Rates of unanticipated premalignant and malignant lesions at the time of hysterectomy performed for pelvic organ prolapse in an underscreened population

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BACKGROUND: The rate of unanticipated premalignant or malignant pathology at the time of hysterectomy performed for pelvic organ prolapse has been previously reported to be 0.2%. It is not known whether this rate is similar in patients with limited access to regular medical care.
OBJECTIVE: This study aimed to describe the rates of unanticipated premalignancy and malignancy at the time of hysterectomy performed for pelvic organ prolapse in an underscreened population and to determine the risk factors for unanticipated pathology.
STUDY DESIGN: Hysterectomies performed for pelvic organ prolapse at a large public hospital between July 2007 and July 2019 were reviewed. Patients undergoing surgery for malignancy or premalignancy were excluded. Medical records were reviewed for demographic information, medical history, preoperative workup, and final pathology. Frequencies of abnormal pathologies were calculated. Demographic and screening factors were correlated with pathologic findings using the Fisher exact test or Mann-Whitney *U* test, as appropriate. This study was approved by the institutional review board.
RESULTS: Between 2007 and 2019, 759 cases of pelvic organ prolapse were identified. Of 759 patients, 667 (87.9%) self-identified as Hispanic. The median age was 57 years old, and 505 of 759 patients (66.5%) were in the postmenopausal stage. Abnormal uterine bleeding history was present in 217 of 759 patients (28.6%). Of 759 patients, 493 (65.4%) underwent preoperative ultrasonography, and 290 (38.3%) underwent preoperative endometrial biopsy. Of the 744 uterine specimens that had available histology results, there were 2 cases of endometrial hyperplasia and 1 case of endometrial cancer. Of the 729 cervical specimens that were available for review, there was 1 case of intraepithelial neoplasia and 2 cases of cervical cancer. In the 246 patients who underwent oophorectomy, no ovarian malignancy was found.
CONCLUSION: For patients undergoing hysterectomy for pelvic organ prolapse in an underscreened population, the rates of endometrial dysplasia or cancer were 0.40% (3/744), and the rates of cervical dysplasia or cancer were 0.42% (3/729). Our results underscore the importance of considering screening history when interpreting preoperative cervical and endometrial cancer screening. Consideration of higher negative predictive value tests, such as cytology with human papillomavirus cotesting and preoperative counseling on the risks and management strategies of unanticipated premalignancy or malignancy within this population may be reasonable.

Key words: cervical cancer, endometrial biopsy, endometrial cancer, Papanicolaou test, pelvic organ prolapse, screening, underserved

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The authors report no conflict of interest.

Patient consent statement is not required because no personal information or detail is included.

Cite this article as: Barakzai S, Koltun-Baker E, Melville SJF, et al. Rates of unanticipated pre-malignant and malignant lesions at the time of hysterectomy performed for pelvic organ prolapse in an underscreened population. Am J Obstet Gynecol Glob Rep 2023;XX:x.ex–x.ex.

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2666-5778/$36.00

http://dx.doi.org/10.1016/j.xagr.2023.100217

Introduction

The risks of unanticipated premalignant and malignant pathologies at the time of hysterectomy are an important topic for pelvic reconstructive surgeons, as the presence of pathology may significantly affect the planned procedure and patient outcome. According to the International Federation of Gynecology and Obstetrics Working Group guidelines, although unanticipated malignancies may be encountered, preoperative biopsy or ultrasound is not routinely recommended in the evaluation of patients with pelvic organ prolapse (POP).[1,2] A recent meta-analysis estimates that the rate of unanticipated malignancy in uterine specimens is approximately 0.2%.[3]

Much of the existing data on unanticipated pathology at the time of hysterectomy are inclusive of all indications, based on population-based data, or do not specifically address the underscreened population.[3–11] There is particular interest in the risk of unanticipated cervical cancer in an underscreened population, given that cervical cytology effectiveness relies heavily on repeated screenings over time.[12] The primary objective of this study was to describe the rates of unanticipated pathology at the time of hysterectomy performed for POP in a medically underscreened population, defined in this study as patients at a large, urban, safety net hospital. The secondary objective was to explore the risk factors for unanticipated pathology.

