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Prevalence of urinary incontinence and prolapse after hysterectomy for benign disease versus gynecologic malignancy

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ABSTRACT

Objectives: To estimate the prevalence of UI and POP after hysterectomy for benign disease and gynecologic malignancy. This is a retrospective cohort chart review study. Two major urban tertiary care centers between 2006–2010. Women ≥ 18 years undergoing hysterectomy for benign or malignant indications.

Material and methods: Presence of UI and POP was based on patient report in clinic notes, ICD-9 UI and POP diagnosis codes, and CPT codes for treatment. Prevalence of UI and POP after hysterectomy and time to development of UI and POP after hysterectomy.

Results: 1363 (55%) women underwent hysterectomy for benign disease while 1107 (45%) had a hysterectomy for malignancy. Postoperative prevalence of UI and POP in the benign versus the malignant group was 15.1% vs 11.1% ($p = 0.001$), and 12.1% vs 2.8%, ($p < 0.001$), respectively. The median time to development of UI in the subset of patients without preoperative UI was 3.5 years in the benign group vs 3 years in the malignant group ($p < 0.001$). The median time to development of POP in the subset of patients without preoperative POP was 5 years in the benign group and 3.5 years in the malignant group ($p < 0.001$). There was no significant difference in the risk of developing UI or POP between groups after adjusting for confounders or when accounting for pre-hysterectomy UI or POP.

Conclusions: When pre-hysterectomy UI or POP is taken into consideration, there is no difference in the prevalence of post-hysterectomy UI or POP.
Keywords: benign disease; gynecologic cancer; hysterectomy; pelvic organ prolapse; prevalence; urinary incontinence

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INTRODUCTION

Pelvic floor disorders (PFDs) are common conditions that negatively impact women's quality of life. Urinary incontinence (UI) and pelvic organ prolapse (POP) are two common PFDs, and their prevalence increases with age [1]. UI and POP symptoms after hysterectomy for benign indications, including POP correction, have been previously studied [2–7]. However, the prevalence of these conditions following hysterectomy for gynecologic cancer is still understudied. Most previous studies investigated the incidence of UI in cervical cancer patients undergoing radical hysterectomy (RH) [8–10]. Although these studies suggest UI symptoms may develop or worsen after RH, the majority have small sample sizes. The baseline prevalence of POP symptoms among women with gynecologic malignancy has been estimated to be 10.9%; however, the prevalence of POP after hysterectomy for malignant indications has not been reported [11].

A more recent systematic review estimated the prevalence of PFDs before and after treatment of various gynecologic malignancies including endometrial, ovarian, and cervical cancer [12]. However, this review did not distinguish between surgical and nonsurgical treatments or between hysterectomy and other surgical treatments for gynecologic cancer. It is unclear whether the prevalence of postsurgical PFDs differs between women who undergo hysterectomy for benign versus malignant indications.

Our primary objectives were to estimate the prevalence of UI and POP after hysterectomy for benign disease and gynecologic malignancy and to evaluate whether the prevalence of these conditions differed depending on the indication for hysterectomy. A secondary objective was to assess the time to development of these conditions after hysterectomy for those women who did not have POP or UI preoperatively.

MATERIAL AND METHODS

We conducted an IRB-approved retrospective cohort study of women who underwent hysterectomy for benign disease or gynecologic malignancy at two major tertiary care referral centers between 2006 and 2010 (Protocol #: 2017P001210). This period was chosen to allow for a relatively long follow up after hysterectomy to assess outcomes over time. We included women 18 years of age or older who underwent total or supracervical hysterectomy for benign disease including POP or gynecologic malignancy and who presented for at least one postoperative visit. Current procedural terminology (CPT) codes were used to identify women who had hysterectomies during the study period.

Patient data were abstracted from electronic medical record review. Demographic and clinical characteristics such as age, race, BMI, and relevant comorbidities were recorded from patient charts. Surgical characteristics including indication for hysterectomy, type of hysterectomy, concomitant surgeries, and perioperative data were gathered from surgical reports. For the malignant group, rates of neoadjuvant chemotherapy and adjuvant chemotherapy and radiation after hysterectomy were also noted.

