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Voiding trial outcome following pelvic floor repair without incontinence procedures

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Abstract

Introduction and hypothesis—Our aim was to identify predictors of postoperative voiding trial failure among patients who had a pelvic floor repair without a concurrent incontinence procedure in order to identify low-risk patients in whom postoperative voiding trials may be modified.

Methods—We conducted a retrospective cohort study of women who underwent pelvic floor repair without concurrent incontinence procedures at two institutions from 1 November 2011 through 13 October 2013 after abstracting demographic and clinical data from medical records. The primary outcome was postoperative retrograde voiding trial failure. We used modified Poisson regression to calculate the risk ratio (RR) and 95 % confidence interval (CI).

Results—Of the 371 women who met eligibility criteria, 294 (79.2 %) had complete data on the variables of interest. Forty nine (16.7%) failed the trial, and those women were less likely to be white ($p = 0.04$), more likely to have had an anterior colporrhaphy ($p = 0.001$), and more likely to have had a preoperative postvoid residual (PVR) ≥ 150 ml ($p = 0.001$). After adjusting for race, women were more likely to fail their voiding trial if they had a preoperative PVR of ≥ 150 ml (RR: 1.9; 95 % CI: 1.1–3.2); institution also was associated with voiding trial failure (RR: 3.0; 95 % CI: 1.6–5.4).

Conclusions—Among our cohort, postoperative voiding trial failure was associated with a PVR of ≥ 150 ml and institution at which the surgery was performed.

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Rui Wang and Sara Won contributed equally to this work.

Compliance with ethical standards

Conflicts of interest None.

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Keywords

Pelvic floor repair; Postoperative voiding trial; Transient postoperative urinary retention

Introduction

Postoperative voiding trials are commonly used after pelvic reconstructive surgeries to assist in detecting transient postoperative urinary retention. They are considered the standard of care and are mostly based on the observation that postoperative urinary retention may affect 33–43 % of patients who undergo incontinence procedures [1–4]. Consequently, postoperative voiding trials have been implemented widely—for both patients who undergo incontinence procedures and those who do not. However, there is limited evidence to support the use of voiding trials following urogynecologic surgeries without a concurrent incontinence procedure [5–7]. In addition, postoperative voiding trials routinely use transurethral catheterization, which can be uncomfortable and has been shown to decrease overall patient satisfaction with surgical outcomes [8]. As voiding trials have low specificity for detecting postoperative urinary dysfunction (58 % for retrograde and 26 % for spontaneous voiding trials) [9], women may be discharged with indwelling catheters or intermittent self-catheterization unnecessarily. As the prevalence of surgical treatment for pelvic floor disorders increases with the increasing elderly and obese populations [10], the potential for overuse will continue to increase. Thus, a more selective approach to screening for postoperative urinary retention will be required.

As a means of comparison, postoperative voiding trials are not routinely performed following other gynecologic surgeries, including laparoscopic hysterectomy, where the reported incidence of urinary retention ranges from 7 to 14 % [11–13]. We hypothesized that patients who undergo pelvic reconstructive surgeries without incontinence procedures have a similar incidence of postoperative urinary retention as those who undergo other gynecologic surgeries and thus may not routinely require a postoperative voiding trial [11, 12, 14]. Our goal was to quantify the risk of postoperative voiding trial failure in patients who have pelvic reconstructive surgeries without incontinence procedures and to identify factors for postoperative voiding trial failure. Identifying risk factors could enable surgeons to modify the use of voiding trials among patients who are at low risk for transient postoperative urinary retention.

Materials and methods

This was a retrospective cohort study of all women 18 years of age who underwent pelvic floor repair (anterior colporrhaphy, posterior colporrhaphy/perineorrhaphy, sacrocolpopexy/sacrocericopexy, colpopolectomy/colpocleisis/colpocleisis, vaginal hysteropexy, vaginal vault suspension) without a concurrent incontinence procedure by a fellowship-trained urogynecologist from 1 January 2011 through 31 October 2013 at two academic medical centers. We excluded women with a history of prior incontinence procedures. This study was approved by the institutional review boards at Beth Israel Deaconess Medical Center (BIDMC) and Mount Auburn Hospital (MAH). We abstracted demographic, preoperative, operative, and

postoperative data, including potential risk factors for voiding trial failure, from medical records. Our primary outcome was postoperative voiding trial failure, defined as being discharged from the hospital with an indwelling catheter or instructions for intermittent self-catheterization.

