Incidence of Lymph Node Metastasis in Patients With a Preoperative Diagnosis of Endometrial Intraepithelial Neoplasia

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ABSTRACT

Introduction: Endometrial cancer is the most common gynecologic cancer in the United States, and endometrial cancer staging historically has included lymph node assessment to inform prognosis and guide recommendations for adjuvant treatment. This study sought to determine the incidence of lymph node involvement in patients undergoing hysterectomy with sentinel lymph node dissection for a preoperative diagnosis of endometrial intraepithelial neoplasia (EIN) to allow for risk stratification and management by general gynecology and gynecologic oncology.

Methods: We performed a retrospective chart review of patients diagnosed with EIN who underwent hysterectomy from January 2018 through July 2021. We collected and analyzed patient characteristics, perioperative metrics, and postoperative data. Incidence of lymph node positivity on final pathology was the primary outcome of interest. We analyzed clinical and histologic risk factors for correlation with a final diagnosis of endometrial carcinoma. Chi-square, Fisher exact, and *t* tests were used for comparisons.

Results: One hundred patients met inclusion criteria, 40 of whom had an underlying endometrial cancer. The majority were stage IA grade 1 endometrioid carcinomas (95%). Per institutional protocol, all patients were recommended sentinel lymph node dissection, of which 84 (84%) patients ultimately underwent lymph node dissection. One patient was found to have a positive sentinel lymph node on final pathology (1.2%). Increasing endometrial stripe thickness was positively associated with risk of endometrial carcinoma on final pathology (22.39 mm ± 31.87 vs 11.78 mm ± 5.17, $P = 0.023$).

Conclusions: The incidence of lymph node involvement in patients with a preoperative diagnosis of EIN is low. Sentinel lymph node dissection is unlikely to affect adjuvant treatment recommendations following surgical staging. Standardized risk assessment methods are warranted for patients with a preoperative diagnosis of EIN to delineate the utility of lymph node assessment in this population.

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INTRODUCTION

Endometrial cancer is the most common gynecologic cancer in the United States, with an estimated 66 570 people diagnosed in 2021.[1] Endometrioid carcinoma, the most common histologic subtype, accounts for 75% to 80% of all cases.[2] Endometrial intraepithelial neoplasia (EIN), formerly referred to as complex atypical hyperplasia (CAH), represents a precursor lesion to endometrioid adenocarcinoma of the endometrium. The underlying risk of occult endometrial cancer with a diagnosis of EIN is estimated to be as high as 43%.[3,4] However, given EIN and well-differentiated endometroid carcinoma exist on a histologic spectrum, it is challenging to distinguish these lesions, leading to poor pathologic diagnostic reproducibility.[5-7] Definitive management with total hysterectomy is recommended when a diagnosis of EIN is made given the risk of concurrent cancer.[4]

Endometrial cancer staging historically has included lymph node assessment to inform prognosis and guide recommendations for adjuvant treatment.[8] Various methods of lymph node assessment have been described given the underlying risk of carcinoma with EIN, though there is a lack of consensus regarding the role of lymphadenectomy.[9-11] Intraoperative endometrial assessment is commonly performed following hysterectomy, along with lymphadenectomy, in patients with

high-risk features and cancer identified on frozen pathology for comprehensive staging.[12,13] The imprecision of intraoperative frozen section and the potential for unnecessary surgical staging for patients with benign final pathology pose limitations to this method. Sentinel lymph node dissection is used as an alternative to lymphadenectomy to stage endometrial cancer with comparable diagnostic outcomes while minimizing postoperative morbidity associated with complete lymphadenectomy.[14-18] Sentinel lymph node dissection (SLND) is increasing in the setting of EIN, despite evidence from 2 randomized studies demonstrating no survival benefit for lymphadenectomy in early-stage endometrial cancer.[12,19,20] However, it is unknown if sentinel lymph node dissection affects adjuvant treatment or survival outcomes for patients ultimately diagnosed with endometrial cancer following hysterectomy.

Several studies have examined the role of lymph node dissection in EIN amid lack of consensus regarding surgical management,[9,10] though there are limited data establishing the absolute risk of lymph node involvement in patients presenting with EIN.[10] The objective of this study was to quantify the incidence of lymph node metastasis in a consecutive cohort of women presenting for surgical management, including SLND, with a preoperative diagnosis of EIN.