The presence or absence of UI and POP and the subtype of UI (stress, urgency, or mixed), if present [13], were recorded at the baseline preoperative visit and again at the time of each postoperative visit. The presence of these conditions was based on patient report in clinic notes, ICD-9 UI and POP diagnosis codes, and CPT codes for treatment of these conditions. The primary outcome was the prevalence of UI after hysterectomy for benign disease versus hysterectomy for malignancy. The secondary outcome was the prevalence of POP after hysterectomy for benign disease versus hysterectomy for malignancy. Additional outcomes included the prevalence of UI subtypes after hysterectomy for benign disease versus hysterectomy for malignancy and time to development of UI and POP after hysterectomy for those who did not have UI or POP preoperatively.

Demographic data and clinical characteristics were summarized using descriptive statistics such as means, standard deviations, medians, and ranges for continuous variables, and frequencies and percentages for categorical variables. Comparisons between the prevalence of UI and POP after hysterectomy for benign disease versus hysterectomy for malignancy were assessed using Chi-square tests. Proportional hazards regression was used to analyze the development of UI and POP after surgery for the subset of patients without preoperative UI or POP adjusting for variables that were significantly different between groups. A p value < 0.05 was considered to indicate statistical significance.

The prevalence of UI 10 years after hysterectomy has been estimated to be 9% [14]. A preliminary review of outcomes following hysterectomy at our institution also suggested the prevalence of UI after hysterectomy was approximately 10–15%. Consequently, we estimated that a clinically significant difference in prevalence would be 5% or more in women who have hysterectomy for malignancy (15%) versus for benign (10%) conditions. Based on these estimates, approximately 725 women in each group were needed to detect a 5% difference with an alpha of 0.05 and beta of 0.80.

RESULTS

A total of 2,725 records of women who underwent hysterectomy between 2006 and 2010 were reviewed. Data were abstracted from 2,470 (90%) of these records, each of which contained at least one postoperative visit. Of these 2,470, 1363 (55%) underwent hysterectomy for benign disease while 1107 (45%) underwent hysterectomy for malignancy. Women in the malignant group were older (59.1 ± 12.1 vs 51.1 ± 11.2), obese (BMI 32.4 ± 9.8 vs 28.9 ± 7.7), and more likely to be Caucasian (77.1% vs 69.8%) compared with women in the benign group (Tab. 1, $p < 0.0001$ for all). A greater proportion of women in the malignant group had diabetes, heart disease, and obstructive sleep apnea while a greater proportion of those in the benign group had chronic constipation, anxiety, and depression (Tab. 1). Approximately 41% of patients had undergone previous pelvic surgery and there was no difference in previous POP or UI surgery between groups. In addition, there was no difference in tobacco or preoperative anticholinergic use between groups (Tab. 1).

The baseline prevalence of UI was 22.5% in women in the benign group versus 8.2% in women in the malignant group ($p < 0.001$). More women in both groups had stress urinary

incontinence compared with urgency and mixed subtypes. Similarly, the baseline prevalence of urinary urgency, frequency, and nocturia were higher in the benign group compared with the malignant group. More women in the benign group had POP (Tab. 1).

Most women in the benign group had surgery for fibroids (33.3%) or POP (24.4%) and underwent either an open abdominal (53.7%) or vaginal (21.6%) approach (Tab. 2). Most women (76.2%) in the malignant group had endometrial cancer. 28.1% in the malignant group underwent simple open abdominal hysterectomy while 26.9% underwent radical open hysterectomy and 41.7% underwent a laparoscopic or robotic approach. An apical suspension, either uterosacral/sacrospinous ligament or sacrocolpopexy, was performed in 12.9% in the benign group and in no patients in the malignant group ($p < 0.0001$, Tab. 2). A midurethral sling was placed in 12.2% in the benign group and in no patients in the malignant group ($p < 0.0001$).

