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Laparoscopic Supracervical Hysterectomy with Morcellation: Should it stay or should it go?[1]

Jubilee Brown, MD[a,*], **Kristal Taylor, MD**[b], **Pedro T. Ramirez, MD**[a], **Charlotte Sun, DrPH**[a], **Laura L. Holman, MD**[a], **S. Mark Cone, MD**[c], **John Irwin, MD**[c], and **Michael Frumovitz, MD, MPH**[a]

[a]Department of Gynecologic Oncology and Reproductive Medicine, The University of Texas MD Anderson Cancer Center, Houston, Texas

[b]The University of Texas Health Science Center at Houston, Houston, Texas

[c]Department of Obstetrics and Gynecology, The Woman's Hospital of Texas, Houston, Texas.

Abstract

Objective—To establish the risk of unidentified neoplasia and subsequent adverse outcomes in patients undergoing laparoscopic supracervical hysterectomy (SCH) with morcellation.

Methods—This was a retrospective review of all consecutive women who had undergone laparoscopic SCH at a single institution between January 2002 and December 2008. We abstracted charts for patient characteristics and outcomes.

Results—We identified 808 women with planned laparoscopic SCH with morcellation. The median age was 44.1 years (range, 23.4-79.8 years). The most common indications were menorrhagia (n=472 patients, 58.4%) and leiomyomata (n=400 patients, 49.5%). Of the 30 patients converted to an open procedure prior to morcellation, one had leiomyosarcoma on final pathology. Of the 778 patients who completed laparoscopic SCH with morcellation, 16 (2.0%) patients had endometrial hyperplasia and 3 (0.4%) patients had cancer on final pathology. Abnormal pathology appeared more likely in women over 50 years of age with abnormal bleeding. Of the 778 patients, 189 were under 40 years of age, and 4 (2.1%) of these 189 women had hyperplasia on final pathology; none had cancer. Of the 433 patients age 40-49 years, 8 (1.8%) patients had hyperplasia or cancer. Of the 156 patients age 50 years or older, 7 (4.5%) had hyperplasia (*P*=.18); none had cancer. No patient with hyperplasia or morcellated cancer had adverse sequelae after a median follow-up of 90.4 months..

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[*]Corresponding author: Jubilee Brown, MD, Department of Gynecologic Oncology and Reproductive Medicine, Unit 1362, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Blvd., Houston, TX 77030; Telephone: (713) 792-1380, Fax: (713) 792-3567, jbbrown@mdanderson.org..

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Conclusion—In this cohort of patients who underwent laparoscopic SCH, the risk of hyperplasia or malignancy was low. Laparoscopic SCH with morcellation appears to be a low risk procedure.

Introduction

Over 500,000 hysterectomies are performed annually in the United States, making this the most common procedure performed in non-pregnant women (1). The desire for less invasive surgery with decreased operative morbidity has prompted physicians to increase the percentage of hysterectomies performed through minimally invasive surgery, including subtotal or supracervical hysterectomies (SCHs), in which the corpus uteri is removed but the cervix remains in situ (2-4). The technique of power uterine morcellation allows minimally invasive surgery (MIS) to be performed in a setting that might otherwise require laparotomy to effect removal of an enlarged uterus (4). While SCH has been linked to lower blood loss and a shorter hospital stay, the data do not support a definitive overall advantage to SCH when compared with total laparoscopic or open hysterectomy (3). However, since MIS results in decreased blood loss, transfusion, pulmonary complications, infection, thromboembolic events, hospital stay, postoperative pain, and mortality with an improvement in quality of life, body image, and return to baseline function (Level I evidence), there has been a trend favoring laparoscopic SCH among some providers (5).

Recent publications in the scientific and lay literature have raised concerns regarding the safety of laparoscopic SCH due to the risk of dissemination of malignancy as this technique requires uterine morcellation for the removal of the uterus (6-9). These reports culminated in a statement by the United States Food and Drug Administration discouraging the use of uterine power morcellation (10). A review of a large database of women undergoing uterine morcellation at the time of hysterectomy suggested that the prevalence of undetected uterine malignancy may be as high as 1:370, and that the risk of undetected pre-invasive disease may exceed 1% (11).

