culture-proven urinary tract infection	200	20.3 (17.9–23.6)
	Pyelonephritis	8	0.9 (0.5–1.8)
Any adverse event	With culture-proven urinary tract infection	312	31.2 (29.2–38.6)
	Without culture-proven urinary tract infection	112	11.4 (10.1–14.4)
	Grade ≥3 Dindo complication[a]	293	29.8 (27.3–33.4)

[a] Requiring surgical, endoscopic, or radiologic intervention.

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adjOR, 20.3; 95% CI, 2.2–191.2; $P \leq .001$) complications. Similarly, subjects with cardiovascular disease were more likely to experience postoperative pulmonary (19.4% vs 0.5%; adjOR, 14.1; 95% CI, 5.3–37.6; $P \leq .001$) and cardiac (11.1% vs 0.6%; adjOR, 34.5; 95% CI, 7.4–160.8; $P \leq .001$) complications.

The rate of postoperative ileus and small bowel obstruction was 0.1% (95% CI, 0.02–0.6) and 0.8% (95% CI, 0.4–1.6), respectively. Known abdominal and pelvic adhesive disease (defined as known pelvic adhesions or a previous diagnosis of endometriosis) was associated with a higher likelihood of postoperative small bowel obstruction (7.7% vs 0.8%; $P = .01$; adjOR, 10.0; 95% CI, 1.2–88.5), whereas history of bowel disease (defined as diverticulitis, inflammatory bowel disease, or previous bowel surgery) was not significantly associated with ileus and/or small bowel obstruction. Postoperative UTI was not found to be significantly associated with any preoperative risk factors. Subjects with obstructive sleep apnea (OSA) were more likely to experience any adverse event (adjOR, 7.2; 95% CI, 2.0–45.5; $P < .001$). The following variables were associated with any adverse event after excluding UTI: OSA (adjOR, 3.3; 95% CI, 1.3–8.2; $P = .008$), cardiovascular disease (adjOR, 3.0; 95% CI, 1.5–5.9; $P < .001$), and concomitant midurethral sling placement (adjOR, 1.4; 95% CI, 1.1–2.0; $P = .02$).

The composite recurrent POP rate over the 6.9-month median follow-up period was 14.4% (95% CI, 12.4–16.8) with 10.6% (95% CI, 8.8–12.7) experiencing vaginal bulge symptoms, 11% (95% CI, 9.2–13.1) with prolapse at or beyond the hymen, and 3.4% (95% CI, 2.4–4.7) requiring retreatment for POP with either reoperation or the use of a pessary. Of subjects who reported bulge symptoms, 70/104 (67.3%) were noted to have prolapse at or beyond the hymen on examination. Recurrence was distributed over the 3 compartments: 55% anterior, 33.9% posterior, and 15.1% apical with or without anterior and/or posterior prolapse. Using all definitions for recurrence, preoperative pelvic organ prolapse quantification (POP-Q) stage was not associated with POP recurrence. Number of sutures used at the time of colpopexy was also not associated with a higher rate of composite recurrence: 12.5% (95% CI, 8.3–18.4) with the 2 high uterosacral sutures and McCall technique, 14.8% (95% CI, 12–18.1) with 4 sutures placed, and 14.1% (95% CI, 11.2–17.7) with 6 sutures placed; $P = .74$. Similarly, type of suture placed (combination delayed-absorbable and permanent vs delayed-absorbable only) was not associated with composite recurrence. Of the 4.5% (44/983) of subjects who required unilateral removal of colpopexy sutures to resolve ureteral kinking, 63.6% (28/44) did not undergo replacement of these sutures, resulting in a unilateral suspension. There was no difference in composite recurrent POP in patients who underwent suture replacement after unilateral ureteral kinking (11.1%; 95% CI, 9.2–15.8) and those who did not have sutures replaced (14.5%; 95% CI, 12.5–16.9), $P = .68$. The overall rate of granulation tissue was 10.7% (95% CI, 8.9–12.8); there was no difference in the rate of granulation tissue found in patients who underwent colpopexy with

delayed-absorbable and permanent suture (10.7%; 95% CI, 8.7−13.1) and those who had delayed-absorbable suture only placed (10.2%; 95% CI, 6.8−15.2), $P = .19$. Suture erosion and need for suture removal in the office was more common in patients who had permanent suture placed compared to delayed-absorbable only, but this difference was not statistically significant: 6.2% (95% CI, 4.7−8.1) vs 2.4% (95% CI, 1−5.6), $P = .10$.