More women in the benign group experienced intraoperative complications compared with the malignant group (10.9% vs 7.6%, $p = 0.006$, Tab. 2). There was no difference in blood transfusion rates or ureteral or bowel injuries between groups (Tab. 2). Although a greater proportion of women in the benign group experienced bladder injuries, the absolute number of women who suffered this complication was low (14, 1.1% vs 2, 0.2%, respectively, $p = 0.009$, Tab. 2). Most patients in the malignant group (58.4%) did not receive adjuvant treatment. Of those that did receive adjuvant treatment after surgery, 11.6% received chemotherapy, 17.1% radiation, and 13.0% both chemotherapy and radiation. The prevalence of UI after hysterectomy was 15.1% in the benign group and 11.1% in the malignant group, ($p = 0.001$, Tab. 3). Most patients with UI in both groups had urgency urinary incontinence. More women in the benign group experienced urinary urgency and frequency postoperatively and were prescribed anticholinergic medications after surgery compared with the malignant group although the proportion of women prescribed these medications was relatively low (4.9% vs 3.0%, respectively, $p < 0.0001$, Tab. 3).

The prevalence of POP after hysterectomy was 12.1% in the benign group and 2.8% in the malignant group ($p < 0.0001$, Tab. 3). The majority of those with POP had a cystocele. A small percentage in each group had vaginal vault prolapse (1.6% in the benign group vs 0.7% in the malignant group, $p = 0.04$, Tab. 3).

We performed two sub-analyses excluding those patients who had UI and POP at baseline prior to hysterectomy given these patients may be at higher risk for persistent or recurrent

symptoms. In the first sub-analysis, 10.7% of patients who underwent hysterectomy for benign disease developed UI compared with 9.9% in the malignant group ($p = 0.514$, Tab. 4). There was a significant difference in the subtypes of postoperative UI between groups ($p = 0.008$, Tab. 4). In the second sub-analysis, 3.6% of patients who underwent hysterectomy for benign disease developed POP compared with 2.1% of patients in the malignant group ($p = 0.037$, Tab. 4).

The median study follow-up period was 87.0 months (IQR 0–156) for the benign group and 53.0 months (IQR 0–150) for the malignant group, $p < 0.0001$. The median time to development of UI in the subset of patients without preoperative UI was 42 months (IQR 12 – 78) in the benign group and 36 months (IQR 12–72) in the malignant group, $p < 0.001$. After adjusting for age, parity, BMI, constipation, diabetes, and midurethral sling placement, there was no significant difference in the risk of developing UI between groups (HR 1.13 [0.79–1.61], $p = 0.499$). We adjusted for these specific variables given that almost all of them were significantly different between groups and the fact that these variables were most likely to significantly affect the outcome of interest.

The median time to development of POP in the subset of patients without preoperative POP was 60 months (IQR 19.5–78.0) in the benign group and 42 months (IQR 11.5–87.0) in the malignant group, $p < 0.001$. There was no significant difference in the risk of developing POP between groups after adjusting for age, parity, BMI, and constipation (HR 1.70 [0.83–3.50], $p = 0.15$). We adjusted for these specific variables given that almost all of them were significantly different between groups and the fact that these variables were most likely to significantly affect the outcome of interest.

DISCUSSION

In our study, the prevalence of UI after hysterectomy for benign disease and malignancy was 15.1% and 11.1%, respectively. Similarly, the prevalence of POP was higher after hysterectomy for benign disease versus malignancy,12.1% vs 2.8%, respectively. When we excluded patients with preoperative UI, it appeared that the prevalence of UI was not different between the two groups (10.7% in the benign vs 9.9% in the malignant group). Similarly, exclusion of patients with preoperative POP resulted in no difference in the prevalence of POP after hysterectomy between women in the benign and malignant group (3.6% vs 2.1%).

Strengths and limitations

The major strength of our study is the number of patients included (n = 2470) with a relatively balanced number of women in both the benign and malignant groups. Furthermore, we investigated the prevalence of UI and POP after hysterectomy for both benign and malignant indications, while most of the previous literature regarding prevalence estimates involves one group or the other. We also looked at the time to development of UI and POP after hysterectomy for the subset of patients without UI and POP preoperatively. Our study results add to the literature about PFDs in gynecologic oncology patients who undergo surgical treatment involving hysterectomy which is important as advancements in the diagnosis and treatment of oncology patients lead to higher survival rates. Moreover, data about the development of UI and POP after hysterectomy in oncology patients can inform preoperative counseling which may result in a better understanding of postoperative expectations and greater patient satisfaction after surgery.

