Does the Degree of Cystocele Predict De Novo Stress Urinary Incontinence After Prolapse Repair? Further Analysis of the Colpopexy and Urinary Reduction Efforts Trial

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Introduction: Cystoceles may cause urethral obstruction by altering the vesicourethral angle. Restoration of normal anatomy after pelvic organ prolapse (POP) repair can relieve this obstruction but may unmask stress urinary incontinence (SUI). The association between the severity of cystocele and developing de novo SUI after prolapse repair, however, is poorly understood. We hypothesized that, in women undergoing prolapse repair, increasing degrees of bladder prolapse would be associated with increasing rates of postoperative de novo SUI.

Materials and Methods: We performed a secondary analysis of the Colpopexy and Urinary Reduction Efforts (CARE) trial data. Using the control arm (women undergoing prolapse repair without a prophylactic SUI procedure), we identified de novo SUI using a composite definition based on original trial criteria. We performed logistic regression to evaluate the relationship between the degree of cystocele and the development of new SUI.

Results: Of the 164 women who underwent abdominal sacrocolpopexy alone, 54% developed de novo postoperative SUI. Stratifying by the degree of anterior prolapse (point Ba), we found a linear increase in the rate of SUI with worsening preoperative cystocele. The incidence of de novo SUI based on the POP Quantification stage of anterior prolapse was 41.3%, 52.5%, and 66.1%, for stage 2, early stage 3, and advanced stage 3 or stage 4, respectively. Point Ba was found to be significantly associated with de novo SUI on both univariate (odds ratio = 1.17, $P = 0.015$) and multivariate analysis (odds ratio = 1.16, $P = 0.04$).

Conclusions: The incidence of de novo SUI after prolapse repair directly correlates to the degree of cystocele on preoperative examination. This simple yet novel relationship should further guide discussions about potential postoperative incontinence.

Key Words: pelvic organ prolapse, stress incontinence, suburethral sling

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It is generally accepted that, in its more severe forms, anterior vaginal prolapse can have an obstructing effect on the female urethra.[1–3] This can lead to obstructive voiding and in rare cases urinary retention. With restoration of normal anatomy after pelvic organ prolapse (POP) surgery, the obstruction is usually relieved.[1,4]

One unintended consequence of restoring normal vaginal anatomy with prolapse correction can be postoperative stress urinary incontinence (SUI) due to the unmasking of sphincteric incompetence that was not apparent before treatment.[4,5] Indeed, several large clinical trials have shown that the rate of de novo SUI (in women who were previously stress continent) approaches 40 to 50% and is irrespective of the method of prolapse repair (abdominal sacrocolpopexy [ASC] or vaginal).[6,7] This has led some to advocate performing concomitant prophylactic SUI surgery at the time of POP repair. However, SUI surgery is not without morbidity, and many practitioners will opt to treat later if and only if bothersome SUI develops.

Although a model intended to predict postoperative SUI after prolapse repair has been published, our ability to predict de novo SUI remains poor.[8] Given that worsening anterior prolapse is theoretically associated with worsening urinary obstruction, we postulated that increasing anterior prolapse (which might mask SUI) would be associated with increasing rates of de novo SUI after POP repair.

MATERIALS AND METHODS

We performed a secondary analysis of publicly available data from the Colpopexy and Urinary Reduction Efforts (CARE) trial.[6,9] The CARE trial was conducted by the Pelvic Floor Disorders Network to estimate the frequency of de novo SUI in women who had baseline stress continence and underwent ASC for repair of POP. The trial was composed of subjects who underwent either (a) ASC without a concomitant SUI procedure (control arm) or (b) ASC with a prophylactic Burch colposuspension. Our analysis comprises the control arm of patients who were randomized to ASC without a concomitant SUI procedure. Three-month follow-up data were used for analysis, because this was the primary end point used in the CARE trial and provides the most complete data.

Our secondary analysis used the exact same SUI composite end point used in the CARE trial. This included SUI based on (a) symptoms, (b) physical examination, and (c) treatment for SUI. For the symptom component, 3 questions from the Pelvic Floor Distress Inventory (PFDI) questionnaire were used at the 3-month follow-up: (1) "Do you usually experience leakage related to coughing, sneezing, or laughing?" (2) "Do you usually experience urine leakage related to physical exercise such as walking, running, aerobics, or tennis?" (3) "Do you usually experience leakage related to lifting or bending over?" The physical examination at 3 months consisted of testing for SUI in both the supine and standing positions with the bladder at maximum capacity or 300 mL (whichever was less) with both cough and Valsalva. For treatment of SUI in the follow-up period, we used the same definition of treatment as the original CARE trial including any study patient who underwent periurethral bulking, transvaginal sling placement, incontinence ring placement, or Kegel exercises.