Comment

The objective of this study was to report on the rates of adverse events after uterosacral colpopexy and to determine the recurrent POP rate in a large cohort of women undergoing this procedure. We found that in subjects undergoing uterosacral colpopexy for uterovaginal and posthysterectomy vaginal vault prolapse from 2006 through 2011, the overall rates of perioperative and postoperative adverse events were low. We also found that our composite recurrent POP rate was similar to the rates reported in the literature.[6]

As surgeons, we strive to reduce morbidity while achieving excellent surgical efficacy; therefore, the topic of perioperative and postoperative outcomes remains an important one. A MEDLINE search from 1998 through 2013 using search terms "uterosacral ligament suspension," "uterosacral colpopexy," and "vaginal vault suspension" confirm that this is the largest series to date looking at outcomes after uterosacral ligament suspension, and our findings augment the current published data and fill in knowledge gaps regarding postoperative events that are less often studied.

Vaginal hysterectomy, age, and operative time were not determined to be significant risk factors for perioperative and postoperative complications. However, subjects with COPD, OSA, or preexisting cardiac disease were more likely to experience postoperative pulmonary and cardiac complications such as pulmonary edema and hypertension, arrhythmia, and heart failure. Given the retrospective nature of this study, we were not able to stratify by severity of COPD. However, our findings are consistent with other studies that have shown that COPD in general is a risk factor for perioperative morbidity after urogynecologic and nonurogynecolgic surgery. For example, in a study published by Catanzarite et al,[15] COPD was significantly associated with 30-day perioperative complications in patients who underwent LeFort colpocleisis. Similarly, COPD was shown to increase the length of hospital stay in coronary artery bypass graft surgery patients[16] and was also found to be the only preoperative comorbid medical condition that increased the risk of readmission in a large cohort of patients who underwent outpatient thyroidectomy.[17] Surgeons should always strive to ensure that their patients are optimized from a pulmonary and cardiac standpoint before proceeding with surgery. Patients with COPD may require special attention preoperatively.

We also found that the rates of postoperative ileus and small bowel obstruction were low: 0.1% and 0.8%, respectively. Interestingly, a history of bowel disease was not associated with the development of postoperative ileus and/or small bowel obstruction. However, known abdominal and/or pelvic adhesive disease was associated with a higher risk of developing a postoperative small bowel obstruction. Our findings are not that surprising given that we know that up to 93% of patients may form adhesions after abdominal and pelvic surgeries,[18] and that approximately 75% of small bowel obstructions are thought to result from adhesions.[19] The rate of small bowel obstruction after vaginal hysterectomy has been shown to be very low (0.12%)[20] and, in our study, the overall rate of small bowel obstruction after uterosacral colpopexy was low as well. However, a history of known pelvic adhesive disease may be sufficient to predispose patients to developing a small bowel obstruction with subsequent surgeries; therefore, patients should be carefully counseled about this risk.

The rate of UTI after pelvic reconstructive surgery ranges from 9−31%[11,21] with postoperative catheterization acting as the biggest risk factor.[22] In this study, 20.3% of subjects had a culture-proven UTI within 12 weeks of surgery, which is consistent with the rates that are reported in the literature. There were no patient-specific risk factors associated with postoperative UTI. In our practice, we routinely perform a retrograde voiding trial prior to patient discharge from the hospital and we do not prescribe prophylactic antibiotics for patients who are discharged home with a Foley catheter. In this study, we did not determine the proportion of patients who were discharged home with a catheter, and therefore, could not determine whether our UTI rate was mostly attributable to postoperative catheterization vs other surgical factors. With regard to ureteral kinking, 4.5% of subjects required suture removal to relieve ureteral obstruction noted on cystoscopy. Our rate of ureteral kinking is consistent with the rates that have already been reported. In the OPTIMAL trial, comparing uterosacral ligament suspension to sacrospinous ligament suspension for the treatment of vaginal vault prolapse, the ureteral obstruction rate in the uterosacral suspension arm was 3.2%.[7] And, in a retrospective cohort study of 700 subjects from our institution undergoing vaginal surgery for anterior and/or apical prolapse, Gustilo-Ashby et al[23] found that 5.9% of patients undergoing uterosacral suspension experienced ureteral kinking.