Given these data, it is critically important to determine the safety of this procedure and identify any subgroups of patients at increased risk in order to prevent intraperitoneal dissemination of an otherwise contained intrauterine malignancy. Therefore, the purpose of this study was to evaluate the prevalence of undetected neoplasia in this population, to identify risk factors for undiagnosed neoplasia, and to examine the long-term outcomes of these women after power morcellation.

Materials and Methods

We conducted this retrospective study with approval from the Institutional Review Board at The Woman's Hospital of Texas (Houston, Texas) and The University of Texas MD Anderson Cancer Center (Houston, Texas). We reviewed the medical records of all women who had undergone a planned laparoscopic SCH at The Woman's Hospital of Texas from January 1, 2002, through December 31, 2008. We chose to include women at the time of laparoscopic SCH as this was the best way to capture a group of patients who underwent power uterine morcellation since no other hospital or medical records database could identify women who had morcellation as part of their hysterectomy. All surgical procedures

were performed by board-certified general gynecologists from multiple community-based practices. We collected the following information from the medical records: age when surgery was performed; race; parity; weight; height; menopausal status; age at menopause; irregular bleeding preceding surgery, including menorrhagia, metrorrhagia, postcoital bleeding, and postmenopausal bleeding; history of infertility; history of polycystic ovarian syndrome; history of diabetes; history of hypertension; history of cancer; tamoxifen use; hormone replacement therapy; history of oral contraceptive use; history of smoking; family history of ovarian/breast/endometrial/colorectal cancer; results of preoperative cervical cytology, endocervical curettage, and endometrial biopsy; ultrasonographic findings; procedure(s) performed; complications; length of stay; final pathologic results; and uterine weight. Follow-up information was obtained from the medical record for each patient with a final pathologic report of hyperplasia or uterine malignancy, and treating physicians were contacted for extended follow-up information on every patient with abnormal uterine pathology.

We used descriptive characteristics to characterize the clinical and demographic data. Student's *t* test and Mann-Whitney test were used to compare continuous variables between groups. Chi-square and Fisher's Exact tests were used to compare categorical variables between groups. Confidence intervals were calculated by the modified Wald method (11). Odds ratios were calculated by chi-square tests (2×2 contingency tables). *P* values <.05 were considered statistically significant. We used the statistical software package IBM Statistics SPSS version for all data analyses.

Results

Patient characteristics

We identified 808 women who initiated a laparoscopic SCH during the interval of interest. Their median age was 44.1 years (range, 23.4-79.8). Collectively, these patients had a median body mass index of 26.9 (range, 15.8-54.7). The median gravidity was 2 (range, 0-11) and the median parity was 2 (range, 0-7). Twenty-eight patients had a personal history of cancer, including breast cancer (n=17), colon cancer (n=3), osteosarcoma (n=2), appendiceal carcinoid (n=1), melanoma (n=1), borderline tumor of the ovary (n=1), pancreatic cancer (n=1), thyroid carcinoma (n=1), and astrocytoma (n=1). Table 1 shows the patient characteristics.

Operative procedures

Of the 808 patients who underwent surgery for a planned laparoscopic SCH with uterine morcellation, 778 (96.3%) completed the surgery as planned and are included in the analysis. Thirty (3.7%) of the 808 patients were converted to other operations prior to uterine morcellation, including laparotomy with SCH (n=7), total abdominal hysterectomy (n=16), total laparoscopic hysterectomy (n=6), and laparoscopic-assisted vaginal hysterectomy (n=1). The most common indication for changing to a different procedure was adhesive disease (n=16, 51.6%) (Table 2). One of the 30 patients who was converted to an open procedure prior to uterine morcellation had leiomyosarcoma on her final pathology

report; the decision to convert was based on the intraoperative appearance of the uterus with extension of tumor to the pelvic sidewall.