AJOG MFM at a Glance

Why was this study conducted?

This study aimed to describe the rate of unanticipated premalignancy and malignancy at the time of hysterectomy for pelvic organ prolapse (POP) in patients with limited access to medical care.

Key findings

In the underscreened cohort, the rates of cervical premalignancy and malignancy were slightly higher than the previously reported rates, and the rates of endometrial premalignancy and malignancy were slightly lower than the previously reported rates.

What does this add to what is known?

In the underscreened patient undergoing hysterectomy for POP, careful assessment of screening history and consideration of preoperative screening are advisable.

Materials and Methods

This was a retrospective cohort study of women who underwent hysterectomy for POP between July 1, 2007, and July 1, 2019, at an academic, safety net hospital. Institutional review board approval was obtained. All hysterectomies performed were reviewed and included if performed for POP. Cases were excluded if the indication for hysterectomy included known malignancy, suspected malignancy, or premalignant lesion or if no final histology result was available for review. Medical records were reviewed for demographic data, including age, self-reported race, ethnicity, body mass index, personal and family history of cancer, history of cervical cytology screening (Papanicolaou test), history of abnormal Papanicolaou tests, history of abnormal uterine bleeding, smoking history, and menopausal status. Human papillomavirus (HPV) status was available in a paucity of patients given the institutional availability of HPV testing beginning in 2015. In addition, preoperative evaluation, including Papanicolaou test results, endometrial biopsy (EMB) results, and ultrasound results, was recorded. Furthermore, operative details, including estimated blood loss, procedures performed, and structures removed, were recorded with corresponding final pathology results. Pathologic assessment was performed before the pathology department adopted World Health Organization (WHO) 2014 nomenclature (benign hyperplasia and endometrial intraepithelial neoplasia) and so has been left in WHO 1994 nomenclature (simple hyperplasia, complex hyperplasia, simple atypical hyperplasia, and complex atypical hyperplasia) for clarity.[13]

Data were recorded using the Research Electronic Data Capture database hosted at the University of Southern California.[14,15] Statistical analysis was performed using SPSS software (version 26, IBM Corporation, Armonk, NY). Descriptive statistics, including rates and confidence intervals, were calculated to describe the rate of abnormal histology by organ type. Univariable comparisons for demographics and preoperative results were correlated with pathologic findings using the Fisher exact test for binary variables, the Student *t* test for continuous variables, and the Mann-Whitney *U* test for categorical variables. Multivariable logistic regression was performed to evaluate

TABLE 1
Demographic factors and preoperative evaluation

Characteristic	n=759	IQR or %
Age (y), median	57	49–62
Body mass index (kg/m^2), median	28.5	25.9–31.6
Race and ethnicity, n		
Hispanic or Latina	667	87.9
White	17	2.2
Black or African American	8	1.1
Asian American	29	3.8
Native American or Alaska Native	0	—
Native Hawaiian or Pacific Islander	0	—
Other	14	1.8
Unknown	24	3.2
Postmenopausal stage[a]	505	66.5
Postmenopausal vaginal bleeding	93	12.3
Abnormal uterine bleeding	217	28.6
Preoperative endometrial biopsy	290	38.3
Preoperative ultrasound	493	65.4
Surgical approach		
Vaginal	513	67.6
Laparoscopic, robotic, or laparoscopic vaginal	100	13.2
Abdominal	144	19.0

IQR, interquartile range.

[a] Postmenopausal stage defined as >1 year since the last menstrual period.

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the risk factors for premalignant and malignant histologies. Variables were included in the analysis if they were identified as significant on univariable analysis or if it was deemed possible that there could be a biologically plausible and clinically significant association.