In this study, the rate of recurrent POP was low, but was dependent on the definition used. Symptomatic POP described by subjects as bothersome vaginal bulge was as common as anatomic recurrence, defined as prolapse noted to or beyond the hymen, but less common than retreatment for POP. In addition, two-thirds of subjects who reported vaginal bulge symptoms actually had anatomic prolapse; whereas one third of subjects did not. Our recurrence rates were lower than the 2-year follow-up rates after uterosacral ligament suspension reported in OPTIMAL; however, one must consider the retrospective nature of this study as well as the shorter follow-up period. Of the subjects in our study who required suture removal

for ureteral kinking, two-thirds of them did not have their sutures replaced and underwent unilateral uterosacral colpopexy. This was not found to contribute to the recurrent POP rate. Additionally, use of delayed-absorbable suture only vs a combination of delayed-absorbable and permanent suture did not increase the likelihood of recurrence at least in the short-term. These results differ from those found by Chung et al[24] who compared the use of permanent and delayed-absorbable suture at the time of uterosacral colpopexy in a retrospective chart review of 248 patients. The authors defined recurrence of anatomical support as recurrent prolapse beyond the hymen and found that the use of permanent suture was associated with a lower recurrence rate than delayed-absorbable sutures in the short-term (1% vs 6%, $P = .03$).[24] However, while the authors used the same type of delayed-absorbable suture we used, their permanent suture (polyester) differed from ours, and this could explain the difference in our findings. Chung et al[24] also found that the number of sutures used did not differ between patients who recurred and those who did not recur, which is consistent with our findings. A retrospective study published by Kasturi et al[25] also looked at recurrent apical prolapse in patients undergoing uterosacral colpopexy with either delayed-absorbable or permanent suture only. The authors found that colpopexy with permanent suture did not offer significantly better apical support at 12 months compared to delayed-absorbable suture. However, permanent suture was associated with a 22% rate of suture erosion. Our suture erosion rate was lower; however, erosion was also more commonly associated with the use of permanent suture, but this was not statistically significant. With regard to the rate of vaginal granulation tissue formation, our rate was much lower than the rate reported in OPTIMAL (10.8% vs 19.1%). However, granulation tissue was a defined outcome in the trial, whereas this study relied on usual clinical care as documented in the medical record; therefore, the reported rate is likely an underestimate. Suture choice did not seem to determine whether or not a patient would develop granulation tissue: patients undergoing colpopexy with a combination of delayed-absorbable and permanent suture were just as likely to experience granulation tissue as those patients who underwent colpopexy with delayed-absorbable suture only. This information can be used to help guide surgeons in their intraoperative decision-making, as it appears that a bilateral suspension may not be necessary to achieve favorable outcomes and permanent suture is not necessary for successful suspension and is not more likely to result in vaginal granulation tissue, but may be associated with a higher rate of suture erosion.

There are several limitations to this study due the inherent biases related to its retrospective design. Misclassification bias was minimized by using strict definitions for all perioperative and postoperative outcomes and by taking several internal data quality control measures. Additionally, the retrospective nature of this study resulted in a low median follow-up time for most patients, as we do not routinely or systematically follow up our patients beyond 3 or 6 months after surgery if they are asymptomatic. Based on clinical experience, we know that there are many patients who are asymptomatic but have prolapse to or even beyond the hymen. This makes it difficult to accurately estimate our recurrent POP rates and we did not perform time to event analyses to account for loss to follow-up, nor did we survey patients for information regarding current symptoms and history of retreatment at an outside facility. Our data were analyzed with the assumption that if patients did not return to clinic for evaluation, they were satisfied with their surgical outcomes. However, this is only an assumption, and we remain unable to account for any patients with recurrent symptoms who presented at outside facilities for further management; therefore our recurrence rate is likely to be an underestimate of the true rate. We also recognize that this study was conducted within a single tertiary urogynecology practice. Our adverse event rates are reassuring; however, they cannot be extrapolated to all types of practices, as surgical experience may vary. Despite these limitations, this is one of the largest retrospective cohort studies to date that looks at adverse outcomes related to uterosacral colpopexy, and our findings may be useful for counseling patients during the preoperative period.

Uterosacral colpopexy is a commonly performed procedure in the United States for the treatment of vaginal vault prolapse. Perioperative and postoperative complication rates associated with severe morbidity appear to be low. The postoperative UTI rate is high, but remains ubiquitous among studies looking at postoperative outcomes after reconstructive pelvic surgery, which highlights the need for strategies to lower the UTI rate after these surgeries. Rates of recurrent POP over a median 6-month period were also low. From these data, we can conclude that uterosacral colpopexy remains a safe option for the treatment of vaginal vault prolapse and surgical technique and suture choice do not appear to affect outcomes. ■

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