Prevalence of hyperplasia or malignancy

Of the 778 patients who completed laparoscopic SCH with uterine morcellation, 19 (2.4%) patients were found to have abnormal uterine results (either hyperplasia or malignancy) on their final pathology report, and the remaining 759 (97.6%) patients had benign findings on final pathologic examination. Of the 19 patients found to have abnormal uterine pathology, 13 (68.4%) had endometrial hyperplasia, 3 (15.8%) had simple endometrial hyperplasia confined to a polyp, and 3 (15.8%) had uterine cancer (Table 3). The malignant histologies included grade 1 endometrioid adenocarcinoma (n=1 patient), grade 3 endometrioid adenocarcinoma (n=1 patient), and endometrial stromal sarcoma (n=1 patient). The prevalence of overall abnormal uterine results, which we defined as either hyperplasia or malignancy, was 19/778, or 2.4%; 95%CI [1.54%, 3.81%]. The prevalence of hyperplasia was 2.06%; 95% CI [1.24%, 3.34%]. The prevalence of uterine malignancy was 0.39%; 95%CI [0.08%, 1.18%]. Of note, 4 patients who had a preoperative diagnosis of endometrial hyperplasia underwent laparoscopic SCH and had normal findings on final pathologic examination. Of these 4 patients, 2 patients had simple hyperplasia, 1 patient had focal complex hyperplasia without atypia, and 1 patient had hyperplasia without atypia on endometrial curettage approximately 1 year earlier. The physicians' reasoning for proceeding with laparoscopic SCH despite abnormal preoperative pathology was not evident in the medical records. None of these 4 patients had residual hyperplasia or cancer on the final pathology report.

Of the 19 patients with abnormal final pathology, 10 (52.6%) underwent endometrial sampling within one year prior to laparoscopic SCH. The preoperative workup was variable for the 3 patients with uterine cancer. One patient with grade 3 endometrioid adenocarcinoma on final pathology reported menometrorrhagia and had a preoperative transvaginal ultrasound which revealed uterine enlargement and endometrial echogenicity. No office endometrial biopsy was performed but a frozen intraoperative curettage was ordered. The request for intraoperative evaluation was overlooked and the laparoscopic SCH was completed; the intraoperative curettage and the final uterine pathology both showed a grade 3 endometrial cancer. The uterus weighed 87 grams. Another woman with grade 1 endometrioid adenocarcinoma on final pathology reported menorrhagia and had a preoperative transvaginal ultrasound that suggested a polyp. An office endometrial biopsy was normal. A third patient with endometrial stromal sarcoma on final pathology reported menorrhagia, dysmenorrhea, and pelvic pain, and had a preoperative transvaginal ultrasound that suggested a degenerating fibroid. An office endometrial biopsy was normal. The uterus weighted 278 grams. She subsequently underwent an exploratory laparotomy, trachelectomy, left salpingo-oophorectomy, optimal tumor reductive surgery for multiple peritoneal nodules of metastatic disease, and she received 5 years of letrozole therapy and was without evidence of recurrence at that time. The patient with leiomyosarcoma who was converted to an abdominal hysterectomy prior to morcellation reported menorrhagia, stress urinary incontinence, and pelvic pressure, and had a preoperative transvaginal ultrasound that showed pedunculated fibroids to the level of the umbilicus. No endometrial sampling

was performed. The uterus weighed 691 grams, and pelvic and para-aortic lymph nodes were negative for metastatic disease. She subsequently received 6 courses of adjuvant adriamycin and dacarbazine chemotherapy, had a complete response, and recurred 42 months after surgery in the liver, lungs, psoas, and pelvis. She received gemcitabine and docetaxel, progressed, and died of disease 54.3 months after surgery.

The prevalence of abnormal uterine pathology was associated with increasing age though this did not reach statistical significance. Of the 189 women younger than 40 years of age, 4 (2.1%) had hyperplasia on the final pathology report; none had cancer. Of the 433 women 40-49 years of age, 8 (1.8%) had hyperplasia (n=5) or cancer (n=3). Of the 156 women age 50 years or older, 7 (4.5%) had hyperplasia (*P*=.18). After combining age groups, the odds ratio for an incidental finding of abnormal uterine pathology after morcellation in women at least 50 years of age compared with women younger than 50 years of age is 2.39 (95% confidence interval [CI], 0.83, 6.66). Post-hoc power analysis showed only an 8.7% power to detect a difference among these groups for this sample size. Table 3 presents details of pathologic findings.