Results

Overall, 3792 hysterectomy procedures were performed between July 1, 2007, and July 1, 2019. Of those procedures, 759 were performed for POP. Basic demographics and preoperative studies are shown in Table 1. Papanicolaou test screening was performed preoperatively for all cases if the patient could not provide documentation of up-to-date screening (generally within 3 years). Of note, 699 patients underwent preoperative cytologic screening, with 56 patients also having HPV cotesting performed (HPV testing was not widely available at this institution until 2015). Of patients who were screened for HPV, none went on to have unanticipated cervical pathology at surgery. Those who had an abnormal preoperative Papanicolaou test (or other cancer screening) were not captured within this dataset as they were generally transferred to and had surgery performed by the gynecology oncology service. This dataset was constructed from the recorded surgical procedures of the urogynecology faculty only.

Screening histories were inconsistent; only 352 of 759 patients (46.4%) reported ever having a Papanicolaou test, with 250 of 352 patients (71.0%) reportedly performed in the last 3 years. Of women who reported a Papanicolaou test in the past, 16 of 352 patients (4.55%) reported a history of an abnormal Papanicolaou test result. Preoperative EMB was performed in 290 of 759 patients (38.3%), usually for reports of abnormal vaginal bleeding. Preoperative ultrasonography was performed in 493 of 759 patients (65.4%). The indications for preoperative ultrasonography were not consistently documented. Given the underscreened nature of this population and inconsistent interactions with healthcare facilities, it is not uncommon for providers to procure preoperative ultrasounds fairly routinely.

TABLE 2
Final histology by organ type

Histology	n (%) median (IQR)
Uterus	744
Uterine weight (g)	76.0 (51.0–127.5)
Leiomyoma	346 (45.6)
Adenomyosis	341 (44.9)
Endometriosis	13 (1.7)
Endometrial polyp	94 (12.6)
Endometrium	744
Simple hyperplasia	1 (0.1)
Atypical hyperplasia	1 (0.1)
Endometrial carcinoma	1 (0.1)
Cervix	722
Cervical polyp	3 (0.4)
CIN1	0 (0)
CIN2	1 (0.1)
CIN3	0 (0)
Carcinoma in situ	0 (0)
Squamous cell carcinoma	1 (0.1)
Adenocarcinoma	1 (0.1)
Fallopian tubes	288
Ovaries	246
Benign cyst—unilateral	55 (22.3)
Benign cyst—bilateral	12 (4.9)
Tumor of low malignant potential	0 (0)
Malignancy	0 (0)

IQR, interquartile range.

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Table 2 shows histology results by organ type. The most commonly encountered extrauterine pathology was benign ovarian cysts, found in 67 of 246 specimens (27.2%) with ovarian removal. Of the patients with single or bilateral adnexal masses found at the time of surgery, 41 of 67 patients (61.2%) had a preoperative ultrasound. Of those who had a preoperative ultrasound, 27 of 41 patients (65.9%) had adnexal masses noted on the radiology report. Of the 3 cases of endometrial premalignancy or malignancy, 2 patients had undergone preoperative EMB with normal results. Of the 3 patients with cervical premalignancy or malignancy, 1 patient had a documented history of a low-grade squamous intraepithelial lesion.

Table 3 shows the association between demographic factors and endometrial or cervical pathology. On univariable analysis, the only preoperative factor that was associated with endometrial pathology was the endometrial thickness on ultrasound (4 vs 13 mm; P=.02). On multivariable analysis, there

TABLE 3
Association between demographic factors and risks of endometrial or cervical dysplasia (n=493)

Variable	Endometrial finding			Cervical pathology		
	Normal n=756	Endometrial hyperplasia or malignancy n=3	*P* value	Normal n=756	Cervical dysplasia or malignancy n=3	*P* value
Age (y)	57 (49–62)	42 (41–42)	.053[a]	57 (49–62)	53 (44–53)	.21[a]
BMI	28.5 (25.9–31.6)	29.4 (27.3–29.4)	.923[a]	28.5 (25.9–31.6)	25.9 (21.7–25.9)	.44[a]
Smoking history	53/698	0/3	1.0[b]	53/698	0/3	1.0[b]
Postmenopausal	504/505	1/3	.25[b]	504/752	1/3	.26[b]
Previous endometrial biopsies	288/755	2/3	.56[b]	288/755	2/3	.56[b]
Abnormal Papanicolaou test ≤1 y before surgery	16/756	0/3	1.0[b]	16/756	0/3	1.0[b]
Previous abnormal Papanicolaou test	72/683	0/3	1.0[b]	71/683	1/3	.28[b]
History of AUB	216/538	1/3	1.0[b]	217/754	0/3	.56[b]
Personal history of cancer	20/736	0/3	1.0[b]	20/756	0/3	1.0[b]
Family history of cancer	100/656	0/3	1.0[b]	100/756	0/3	1.0[b]
Endometrial thickness (mm)[c]	4.0 (2.9–9.0)	13.0 (9.0–13.0)	.024[a]	4.0 (2.9–9.0)	3.1 (1.0–3.1)	.33[a]