At both institutions, the postoperative voiding trial is conducted in a similar manner prior to discharge: the bladder is backfilled with 300 ml of saline using a transurethral catheter. If, after 30 min, the patient has not voided at least 200 ml or if the postvoid residual (PVR) volume is >100 ml (measured either directly by transurethral catheterization or by bladder ultrasound), then the patient fails the trial. Voiding trials are performed twice consecutively for all patients at BIDMC. After the first trial, the bladder is fully emptied via catheterization and then backfilled a second time. Failure is defined as failing both attempts. In contrast, MAH requires only one PVR measurement. All patients who meet criteria for failure as described above are discharged from the hospital with either an indwelling catheter or instructions for intermittent catheterization.

Data are presented as mean with standard deviation (SD), median and interquartile range (IQR), or proportion. Categorical variables were compared using chi-square and Fisher's exact tests and continuous variables using the *t* test or Wilcoxon rank-sum test. Given the high incidence of failure in our cohort, we used modified Poisson regression [15] to calculate the risk ratio (RR) and 95 % confidence interval (CI), rather than odds ratio, for the dichotomous outcome of failure. As we had no a priori hypothesis regarding which potential risk factors would be associated with failing, we used a backward-selection process to identify predictors of failure from among the following variables: age, race/ethnicity, body mass index (BMI), smoking status, parity, history of prior urogynecologic procedure, institution where surgery was performed, preoperative PVR, and number of concurrent procedures. Variables were retained in the model if they had a *p* value <0.2. Preoperative PVR, a routine part of urodynamic testing in our population, was categorized as <150 ml or ≥150 ml. Data were stored in Research Electronic Data Capture (REDCap) [16] and analyzed using SAS 9.4 (SAS institute, Cary, NC, USA).

Results

During the study period, 371 women met eligibility criteria; 314 (84.6 %) had a voiding trial documented in the medical record. Women who did not have a voiding trial documented were more likely to be older (*p* = 0.046) but had similar characteristics with those included with regards to BMI, race, parity, and having undergone a previous urogynecologic procedure (*p* = 0.16). Of the 314 women who had a documented trial, 294 (93.6 %) had complete data for the variables of interest, and 245 (83.3 %) passed the trial. Women who failed were more likely to be nonwhite (*p* = 0.04) and to have a preoperative PVR ≥150 ml (*p* = 0.001). However, all women were similar with respect to age, BMI, smoking status, parity, sexual activity, and history of prior urogynecologic procedure (all *p* ≥ 0.06; Table 1). There was no difference in the risk of failure relative to whether the women used a transdermal scopolamine patch or the type of anesthesia they received (all *p* ≥ 0.27; Table 2).

The most common pelvic floor repair procedures were posterior colporrhaphy/perineorrhaphy (52.9 %), sacrocervicocolpopexy (32.0 %), anterior colporrhaphy (21.4 %), and vaginal vault suspension (21.1 %). Less than 15 % of participants underwent sacrocolpopexy, colpocleisis/colpectomy, and vaginal hysteropexy procedures. Most patients (88.6 %) had a concurrent cystoscopy, and 38.0 % had a concurrent hysterectomy (vaginal, laparoscopic, or supracervical). Women who had an anterior colporrhaphy were more likely to fail the voiding trial (30.2 %) than women who did not have an anterior colporrhaphy (13.0 %; $p = 0.001$). None of the other procedures were statistically significantly associated with failure ($p = 0.06$ for all). Both preoperative PVR and institution were significantly associated with trial failure. Though it was not an independent predictor of failure, race/ethnicity met criteria to be retained in the model. No other potential risk factor had an appreciable influence on these associations. We observed that women with a preoperative PVR of ≥ 150 ml had a nearly two-fold increased risk of failure compared to women with a preoperative PVR of <150 ml when adjusting for race/ethnicity and institution (RR, 1.9; 95 % CI, 1.1–3.2; Table 3). When adjusting for preoperative PVR, the risk of failure was three times higher at one institution compared with the other (RR, 3.0; 95 % CI, 1.6–5.4). While each racial/ethnic group had an increased risk of failure compared with white women, none of these associations were statistically significant.