The presence of abnormal bleeding (including menorrhagia, metrorrhagia, postcoital bleeding, and postmenopausal bleeding) was not found to be an isolated risk factor for abnormal uterine pathology. Overall, 290 of the 530 (54.7%) patients with abnormal bleeding had preoperative or intraoperative endometrial sampling documented. Sixteen of the 530 (3.0%) women with abnormal bleeding had hyperplasia (n=14) or cancer (n=2) detected on their final pathology specimen, compared with 3 of the 248 (1.2%) women (2 patients had hyperplasia and 1 patient had cancer) without abnormal bleeding (*P*=.13). Post-hoc power analysis showed a 1.7% power to detect a difference among these groups for this sample size.

Preoperative sampling was not documented in all patients with abnormal bleeding. The percentages of preoperative and intraoperative sampling in women with abnormal bleeding are characterized by patient age in Table 4. No association was found between endometrial sampling by age group (p=.10). Preoperative and intraoperative sampling in women with abnormal uterine findings on final pathology is detailed by patient age in Table 5. Of the 4 sampled patients aged 50 or greater with hyperplasia or malignancy, 1 was preoperative and 3 were intraoperative. Of the 3 patients with intraoperative sampling, 2 (66.7%) had abnormal pathologic findings and morcellation with laparoscopic SCH was performed. No documentation was provided in the medical record explaining the decision to proceed with morcellation in these patients. Abnormal bleeding was present in 2 of the 3 patients with cancer; both were sampled and one was normal while the other demonstrated a fragment of carcinoma.

Of note, identification of menopausal status was difficult based on review of the medical records. Of the 156 patients who were at least 50 years of age, only 63 (40.4%) patients were identified in the medical record as menopausal. Of the 75 patients who were at least 50 years of age and who had been identified as having abnormal bleeding, only 21 (24.4%) were identified in the medical records as having postmenopausal bleeding. Due to

inconsistencies in medical record documentation, postmenopausal bleeding was not included as a risk factor for hyperplasia or malignancy in this study.

Surgical procedures and outcomes of patients with hyperplasia or malignancy on final pathology

All 16 patients with hyperplasia identified on final pathology underwent the planned laparopscopic SCH with morcellation of the uterus. Laparoscopic retrieval bags were not used during morcellation in any procedure according to the operative reports. None of these patients underwent any additional related surgical procedures, and all patients were without evidence of disease after a median postoperative follow-up time of 33.0 months (range, 3.7-76.0). All 3 patients with a malignancy that underwent morcellation were without evidence of disease after a median postoperative follow-up time of 90.4 months (range, 81.7-93.7) (Table 6).

Discussion

Our findings indicate that laparoscopic SCH is associated with a low but significant risk of undetected hyperplasia or malignancy. The overall prevalence of uterine malignancy detected on final pathology in this population of women who completed laparoscopic SCH was 0.4% (95% CI [0.08%, 1.2%]), and the additional 2.1% (95% CI [1.2%, 3.3%]) of patients who were found to have endometrial hyperplasia did not develop sequelae from morcellation during extended follow-up.

The issue of prevalence of undetected malignancy has been at the forefront of the morcellation debate, with estimates of undetected leiomyosarcoma ranging from 1:360 to 1:7400 (10, 11, 13). While our cohort is of modest sample size, it does suggest a rate of approximately 1:800, though this patient with leiomyosarcoma was converted to laparotomy prior to morcellation. The study by Wright et al at first glance supports a more frequent prevalence (1:370 cases of uterine malignancy in patients undergoing morcellation), but this study did not differentiate between patients with leiomyosarcoma and uterine carcinoma. It is unclear what percentage of these patients had undetected leiomyosarcoma or were simply not fully evaluated prior to surgery with an endometrial biopsy and/or imaging, so it does not clarify the issue of prevalence. While relatively small, does avoid bias of an oncology referral service, and may represent an accurate depiction of the general population, where risk appears lower than 1:360.