Other variables used in the analysis were obtained from baseline questionnaire data and physical examination. Prolapse measurements were obtained using the patient's preoperative POP Quantification (POP-Q) system measurements, specifically point Ba (point of maximal anterior vaginal wall prolapse). For the purposes of our analysis, we divided the range of Ba measurements into POP-Q stages to better understand the relationship of point Ba to de novo SUI (stage 2 [−1 to +1 cm], early stage 3 [>

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+1 cm but ≤+3 cm], and advanced stage 3 or stage 4 [>+3 cm]). In addition to POP-Q measurements, we included in our modeling the age, body mass index (BMI), parity, smoking status, history of diabetes, preoperative urinary urge incontinence, and the presence of preoperative SUI with prolapse reduction during baseline urodynamic testing. Preoperative urinary urge incontinence was measured using any positive answer to question 19 of the PFDI, "Do you usually experience urine leakage associated with a feeling of urgency that is a strong sensation of needing to go to the bathroom?"

All data manipulation and statistics were performed using Stata version 12.1 (StataCorp, College Station, Tex). Logistic regression was used to create a multivariate model of risk factors for de novo SUI after ASC, and $P < 0.05$ were considered statistically significant. Because the POP-Q points Aa, Ba, and C are highly correlated, all 3 points were not used simultaneously in multivariate analysis because of colinearity concerns. Point Ba was used in the final modeling because it was the most statistically significant of the 3 measurement points.

RESULTS

A total of 168 women underwent ASC without combined Burch procedure. This included 164 women who were randomized to the control arm of the trial and 4 women who were randomized to the sacrocolpopexy with concomitant Burch group but ultimately underwent ASC alone. To mimic the original CARE trial study, only the 164 women randomized to sacrocolpopexy alone were included in our study cohort. The women in our analysis group were largely multiparous and had undergone hysterectomy, with a mean age of 60 years (Table 1). In addition, most study group had severe degree of POP with 84.8% having a POP-Q stage of 3 or higher. After ASC, 163 of the 164 women had improvement in the measurement of anterior prolapse at point Ba with the remaining patient having no change.

Our analysis found that 54% women who underwent ASC alone developed de novo SUI (compared with 29% of women who had the combined procedure). Stratifying these results based on the degree of anterior prolapse measured at point Ba showed that the incidence of de novo SUI increased with increasing cystocele severity. Women with stage 2 anterior prolapse (Ba, −1 to +1 cm) had a de novo SUI rate of 41.3% compared with 53.3% in women with early stage 3 anterior prolapse (Ba > 1 cm but Ba ≤ +3 cm) and 66.1% in those with advanced stage 3 or stage 4 anterior prolapse (Ba > +3 cm) (Table 2). This was statistically significant on univariate analysis (odds ratio [OR] = 1.17, $P = 0.02$).

Further multivariate analysis confirmed that point Ba is significantly associated with de novo SUI after prolapse repair (OR = 1.16, $P = 0.04$) (Table 3). Similar to the initial CARE trial, we also found that SUI on prolapse reduction at the time of preoperative examination was predictive of de novo SUI after POP repair (OR = 2.39, $P = 0.03$). Age, BMI, parity, diabetes, preoperative urge urinary incontinence, and smoking were not predictive of de novo SUI.

TABLE 1. Demographic and Clinical Characteristics at Baseline

Characteristics	Study Population (N = 164)
Mean age, y	59.9 ± 10.6
Median no. vaginal deliveries	3 (range, 1–11)
Previous SUI surgery	6.7% (11/153)
Previous prolapse surgery	34.7% (57/164)
Previous hysterectomy	81.1% (116/143)
Mean BMI	27.2 ± 4.8
POP-Q stage 3 or 4	84.8% (139/164)

TABLE 2. Incidence of De Novo Stress Urinary Incontinence by Cystocele Severity

Severity of Prolapse at Point Ba	Rate of De Novo SUI, % (n/n)
Stage 2 (−1 to +1)	41.3 (19/46)
Early stage (>+1 and ≤+3)	52.5 (31/59)
Advanced STAGE 3 or 4 (>+3)	66.1 (39/59)

DISCUSSION

We find that a greater degree of anterior vaginal wall prolapse is associated with a higher odds of de novo SUI after ASC. Specifically, each extra centimeter of cystocele protrusion corresponds to a 16% increased chance of postoperative SUI. Similar to previous analyses of the CARE trial data, we also find that inducing SUI with reduction of prolapse on the preoperative examination was a significant predictor of de novo SUI. Although prolapse reduction to predict de novo SUI has been noted in previous work,[10,11] the fact that both preoperative anatomy and preoperative prolapse reduction are both significant in our multivariable model supports the hypothesis that "unkinking" of the vesicourethral angle unmasks sphincteric insufficiency.