Table 1. Patient Characteristics, N = 100

	n (%)[a]
Age, years; mean	56.8 (± 10.8)
Body mass index, mean	40.4 (± 11.4)
Race/ethnicity	
Non-Hispanic White	94 (94%)
Non-HispanicBlack	3 (3%)
Hispanic	2 (2%)
Asian	1 (1%)
Menopausal status	
Premenopause	38 (38%)
Postmenopause	62 (62%)
Medical history	
Hypertension	62 (62%)
Diabetes	24 (24%)
Polycystic ovary syndrome	7 (7%)
Surgical history	
Cesarean delivery	17 (17%)
Appendectomy	11 (11%)
Laparotomy	5 (5%)
Laparoscopy	23 (23%)
Personal cancer history	11 (11%)
Breast	7 (64%)
Thyroid	1 (9%)
Pancreas	1 (9%)
Granulosa cell tumor (concurrent)	2 (18%)

[a]Percentage unless otherwise noted.

METHODS

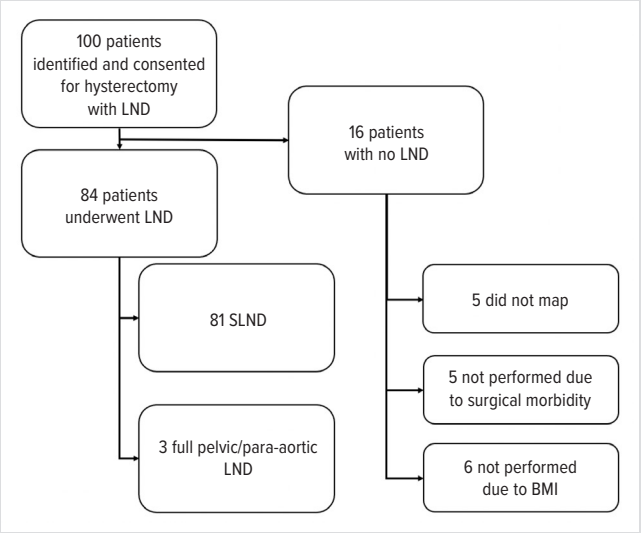
Following Institutional Review Board approval (IRB#2020-1404), we performed a retrospective cohort study of all patients with a preoperative diagnosis of EIN or CAH. We used *International Classification of Diseases*, *Ninth Revision (*ICD-9) or *Tenth Revision* (ICD-10) codes to identify all patients who underwent definitive surgical management for EIN/CAH with total hysterectomy from January 1, 2018, through July 31, 2021. All preoperative pathology specimens were reviewed and confirmed by institutional pathologists per division policy. We excluded patients who did not receive surgical management or whose surgery was not performed by a gynecologic oncologist.

In 2018, a uniform protocol for lymph node assessment at the time of hysterectomy for EIN was instituted at our institution. All patients undergoing hysterectomy for a preoperative diagnosis of EIN were managed surgically by a gynecologic oncologist, and lymph node sampling via sentinel lymph node dissection was recommended if no contraindications were present. If sentinel lymph node dissection could not be performed, a complete pelvic lymphadenectomy was recommended unless contraindications existed.

We manually reviewed the electronic medical record to collect baseline demographic and patient characteristic data. Race and ethnicity were self-reported by patients. Clinical characteristics including age, body mass index (BMI) (kg/m^2), menopausal status, and medical, surgical, and personal cancer history were collected. Perioperative outcomes, including method of endometrial biopsy acquisition (dilation and curettage [D&C], endometrial aspiration, hysteroscopy with D&C), operative time, estimated blood loss, perioperative blood transfusions, length of stay, and emergency department visit or readmission within 30 days also were recorded to secondarily identify risk factors for underlying carcinoma on final pathology. We abstracted pathologic data, including histology, grade, final cancer stage, mismatch repair status, tumor size (cm), depth of invasion, presence of lymphovascular space invasion, and pelvic washings status from the preoperative biopsy and final pathologic specimens. The number of patients with a preoperative diagnosis of "endometrial intraepithelial neoplasia – cannot rule out carcinoma" was recorded for analysis. Using established pathology diagnostic criteria from the Mayo Clinic, we dichotomized patients with a final diagnosis of cancer into high-risk and low-risk groups to examine associations between clinical data and final pathology results.[17] Lymph nodal tissue was analyzed by institutional gynecologic pathologists. Ultrastaging was used to assess sentinel lymph nodes on permanent specimens.[14]

The primary outcome – incidence of lymph node involvement at the time of hysterectomy – was defined by the presence of micrometastasis, or macrometastasis found within a lymph node specimen on final pathology. Secondary outcomes – risk factors for endometrial cancer and lymph node involvement on final pathology – were determined using statistical analysis. Descriptive statis-

Figure. Patients Undergoing or Omitted from Lymph Node Assessment at Time of Hysterectomy for Endometrial Intraepithelial Neoplasia



Abbreviations: LND, lymph node dissection; SLND, sentinel lymph node dissection; BMI, body mass index.