In addition to benign sequelae from laparoscopic SCH with morcellation, including possible subsequent cervical stump neoplasia, endometriosis, residual endometrium, bowel adhesions, chronic cervicitis, and post-procedure cyclical bleeding in premenopausal women. (14-20), Einstein et al. described 17 patients who underwent laparoscopic SCH who had undetected uterine malignancy on the postoperative pathologic review (6). The authors noted that morcellation may convert a malignant process that is contained within the uterus to one where gross spill-age of tumor occurs with potential subsequent adverse outcomes, though upstaging occurred in only 15% of patients who underwent post-morcellation staging. Another recent publication found disease-free and overall survival to be significantly worse in patients with leiomyosarcoma who underwent morcellation compared

with a matched cohort of patients who did not undergo morcellation (8). None of the patients in our study were upstaged, but several were treated; no adverse outcomes were detected in any patient with pre-malignant or malignant disease (Table 6).

Since recent studies have identified overt malignancy in up to 48% of women with a pre-operative diagnosis of complex atypical hyperplasia, it seems imperative to avoid morcellation in women with either endometrial hyperplasia or uterine malignancy (21-24). The study by Wright et al raises concern as to outcomes of the 1% of patients with pre-malignant disease who were found to undergo power morcellation (11). To our knowledge, the outcomes of women with morcellated hyperplasia have not been described. None of the 20 patients in this study with morcellated endometrial hyperplasia had any sequelae on 5-year follow-up, suggesting that the presence of hyperplasia on final pathology is of no clinical significance.

According to the American College of Obstetricians and Gynecologists (ACOG), women with known or suspected gynecologic cancer, cervical dysplasia, or endometrial hyperplasia are excluded as candidates for laparoscopic SCH (3). All candidates should have normal results from a recent Pap test and appropriate preoperative assessment of the endometrial cavity as indicated to exclude neoplasia (25-26). ACOG recommends endometrial sampling as a first-line test for any patient over the age of 45 years who has abnormal uterine bleeding, as the incidence of endometrial carcinoma increases with age from 13.6 per 100,000 women age 40-50 years to 87.3 per 100,000 women age 70-74 years (26-27). ACOG also recommends sampling in women under 45 years of age with a history of unopposed estrogen exposure as seen with obesity or polycystic ovary syndrome, failed medical management, and persistent abnormal uterine bleeding (27). In the present study, 290 of 530 patients with abnormal bleeding had documented sampling (54.7%). Although the medical records may not have captured all of the office endometrial biopsies performed preoperatively, this number of patients with documented sampling was substantially lower than we anticipated. Failure to strictly adhere to ACOG guidelines could lead to the performance of laparoscopic SCH in patients with an undetected malignancy, in whom morcellation may cause extrauterine spread of disease and therefore the need for further intervention. Therefore, rigorous adherence to preoperative screening may further limit the risk of unidentified neoplasia and potential adverse outcomes. While compliance with these guidelines appeared to be less than 100% in this study, these findings reflect the “real world practice” in a large urban community hospital. Any bias introduced by this inconsistency in preoperative evaluation would overestimate the risk of neoplasia in SCH, underscoring the low risk of neoplasia identified in this study. In this study, if a sensitivity of 94% is assumed for office endometrial biopsy to detect an endometrial carcinoma in a woman with abnormal bleeding (28), and if the preoperative diagnosis of hyperplasia or malignancy prevented the surgeon from performing morcellation, we believe that all but one of the morcellated pathologies could have been avoided.

In this study, increasing age did not reach statistical significance as a risk factor for undetected hyperplasia or malignancy. The odds ratio for hyperplasia or malignancy in women age 50 years and older compared with women younger than age 50 is 2.39 (CI, 0.83, 6.66). The wide CI suggests that a larger sample size would give us more confidence that the

odds of having undetected abnormal uterine pathology are truly greater in the older women, and the lack of statistical significance suggests that both the sample sizes and low number of events were not sufficient to achieve statistical significance. Post-hoc power analysis shows that we had an 8.3% power to detect a difference, also suggesting that the number of events in each category was too small to obtain statistical significance.

Abnormal bleeding was not found to be a significant risk factor for undetected abnormal uterine pathology, either alone or when considered with age. However, we observed a trend toward significance for abnormal bleeding combined with age. In addition, many more women over 50 years of age had preoperative endometrial sampling; if there is a signal of increased abnormal uterine findings despite the increased preoperative sampling, this may indicate an even greater risk of undetected abnormality in women over age 50. Since there was a low incidence of either hyperplasia or malignancy in this study overall, a larger overall cohort of patients and a larger cohort of patients with abnormal uterine pathology are necessary to show a statistically significant impact of abnormal bleeding. Additionally, this study may underestimate the risk associated with abnormal bleeding, as the sample included only patients in whom laparoscopic SCH was planned; many patients with abnormal bleeding in the same population may have had an open procedure planned and not been included in the study.