Our analysis provides insight into the association of cystocele severity and de novo SUI after prolapse repair and provides a simple means to potentially aid the preoperative counseling of women regarding prophylactic SUI surgery. Specifically, this would include the chance of de novo SUI should a concomitant continence procedure not be performed at the time of POP repair. By identifying the association between the degree of cystocele and the occurrence of de novo SUI, our analysis provides evidence supporting the use of POP-Q measurements for potentially predicting postoperative continence. This finding should be easily confirmed by others, because the American Congress of Obstetrics and Gynecology and the International Continence Society recommend that women considering POP repair should undergo prolapse staging using scales such as the POP-Q.[12,13]

Other studies have described predictors of de novo SUI after POP surgery. Jelovsek et al,[8] using data from the Outcomes following vaginal Prolapse repair and mid-Urethral Sling trial (OPUS) trial, proposed a prediction model based on similar factors used in our multivariable analysis.[8] Analogous to our findings, they did not demonstrate any significant association between the risk of de novo SUI after prolapse repair and factors such as age, parity, BMI, diabetes, or preoperative urinary urgency. However, unlike our analysis, they did not find patient

TABLE 3. Multivariate Analysis of the Risk of De Novo SUI

Risk Factor	OR	95% Confidence Interval	P
Age	1.03	0.99–1.07	0.08
BMI	0.97	0.91–1.05	0.53
Parity	0.96	0.76–1.20	0.72
Smoking	1.40	0.37–5.29	0.62
Diabetes	0.93	0.21–4.17	0.93
Preoperative urge urinary incontinence	0.99	0.46–2.14	0.98
SUI with prolapse reduction	2.39	1.10–5.21	0.03
Point Ba (per centimeter)	1.16	1.01–1.34	0.04

anatomy to be helpful in predicting de novo SUI. One possible reason for this may be that the OPUS trial was conducted on women undergoing vaginal prolapse repair rather than ASC. In addition to the fact that the OPUS trial participants had milder prolapse (72% with stage 3 or great prolapse compared with 83% in the CARE trial), it is possible, albeit unlikely, that repairing pelvic prolapse via differing approaches might account for differing associations. Another explanation may be that the OPUS prediction calculator uses point Aa of the POP-Q staging system rather than Ba. We found that, when using the CARE trial data, point Ba was a stronger predictor than points Aa and C on multivariate analysis (data not shown). More likely, however, is the fact that different definitions of de novo SUI were used in our definition as compared with theirs. In our analysis, a composite end point using examination, questionnaire and further SUI treatment was used. In the prediction model by Jelovsek et al,[8] only questionnaire data were used, and only bothersome symptoms were used (somewhat, moderately or quite a bit bothered). If a similar method had been used in our analysis (only using questionnaire data and not including examination or SUI retreatment, 32% (29/90) of those with SUI would have been omitted. The question as to which method is ultimately superior remains open to debate.

A potential limitation of our analysis is that it does not account for the degree of bother associated with de novo SUI. Notably, of the women in the CARE with de novo SUI after prolapse repair, only half were bothered by their leakage.[6] We also found that bothersome SUI (using the PFDI questionnaire and using the same definition used in the CARE trial) did not correlate with the degree of anterior vaginal wall prolapse (data not shown). However, as noted earlier, significant changes to the cohort took place when the other components of the composite definition of SUI (examination and treatment) were omitted and we question the use of just 1 specific modality to confirm SUI when multiple components are available. Nonetheless, despite our findings of an increased incidence of de novo SUI with increasing cystocele, the same cannot be said for bothersome SUI. Surgeons should consider the subjective aspects of incontinence and incorporate these into discussions of POP repair and the possibility of concurrent or future SUI surgery. It seems logical to consider the same factors in patients undergoing colpocleisis surgery. Although the postoperative anatomy in those undergoing colpocleisis may be different from women undergoing ASC, both procedures should theoretically result in the correction of a previously kinked vesicourethral angle. Because our analysis suggests that women with severe prolapse (Ba greater than +3 cm) have a 60% or more chance of developing de novo SUI after prolapse correction and given the inherent problems of treating SUI after an obliterative vaginal procedure such as colpocleisis, it is our opinion that these patients may benefit from a concurrent SUI operation.

The CARE trial enrolled a large number of women who were treated by high-volume pelvic surgeons and then followed closely to evaluate for new symptoms and findings of SUI after POP repair. The follow-up data were based on multimodal evaluation including standardized questionnaires and SUI testing on physical examination. Furthermore, the use of a composite SUI end point (which we took great care to reproduce using the exact same definitions) allowed us to ensure a robust definition of the outcome of interest. Together, these factors allow the control arm of the trial to provide a rich natural history of the postoperative period after the surgical repair of POP.

CONCLUSIONS

The incidence of de novo SUI after prolapse surgery increases with the degree of preoperative cystocele. This important finding should provide a simple tool to potentially counsel continent patients before prolapse surgery regarding the chance of developing postoperative SUI.

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