AUB, abnormal uterine bleeding; *BMI*, body mass index.

[a] Mann-Whitney *U* test was used; [b] The Fisher exact test was used; [c] Detected by transvaginal ultrasonography.

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was no significant association between any demographic or historical factors and risk of unanticipated malignancy or premalignancy.

Table 4 describes the clinical details associated with all cases of unanticipated malignancies and premalignancies.

Comment

Principal findings

The rate of unanticipated cervical premalignancy or malignancy (CIN2 or higher) was 0.42% (3/729), and the rate of premalignant or malignant unanticipated endometrial pathology was 0.40% (3/744) in our cohort of women who underwent hysterectomy for POP. These patients are cared for in an urban, safety net hospital and represent a group with less reliable access to regular medical care and screening.

Results

In this safety net population, the rate of unanticipated premalignant or malignant endometrial pathology falls within the 0.22% to 2.60% rate reported in the literature.[3–5,7,8]

The rate of cervical pathology (CIN2 or higher) included a 0.28% (2/729) rate of cervical malignancy. Previous literature did not report cases of significant cervical pathology.[7]

Unanticipated benign findings were common. Of note, 94 of 744 patients (12.6%) had endometrial polyps, and 67 of 759 patients (8.82%) had adnexal masses that were removed. Unanticipated benign findings are relevant if they affect the surgical approach or if they are associated with complications. The indications for adnexectomy were not consistently documented. We did not find any cases of undetected leiomyomas or adnexal masses that changed the planned surgical approach, resulted in surgical complications, or changed the patient's prognosis.

Clinical implications

Our cohort may fall into the lower end of the previously reported range of endometrial pathology because of more aggressive EMB use (38.3% vs 15.2%). However, it is notable that the patients within our cohort also reported a higher rate of abnormal uterine bleeding (28.6% vs 15.2%).[7]

The findings of cervical pathology and cancer were despite universal preoperative cervical cytology (Papanicolaou) test screening and follow-up consistent with the American Society for Colposcopy and Cervical Pathology guidelines. Part of the strength of cervical cancer screening lies in repeated assessments over time, as negative Papanicolaou tests may have a false negative rate of 5% to 35%.[12,16,17] HPV testing at the time of cervical cytology examination has been predicted to increase 2- to 3-fold the detection of CIN3 or greater lesions.[18] Given that cotesting has a higher single negative predictive value than cytology alone, it may be advisable to consider preoperative cotesting in the underscreened patient.[13]

Moreover, it should be noted that the sample population for this study was predominantly Hispanic. The cervical cancer incidence was 32% higher among Hispanic women in the continental United States and Hawaii than non-Hispanic women; therefore, this