The limitations of this study include those typically found in retrospective studies, namely inconsistent documentation captured in the patient records and limited sample size. As this is a descriptive study from a convenience sample of cases, it is observational and hypothesis generating. Additionally, we have follow-up data on all patients with abnormal uterine pathology results, but not on the patients with normal pathology; this could miss potential sequelae related to an occult malignancy or endocervical disease.

Nonetheless, this study suggests that the risk of malignancy at the time of laparoscopic SCH is low but not zero, and that the risk of neoplasia may increase with age. Since any invasive procedure and any diagnosis of malignancy have some inherent risk independent of surgical route, one must balance these risks with the well-documented benefits of minimally invasive surgery. The death from leiomyosarcoma in the patient converted to an open procedure prior to morcellation in this study highlights the aggressive nature of leiomyosarcoma even without morcellation. This contrasts with the excellent long-term outcomes of the patients with hyperplasia or malignancies other than leiomyosarcoma who underwent morcellation. The lack of adverse sequelae on long-term followup in any patient who underwent morcellation of hyperplasia is a novel observation and has not been previously reported. Though preoperative sampling guidelines should be meticulously followed, this suggests that morcellating an undiagnosed hyperplasia may be clinically insignificant and warrants further investigation. As demonstrated here, morcellation of endometrioid carcinoma or endometrial stromal sarcoma is unlikely to affect outcom. While it is clearly advised to avoid morcellating any malignancy, the incidental morcellation of a malignancy other than LMS is unlikely to impact clinical outcome. Furthermore, the determination of what constitutes an “acceptable risk” for this or any surgical procedure is at the forefront of medical decision making.

The favorable outcomes in this study support laparoscopic SCH as a safe procedure in appropriately selected patients when screening guidelines are meticulously followed. The safety profile of this procedure may be further increased by avoiding the procedure in patients deemed at higher likelihood of malignancy, and by removal of uteri through alternate techniques, such as use of a morcellation bag, transvaginal morcellation, or minilaparotomy. Future investigations will establish the cost effectiveness and safety of performing laparoscopic SCH in an ambulatory surgery center and help to define the absolute risk of laparoscopic SCH to better inform the pre-operative patient consent and counseling process.

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Précis

Laparoscopic supracervical hysterectomy with morcellation has a low but not absent risk of undetected malignancy.

Table 1

Clinical and demographic characteristics of patients (N=808)

Potential Risk Factors	Number of Patients	Percentage
Race		
Caucasian	503	62.3
African American	174	21.5
Hispanic	97	12.0
Asian	16	2.0
Other	18	2.2
Age		
Younger than 40 years	194	24.0
40-50 years	451	55.8
Older than 50 years	163	20.2
Perimenopausal or postmenopausal status	75	9.3
History of infertility	18	2.2
History of polycystic ovarian syndrome	13	1.6
History of diabetes	26	3.2
History of hypertension	158	19.6
History of cancer	28	3.5
History of tamoxifen use	5	0.6
History of hormone replacement therapy	34	4.2
Oral contraceptive use (ever users)	248	30.7
History of smoking	92	11.4
Family history of ovarian, breast, endometrial, or colorectal cancer	94	11.8
Preoperative Pap test results (within 1 year)	713	88.2
Normal	698	97.9
Abnormal[1]	15	2.1
Preoperative or intraoperative endocervical curettage	30	3.7
Preoperative ultrasonography	458	56.7

[1] Abnormal pap tests included atypical squamous cells of undetermined significance with either negative HPV or colposcopic evaluation (n=13), cervical intraepithelial neoplasia (CIN) 2 on pap test and colposcopy (n=1), and endometrial cells on pap test (n=1).