This study did have some limitations including those inherent to studies with retrospective designs. Our study population was predominantly White, potentially limiting the generalizability of our findings. In addition, cases of UI and POP were based on medical record review and not using self-reported validated questionnaires. It is possible that patients who had symptoms of these conditions after surgery may not have reported them to their surgeons, or surgeons may not have documented patients' symptoms in either preoperative or postoperative notes. Oncologic patients may have been more focused on treatment of their primary disease and less likely to report symptoms of PFDs than patients who underwent hysterectomy for benign indications. It is possible that patients could have developed UI or POP postoperatively but did not follow up in our healthcare system after developing symptoms of these conditions.

Interpretation

Our prevalence estimates are lower than those reported previously [8–10, 12]. Two explanations may be considered regarding this finding. On one hand, our cohort is substantially larger than the cohorts included in other studies [8–10], but on the other hand, it is possible that we may have underestimated the prevalence of UI and POP. The presence or absence of these conditions in our study was based on documentation in medical notes and billing codes. It is

worth noting that more recently, a large Swedish study reported the prevalence of de novo post-hysterectomy UI as 8.5%, which is similar to our findings [15]. Additionally, that study was conducted during an analogous time period (2006–2013) but included only those undergoing hysterectomy for benign indications. Interestingly, the authors of that study found de novo postoperative UI significantly reduces satisfaction 1 year after surgery. This finding should be considered when counseling patients planning hysterectomy for both benign and malignant indications.

A new study showed that among 169 women who underwent radical hysterectomy for cervical cancer, the prevalence of postoperative UI was as high as 39% [16]. In our study, most patients who underwent hysterectomy for malignancy had endometrial cancer and cervical cancer patients constituted only 9% (n = 99) of all patients in the malignant group. This may explain why our data differ from what was reported by Wang et al [1–6]. In another recent study querying women who underwent surgery for gynecologic cancer, 35% reported first-time postoperative UI [17]. That study was conducted during a similar period as ours (2008–2013 vs 2006–2010, respectively) and found that 57% had stress UI, 13% OAB and 31% mixed UI in the postoperative period. In contrast, we found 1.9% women had stress UI, 6.6% urgency UI and 2.6% mixed UI after hysterectomy for malignancy. However, our study had 10 times more participants in the malignant group compared to the study conducted by Nakayama et al [17].

Pelvic organ prolapse symptoms after total abdominal vs laparoscopic hysterectomy for endometrial cancer were recently studied by Higgs et al [18]. Patients in both groups experienced improvement in Pelvic Floor Distress Inventory (PFDI) scores at 6- months postoperatively, especially in the POP domain. This improvement in PFDI scores was sustained throughout the 4.5-year study period regardless of the mode of hysterectomy. In addition, pelvic floor symptoms did not differ between women who received or did not receive adjuvant therapy. However, only 54% of patients in this study completed PFDI questionnaires at 4.5 years postoperative. The prevalence of POP in the malignant group in our study was 2% after adjusting for confounders. It is worth noting that the median time to develop POP in our study was 42 months in women after gynecological cancer surgery.

CONCLUSIONS

When taking confounders and preoperative UI or POP into consideration, there is no difference in the prevalence of postoperative UI or POP. Future research should focus on prospectively evaluating UI and POP before and after hysterectomy in oncologic and general gynecologic populations using both self-reported validated questionnaires and standardized objective outcome measures.

Article information and declarations

Conflict of interest

The authors declare that they have no competing interests.

Author contributions

JMM was responsible for project development, data analysis, manuscript writing and editing. IG was responsible for project development, data collection, data analysis, and manuscript editing. MK was responsible for manuscript editing. AC was responsible for data analysis, manuscript editing. VAM was responsible for project development, data analysis, and manuscript editing.