TABLE 4
Clinical details of patients with unanticipated pathology

No.	Detail
1	52 y G5P5 Referral or history: abnormal Papanicolaou test reported as "abnormality of unknown significance" on referral paperwork Ultrasound: not performed Papanicolaou tests: 4 negative results Colposcopy: 3 benign biopsies and negative endocervical curettage Endometrial biopsy: atrophic Procedure: total abdominal hysterectomy, Burch urethropexy, and abdominal sacral colpopexy Final pathology: FIGO Grade IB1 adenocarcinoma of the cervix
2	45 y G5P5 Referral or history: referred for urinary incontinence, reported a remote history of an abnormal Papanicolaou test, no mass identified on preoperative clinic examination Ultrasound: not performed Papanicolaou test: negative Colposcopy: not performed Endometrial biopsy: not performed Procedure: on examination under anesthesia, found to have a small mass in the cervix. Intraoperative frozen section was squamous cell carcinoma. Oncology consulted, recommended trachelectomy for biopsy purposes and to awaken the patient for further counseling Second procedure: 2 d later, total abdominal hysterectomy and sacral colpopexy Final pathology: FIGO Grade IB1 squamous carcinoma of the cervix
3	53 y G3P3 Referral or history: prolapse and fecal incontinence, single episode of postmenopausal vaginal bleeding 1 y prior, preoperative endometrial biopsy: atrophic Ultrasound: Not performed Papanicolaou test: low grade squamous intraepithelial lesion Colposcopy: adequate for evaluation, one negative biopsy and benign endocervical curettage Endometrial biopsy: Not performed Procedure: vaginal hysterectomy, uterosacral ligament suspension, anterior and posterior repair, transobturator tape, and anal sphincteroplasty. Final pathology: cervical intraepithelial neoplasia 2
4	41 y G1P1 Referral or history: abnormal uterine bleeding and prolapse Ultrasound: fibroids and 9-mm endometrial thickness Papanicolaou test: negative Endometrial biopsy: secretory Endocervical curettage: benign Procedure: total abdominal hysterectomy, Burch colposuspension, anterior posterior repair Final pathology: atypical endometrial hyperplasia
5	52 y G3P3 Referral or history: pelvic pain and prolapse, no postmenopausal vaginal bleeding Ultrasound: 13-mm endometrial thickness Papanicolaou test: negative Endometrial biopsy: benign polyp in a background of an atrophic endometrium Procedure: laparoscopic-assisted vaginal hysterectomy, abdominal sacral colpopexy, transobturator tape, cystoscopy Final pathology: 1A endometrioid adenocarcinoma
6	41 y G1P1 Referral or history: prolapse and mixed urinary incontinence Ultrasound: not performed Papanicolaou test: negative Endometrial biopsy: not performed Procedure: vaginal hysterectomy, uterosacral ligament suspension, cystoscopy Final pathology: complex hyperplasia without atypia in a background of a secretory endometrium

abnormality of unknown significance; FIGO Grade IB1.

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cohort represented a particularly high-risk population.[19]

Research implications

Further studies could be performed in larger cohorts of underserved patients to truly assess whether patient demographic factors have significant associations with the risk of unanticipated malignancy at the time of hysterectomy for POP. Another elucidating study would be to compare the risk of unanticipated cervical malignancy at the time of hysterectomy in an underscreened cohort screened by cervical cotesting rather than cytology alone.

Strengths and limitations

The strengths of this study include the moderate population size and representation of real practice data in an underscreened, safety net population. In addition, we were able to review preoperative patient assessments, including biopsy results, cervical cytology, and ultrasounds, allowing for correlation with final pathology findings. The limitations of this study include the retrospective approach with inherent limitations in data collection. These data were descriptive and were not directly compared with an adequately screened patient cohort controlled for other factors; this precludes the establishment of the association between underscreened status and unanticipated premalignancy or malignancy. Patients who were accessible for data capture were only those who had their surgery with urogynecology faculty; those with premalignant or malignant findings on preoperative EMB would have been transitioned to care and surgery with the gynecology oncology department and, therefore, lost to capture within the database used for this study. Given the relatively low frequency of gynecologic malignancies within the asymptomatic patients, this study was underpowered to detect the true rate of malignancy or correlation with most demographic factors in this population.

Conclusions

Underscreened patients may have an elevated risk of unanticipated cervical

pathology at the time of hysterectomy for POP. This study highlights the importance of endometrial evaluation for reported abnormal bleeding and routine cervical cancer screening in preoperative patients. In addition, cervical cytology and HPV cotesting may be preferred because of their higher negative predictive value than cytology alone, and preoperative counseling on the risk and management of unanticipated premalignancy and malignancy may be advisable within this population. Further prospective studies or otherwise risk-matched retrospective cohorts are needed to assess the association between underscreened status and risk of unanticipated premalignancy or malignancy illustrated by this descriptive study. ■

REFERENCES

1. Ramm O, Gleason JL, Segal S, Antosh DD, Kenton KS. Utility of preoperative endometrial assessment in asymptomatic women undergoing hysterectomy for pelvic floor dysfunction. Int Urogynecol J 2012;23:913–7.