Table 2

Final procedures used in patients not receiving laparoscopic supracervical hysterectomy and reasons for conversion

Final Procedure Used	Number of Patients	Indication(s) for Conversion
Open supracervical hysterectomy	7	Adhesions (n=5)
		Control of bleeding (n=1)
		Enterotomy (n=1)
Total abdominal hysterectomy	16	Adhesions (n=11)
		Insufficient insufflations (n=1)
		Bleeding from fibroids (n=1)
		Endometriosis (n=1)
		Large bowel injury (n=1)
		Leiomyosarcoma (n=1)
Total laparoscopic hysterectomy	6	Cervical or broad ligament mass (n=5)
		Prolonged morcellation time (n=1)
Laparoscopic-assisted vaginal hysterectomy	1	Uterine size (n=1)

Table 3

Characteristics of the 20 patients with neoplasia on final pathology report

Patient	Age	Indications*	Endometrial Biopsy Results	Pathologic Finding**
1	32	1, 2, 3	Normal	Complex hyperplasia
2	33	4	Not done	Complex hyperplasia
3	37	1, 2	Not done	Simple hyperplasia
4	38	2, 3	Not done	Simple hyperplasia
5	40	1-3,5-7	Not done	Simple hyperplasia
6	40	1, 2, 8	Grade 3 carcinoma	Grade 3 carcinoma
7	43	1, 3, 9, 10	Not done	Simple hyperplasia
8	44	2	Normal	Grade 1 endometrial cancer
9	45	2, 6	Normal	Simple hyperplasia (polyp)
10	47	2, 11	Complex hyperplasia	Complex hyperplasia
11	48	2, 8	Not done	Simple hyperplasia
12	49	1, 2, 3, 14	Normal	Endometrial stromal sarcoma
13	51	1, 2, 8	Not done	Simple hyperplasia (polyp)
14	53	9, 12, 14	Simple hyperplasia	Simple hyperplasia
15	55	1, 2, 3	Simple hyperplasia	Simple hyperplasia
16	57	12	Not done	Complex hyperplasia
17	58	1, 12	Normal	Complex hyperplasia
18	58	11, 13, 14	Not done	Simple hyperplasia
19	58	1, 12	Normal	Simple hyperplasia (polyp)

* Indications: 1=fibroids, 2=menorrhagia, 3=dysmenorrhea, 4=BRCA mutation, 5=dyspareunia, 6=adenomyosis, 7=adhesions, 8=metrorrhagia, 9=adnexal mass, 10=postcoital bleeding, 11=stress urinary incontinence, 12=postmenopausal bleeding, 13=prolapse, and 14=chronic pelvic pain.

** No patient with hyperplasia had atypia.

Table 4

Endometrial sampling in patients with abnormal bleeding: Results by patient age group

Patient age (years)	Number of patients with abnormal bleeding	Number of patients who underwent sampling (%)
<40	125	54 (43.2%)
40-49	319	175 (54.9%)
≥50	86	61 (70.9%)

Table 5

Endometrial sampling in patients with neoplasia on final pathology by patient age

Patient Age (years)	Number of Patients with Abnormal Pathology	Number of Patients with Sampling (%)
<40	4	1 (25%)
40-49	8	5 (63%)
≥50	7	4 (57.1%)

Table 6

Outcomes of patients with uterine cancer detected on final pathology

Patient Age (years)	Final Pathology	Subsequent procedure	Follow-up (months)
40	Grade 3 endometrioid adenocarcinoma invading 50% of myometrium with lymphvascular space invasion	None	81.7
44	Grade 1 villoglandular endometrioid adenocarcinoma with no myometrial invasion	Exploratory laparotomy, trachelectomy, bilateral salpingo-oophorectomy, washings, staging (all specimens negative for disease)	93.7
49	Endometrial stromal sarcoma	Exploratory laparotomy, trachelectomy, left salpingo-oophorectomy, optimal tumor reductive surgery for multiple peritoneal nodules; received 5 years of letrozole	90.4
60	Leiomyosarcoma involving pelvic sidewall with all staging biopsies and lymph nodes negative	None (converted to open procedure); received 6 courses of adjuvant adriamycin and dacarbazine with complete response. Recurred 42 months after surgery in pelvis, psoas, liver, and lungs; progressed on gemcitabine and docetaxel; died of disease 54.3 months after diagnosis	57.8