Ethics statement

This study was approved by the Mass General Brigham Institutional Review Board (IRB) on 07/06/17 as an Exempt study (Protocol #: 2017P001210).

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Table 1. Baseline demographic data and clinical characteristics

Variable	**Hysterectomy for Benign Disease n = 1363**	**Hysterectomy for Malignancy n = 1107**	**p value**
Age, years	51.1 ± 11.2	59.1 ± 12.1	< 0.0001
Race			
Asian	37 (2.7)	22 (2.0)	< 0.0001
Black/African American	107 (7.9)	39 (3.5)	
Hispanic	99 (7.3)	22 (2.0)	
White	951 (69.8)	853 (77.1)	
Other	5 (0.4)	1 (0.1)	
Unknown	164 (12.0)	170 (15.4)	
BMI, kg/m^2	28.9 ± 7.7	32.4 ± 9.8	< 0.0001
Parity	2.0 (0–12)	2.0 (0–13)	0.76
Comorbidities			
Neurologic disease	35 (2.6)	31 (2.8)	0.63
Diabetes	79 (5.8)	166 (15.0)	< 0.0001

Heart disease	112 (8.2)	123 (11.1)	0.03
COPD/asthma	147 (10.8)	102 (9.2)	0.2
Obstructive sleep apnea	21 (1.5)	35 (3.2)	0.007
Chronic constipation	58 (4.3)	30 (2.7)	0.04
Connective tissue disease	1 (0.1)	1 (0.1)	0.88
Anxiety/Depression	287 (21.1)	167 (15.1)	0.0001
Tobacco use	139 (10.2)	85 (7.7)	0.08
Anticholinergic medication use	33 (2.4)	13 (1.2)	0.07
Urinary incontinence (UI)			
Stress UI	168 (12.3)	47 (4.2)	< 0.0001
Urgency UI	61 (4.5)	38 (3.4)	
Mixed UI	77 (5.6)	6 (0.5)	
Urinary urgency	206 (15.1)	29 (2.6)	< 0.0001
Urinary frequency	284 (20.8)	47 (4.2)	< 0.0001
Nocturia	160 (11.7)	13 (1.2)	< 0.0001
Previous pelvic surgery	559 (41.0)	456 (41.2)	0.66
Pelvic organ prolapse grade[a]			
Grade 0	2 (0.1)	0	< 0.0001
Grade 1	13 (1.0)	4 (0.4)	
Grade 2	113 (8.3)	12 (1.1)	
Grade 3	195 (14.3)	5 (0.5)	
Grade 4	12 (0.9)	0	

Data are n (%), mean ± SD, or median (interquartile range)

[a] Stage data not available; most prolapse during the study time period was quantified using Baden-Walker grade rather than POP-Q stage; additionally, quantification data not available for all patients with prolapse

Table 2. Intraoperative details

Variable	**Hysterectomy for Benign Disease n = 1363**	**Hysterectomy for Malignancy n = 1107**	**p value**
Indication for hysterectomy			
Abnormal uterine bleeding	161 (11.8)	-	

Fibroids	454 (33.3)	-	
Endometriosis	90 (6.6)	-	
Pelvic pain or dyspareunia	62 (4.5)	-	
Prolapse	333 (24.4)	-	
Cesarean hysterectomy	19 (1.4)	-	
Benign pelvic and/or adnexal mass	74 (5.4)	-	
Ovarian/primary peritoneal cancer	-	120 (10.8)	
Endometrial cancer	-	843 (76.2)	
Leiomyosarcoma	-	40 (3.6)	
Cervical cancer	-	99 (8.9)	
Vaginal cancer	-	5 (0.5)	
EIN	78 (5.7)	-	
Cervical dysplasia	27 (2.0)	-	
Other	65 (4.7)	-	
Hysterectomy route			
Simple open abdominal	732 (53.7)	311 (28.1)	< 0.0001
Radical open abdominal	15 (1.1)	298 (26.9)	
Vaginal	295 (21.6)	5 (0.5)	
Laparoscopic	241 (17.7)	334 (30.2)	
Robotic	27 (2.0)	128 (11.6)	
Laparoscopic assisted vaginal	53 (3.9)	31 (2.8)	
Supracervical hysterectomy	331 (24.3)	2 (0.2)	< 0.0001
McCall’s culdoplasty	169 (12.4)	0	< 0.0001
Concomitant surgeries			
Unilateral or bilateral adnexectomy	701 (51.4)	998 (90.2)	< 0.0001
Lysis of adhesions	165 (12.1)	81 (7.3)	< 0.0001
Midurethral sling	166 (12.2)	0	< 0.0001
Cystocele repair	264 (19.4)	0	< 0.0001
Rectocele repair	275 (20.2)	0	< 0.0001
Uterosacral ligament suspension	98 (7.2)	0	< 0.0001
Sacrospinous ligament suspension	31 (2.3)	0	< 0.0001
Sacrocolpopexy	47 (3.4)	0	< 0.0001