Discussion

Our findings indicate that the risk of voiding trial failure is higher for women with higher preoperative PVR as defined by preoperative PVR ≥ 150 ml. Furthermore, women with a preoperative PVR measurement <150 ml had an incidence of postoperative voiding trial failure of 14.0 %, which is consistent with that of other benign gynecological surgeries for which postoperative voiding trials are not the standard of care [12]. We also identified an increased risk of failure associated with the institution where the surgery was performed.

As our study was retrospective, we can only speculate on the possible underlying etiologies for the associations we identified. The association between preoperative PVR values and the risk of failure may reflect an existing predisposition to urinary retention. Our results suggest that higher preoperative PVR may be considered as part of a preoperative screening to stratify patients by risk for postoperative urinary retention. The association between certain types of procedures and the risk of trial failure may be due to the anatomy involved in the procedures. Dissection for an anterior colporrhaphy likely involves some microdamage to peripheral nerve endings and may interfere with either afferent or efferent pathways of micturition [17]. Book et al. found a high rate of voiding trial failure (32.4 %) in patients who underwent posterior colporrhaphy and theorized that the pain associated with the procedure may interfere with the ability to void successfully [18]. Furthermore, edema and inflammation are part of the postsurgical healing process and may also contribute to transient urinary retention.

There are several potential explanations for why the risk of voiding trial failure may vary by institution. As we described, the trial protocol differed between institutions. We would have expected that the risk of failure would be lower with a protocol that allows women two opportunities to pass; however, that was not the case in our study. In addition, across

institutions, there may be variability in surgical technique, type and volume of anesthesia used, and patient characteristics, which could alter the risk trial failure. In our population, black and Hispanic women were more likely to have their surgery at the institution where trial failure was more likely. Thus, it may be that institution acts as an intermediate between race/ethnicity and trial failure rather than as an independent predictor of failure. Given the limited understanding of any causal associations between identified risk factors and failure, these results should be interpreted cautiously and confirmed in prospective studies.

Our study adds to the existing literature surrounding predictors of postoperative voiding trial failure by specifically evaluating women who undergo pelvic floor repair without concurrent incontinence procedures and had the goal of identifying risk factors for failure that may be used in the future to selectively screen patients. The extensive literature on incontinence procedures has shown that demographic factors such as parity, age, menopausal status, and BMI are all associated with voiding trial failure following incontinence procedures [1]. We examined many of these same variables in women who underwent pelvic floor repairs without incontinence procedures, including age, BMI, race, smoking status, parity, and prior urogynecological procedures in both crude and multivariable analyses, finding that institution and preoperative PVR only were significantly associated with postoperative voiding trial failure. Other associated factors from the incontinence surgery literature relevant to vaginal reconstructive surgery without a concurrent incontinence procedure include general anesthesia and urine load (amount backfilled in bladder) at the voiding trial [2, 19–21]. Type of anesthesia was not associated with failure in our study. Perioperative transdermal scopolamine has been linked with urinary retention [22]; however, our findings showed no association between its use and trial failure.

At the same time, much of the existing literature examining predictors of transient urinary retention following pelvic floor repair without a concurrent incontinence procedure is limited to vaginal prolapse surgeries or other specific procedures, such as sacrocolpopexy [6, 7, 23]. One recent study in women undergoing pelvic floor repair with a specific type of mesh kit found low urine flow rate and preoperative urinary retention to be predictors of postoperative urinary difficulty [24]. Our findings support and build on the existing literature by providing results for postoperative voiding trials following a wider variety of urogynecologic procedures.

Strengths of our study include a relatively large sample size, making this one of the largest studies on postoperative voiding trials. Furthermore, our sample population allows for generalizability of results, as we included a number of different pelvic floor reconstructive surgeries including vaginal and laparoscopic approaches that were performed by seven board-certified pelvic reconstructive surgeons at two institutions. Limitations include the retrospective nature of this study, which required us to exclude 77 of the 371 potentially eligible patients, as there was either no mention of a voiding trial in their medical record or we were unable to locate the results of the voiding trial. Additionally, very few women had some of the characteristics of interest, which limited our power to detect associations; thus, our results must be interpreted cautiously. We were also unable to abstract data on some potential predictors of interest, including menopausal status and stage of pelvic prolapse.