2. Tubaro A, Koelbl H, Laterza R, Khullar V, de Nunzio C. Ultrasound imaging of the pelvic floor: where are we going? Neurourol Urodyn 2011;30:729–34.

3. Davenport E, James L, Parks T, Howard DL. Occult uterine malignancy at the time of surgery for pelvic organ prolapse: a systematic review and meta-analysis. Female Pelvic Med Reconstr Surg 2021;27:e282–9.

4. Parsons LHP, Pedersen R, Richardson DL, Kho KA. The prevalence of occult endometrial cancer in women undergoing hysterectomy for benign indications. Eur J Obstet Gynecol Reprod Biol 2018;223:108–12.

5. Von Bargen EC, Grimes CL, Mishra K, et al. Prevalence of occult pre-malignant or malignant pathology at the time of uterine morcellation for benign disease. Int J Gynaecol Obstet 2017; 137:123–8.

6. Picerno TM, Wasson MN, Gonzalez Rios AR, et al. Morcellation and the incidence of occult uterine malignancy: a dual-institution review. Int J Gynecol Cancer 2016;26:149–55.

7. Frick AC, Walters MD, Larkin KS, Barber MD. Risk of unanticipated abnormal gynecologic pathology at the time of hysterectomy for uterovaginal prolapse. Am J Obstet Gynecol 2010;202:507.e1–4.

8. Ackenbom MF, Giugale LE, Wang Y, Shepherd JP. Incidence of occult uterine pathology in women undergoing hysterectomy with pelvic organ prolapse repair. Female Pelvic Med Reconstr Surg 2016;22:332–5.

9. Hill AJ, Carroll AW, Matthews CA. Unanticipated uterine pathologic finding after morcellation during robotic-assisted supracervical hysterectomy and cervicosacropexy for uterine prolapse. Female Pelvic Med Reconstr Surg 2014;20:113–5.

10. Vallabh-Patel V, Saiz C, Salamon C, Francis A, Pagnillo J, Culligan P. Prevalence of occult malignancy within morcellated specimens removed during laparoscopic sacrocolpopexy. Female Pelvic Med Reconstr Surg 2016;22:190–3.

11. Desai VB, Wright JD, Gross CP, et al. Prevalence, characteristics, and risk factors of occult uterine cancer in presumed benign hysterectomy. Am J Obstet Gynecol 2019; 221:39.e1–14.

12. Grimes D, Corry E, Malagon T, O'Riain C, Franco E, Brennen D. Challenges of false positive and negative results in cervical cancer screening. medRxiv 2020 [Preprint].

13. Emons G, Beckmann MW, Schmidt D, Mallmann P. Uterus commission of the Gynecological Oncology Working Group (AGO). New WHO classification of endometrial hyperplasias. Geburtshilfe Frauenheilkd 2015;75:135–6.

14. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research Electronic Data Capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009;42:377–81.

15. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: building an international community of software platform partners. J Biomed Inform 2019;95:103208.

16. Koonmee S, Bychkov A, Shuangshoti S, et al. False-negative rate of Papanicolaou testing: a national survey from the Thai society of cytology. Acta Cytol 2017;61:434–40.

17. Lönnberg S, Anttila A, Kotaniemi-Talonen L, et al. Low proportion of false-negative smears in the Finnish program for cervical cancer screening. Cancer Epidemiol Biomarkers Prev 2010;19:381–7.

18. Melnikow J, Henderson JT, Burda BU, Senger CA, Durbin S, Soulsby MA. Screening for cervical cancer with high-risk human papillomavirus testing: a systematic evidence review for the U.S. Preventive Services Task Force. Rockville, MD: Agency for Healthcare Research and Quality; 2018.

19. Miller KD, Ortiz AP, Pinheiro PS, et al. Cancer statistics for the US Hispanic/Latino population, 2021. CA Cancer J Clin 2021;71:466–87.