Vaginal mesh	78 (5.7)	2 (0.2)	< 0.0001
Colpocleisis	2 (0.1)	0	0.2
Surgical staging	40 (2.9)	714 (64.5)	< 0.0001
EBL in mL	260.6 ± 367.3	223 ± 343.3	< 0.0001
Intraoperative complications			
EBL > 500 mL	118 (8.7)	72 (6.5)	0.046
Blood transfusion	20 (1.5)	10 (0.9)	0.2
Bladder injury	14 (1.1)	2 (0.2)	0.009
Ureteral injury	4 (0.3)	1 (0.1)	0.26
Bowel injury	2 (0.1)	3 (0.3)	0.49
Cardiopulmonary event	0	4 (0.4)	0.026

Data are n (%), mean ± SD; EBL, estimated blood loss. EIN, endometrial intraepithelial neoplasia

Table 3. Postoperative urinary incontinence and pelvic organ prolapse data

Variable	**Hysterectomy for Benign Disease n = 1363**	**Hysterectomy for Malignancy n = 1107**	**p value**
Urinary incontinence (UI)	206 (15.1)	123 (11.1)	0.001
Stress UI	63 (4.6)	21 (1.9)	
Urgency UI	99 (7.3)	73 (6.6)	
Mixed UI	44 (3.2)	29 (2.6)	
Urinary urgency	185 (13.6)	101 (9.1)	0.001
Urinary frequency	200 (14.7)	118 (10.7)	0.005
Nocturia	121 (8.9)	69 (6.2)	0.05
Anticholinergic medication use	67 (4.9)	33 (3.0)	< 0.0001
Pelvic organ prolapse	165 (12.1)	31 (2.8)	< 0.0001
Type of prolapse			
Cystocele	132 (9.7)	24 (2.2)	< 0.0001
Rectocele	65 (4.8)	19 (1.7)	< 0.0001
Vaginal vault prolapse	22 (1.6)	8 (0.7)	0.04
Pelvic organ prolapse grade[a]			
Grade 1	48 (29.1)	9 (29)	< 0.0001

Grade 2	63 (38.2)	13 (41.9)	
Grade 3	35 (21.2)	7 (22.6)	
Grade 4	2 (1.2)	0	

Data are n (%). [a] Stage data not available; most prolapse during the study time period was quantified using Baden-Walker grade rather than POP-Q stage; additionally, quantification data not available for all patients with prolapse

Table 4. Prevalence of urinary incontinence and pelvic organ prolapse after hysterectomy excluding patients with preoperative urinary incontinence and prolapse

Variable	**Hysterectomy for Benign Disease n = 1055**	**Hysterectomy for Malignancy n = 1017**	**p value**
Urinary incontinence (UI)	113 (10.7)	101 (9.9)	0.514
Stress UI	40 (3.79)	18 (1.77)	0.008
Urgency UI	27 (2.56)	20 (1.97)	
Mixed UI	46 (4.36)	63 (6.19)	
Variable	**Hysterectomy for Benign Disease n = 1019**	**Hysterectomy for Malignancy n = 1085**	**p value**
Pelvic organ prolapse	37 (3.63)	23 (2.12)	0.037

Data are n (%)