We showed that the likelihood of failing a postoperative voiding trial following pelvic floor reconstructive surgeries without concurrent incontinence procedures was lower among women with lower preoperative PVR. This raises the question of whether there may be risk-stratifying alternatives to routine postoperative voiding trials for women undergoing pelvic floor repair surgeries without concurrent incontinence procedures. We also found that the risk of failure varied by institution, suggesting that evaluation of specific voiding trial protocols is warranted. In addition, further investigation regarding the risks and benefits of selective use of postoperative voiding trials for some patients is appropriate.

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Table 1

Preoperative patient characteristics

Characteristic	Passed voiding trial <i>N</i> = 245	Failed voiding trial <i>N</i> = 49	<i>P</i> value
Age	60.8 ± 11.6	64.4 ± 13.7	0.06
Body mass index	26.4 (24.0–29.6)	25.4 (22.5–30.3)	0.20
Race			0.04
White	215 (87.8)	36 (73.5)	
Hispanic	11 (4.5)	4 (8.2)	
Black	8 (3.3)	5 (10.2)	
Other/unknown	11 (4.5)	4 (8.2)	
Smoking status			0.51
Current	13 (5.3)	4 (8.2)	
Former	56 (22.9)	13 (26.5)	
Never	176 (71.8)	32 (65.3)	
Sexually active ^b			0.75
Yes	131 (54.6)	25 (52.1)	
No	109 (45.4)	23 (47.9)	
Parity ^a			0.32
0	12 (4.9)	1 (2.0)	
1	30 (12.3)	6 (12.2)	
2	111 (45.5)	17 (34.7)	
3	91 (37.3)	25 (51.0)	
Prior urogynecologic procedure			0.86
Yes	67 (27.4)	14 (28.6)	
No	178 (72.7)	35 (71.4)	
Preoperative postvoid residual			0.001
<150	221 (90.2)	36 (73.5)	
150	24 (9.8)	13 (26.5)	

Mean ± standard deviation, median (interquartile range), or *n* (%)

^aPercentages may not add up to 100 % due to rounding

^bSexual activity data missing for 6 women

Table 2

Intraoperative characteristics

	Passed voiding trial <i>N</i> = 245	Failed voiding trial <i>N</i> = 49	<i>P</i> value
Total number of procedures			0.09
1 or 2	46 (18.8)	4 (8.2)	
3	72 (29.4)	12 (24.5)	
4	127 (51.8)	33 (67.4)	
Type of anesthesia			0.62
General	239 (97.6)	47 (95.9)	
Spinal	6 (2.5)	2 (4.1)	
Scopolamine			0.27
Yes	40 (16.39)	5 (10.2)	
No	204 (83.61)	44 (89.8)	

Data presented as *n* (%)

Table 3

Risk of voiding trial failure by predictor

Predictor	Passed voiding trial N = 245	Failed voiding trial N = 49	P value	Crude RR (95 % CI)	Adjusted RR (95 % CI) ^a
Preoperative PVR					
<150	221 (86.0)	36 (14.0)	0.001	Ref	Ref
150	24 (64.9)	13 (35.1)		2.5 (1.5–4.3)	1.9 (1.1–3.2)
Institution					
BIDMC	82 (70.7)	34 (29.3)	<0.0001	3.5 (2.0–6.1)	3.0 (1.6–5.4)
MAH	162 (91.5)	15 (8.5)		Ref	Ref
Race					
Black	8 (61.5)	5 (38.5)	0.04	2.7 (1.3–5.7)	1.5 (0.80–2.9)
Hispanic	11 (73.3)	4 (26.7)		1.9 (0.8–4.5)	1.1 (0.41–2.7)
Other	11 (73.3)	4 (26.7)		1.9 (0.8–4.5)	1.5 (0.61–3.9)
White	215 (85.7)	36 (14.3)		Ref	Ref

Data presented as n (%)

BIDMC Beth Israel Deaconess Medical Center, MAH Mount Auburn Hospital, RR risk ratio, CI confidence interval

^aModels adjusted for other variables in the table