Table 2. Surgical Characteristics, N = 100

	n (%)[a]
Means of diagnosis	
Endometrial pipelle	60 (60%)
Dilation & curettage	4 (4%)
Hysteroscopy	36 (36%)
Surgical approach	
Robotic	58 (58%)
Laparoscopic	26 (26%)
Single-incision laparoscopy	9 (9%)
Abdominal	6 (6%)
Vaginal	1 (1%)
Lymph node assessment	
Full	3 (3%)
Sentinel	81 (81%)
None	16 (16%)
Lymph nodes positive (yes/no)	1 (1.2%)
Number of lymph nodes biopsied, mean	3.4 (± 2.8)
Final pathology	
Cancer	40 (40%)
Benign	60 (60%)

[a]Percentage unless otherwise noted.

tics were used to summarize demographic and clinic-pathologic data. Chi-square, Fisher exact, and *t* tests were performed using STATA version 16.1 (Stata Corp, College Station, Texas). A *P* value of < 0.05 was deemed statistically significant.

RESULTS

One hundred patients with a preoperative diagnosis of EIN met inclusion criteria. The mean age of the entire cohort was 56.8 years (±10.8), and mean BMI was 40.4 kg/m^2 (±11.4). The majority of patients were postmenopausal (62%) and self-identified as non-Hispanic White (94%). All patients underwent total hysterectomy and bilateral salpingo-oophorectomy. Complete patient characteristics are listed in Table 1. Eighty-one of the 100 patients who consented for lymph node assessment had bilateral sentinel lymph node dissection performed.

Three patients underwent complete bilateral pelvic lymphadenectomy at surgeon discretion following failed sentinel mapping. The Figure depicts surgical decision-making regarding completion of lymph node assessment. The large majority (93%) of procedures were completed laparoscopically, 6% via laparotomy, and 1% via a vaginal approach. Surgical characteristics of the entire cohort are listed in Table 2.

Forty patients were diagnosed with International Federation of Gynecology and Obstetrics (FIGO) grade 1 endometrioid adenocarcinoma on final pathology. Thirty-eight patients were diagnosed FIGO stage IA, 1 patient was diagnosed with Stage IIIC1 disease with metastatic involvement to 1 lymph node, and 1 patient with occult serosal involvement was diagnosed with Stage IIIA disease. None of the patients demonstrated >50% myometrial invasion or lymphovascular space invasion. The

Table 3. Characteristics of Patients Diagnosed with Endometrial Cancer on Final Pathology, N = 40

	n (%)[a]
Lymph mode assessment	
Full	2 (5%)
Sentinel	30 (75%)
None	8 (20%)
Histology	
Endometrioid	40 (100%)
Grade	40 (100%)
Stage	
IA	38 (95%)
IIIA	1 (2.5%)
IIIC1	1 (2.5%)
Microsatellite status	
MSS	38 (95%)
MSI	2 (5%)
Endometrial stripe thickness (mm), mean	15.6 (± 20)
Lymphovascular space invasion (yes/no)	0

[a]Percentage unless otherwise noted.

mean number of lymph nodes evaluated and removed per patient was 3.4 (±2.8). Only 1 of the 84 patients (1.2%) who underwent lymph node assessment was found to have lymph node involvement on final pathology. Of the patients diagnosed with Stage III disease, 1 patient received adjuvant treatment based on uterine factors, and 1 received adjuvant treatment based on lymph node assessment. Complete histopathologic characteristics are listed in Table 3.

Age, BMI, race and ethnicity, menopausal status, and mechanism of diagnosis were not significant predictors of cancer in univariate analysis. Increasing endometrial stripe thickness on preoperative ultrasound was associated with a statistically sig-

Table 4. Characteristics of Patients Based on Final Pathology (N = 100)

	Cancer (n = 40)	Benign (n = 60)	*P* value
Age, years; mean	55.7 (± 10.5)	57.5 (± 11)	0.421
Body mass index (kg/m^2), mean	41.6 (± 11.6)	39.6 (± 11.2)	0.389
Race			0.738
Non-Hispanic White	37 (92.5%)	57 (95%)	
Non-Hispanic Black	1 (2.5%)	2 (3.3%)	
Hispanic	2 (5%)	0	
Asian	0	1 (1.6%)	
Menopausal status			0.449
Premenopause	17 (42.5%)	21 (35%)	
Postmenopause	23 (57.5%)	39 (65%)	
Medical history			
Hypertension	25 (62.5%)	37 (61.7%)	0.933
Diabetes	10 (25%)	14 (23.3%)	0.848
Polycystic ovary syndrome	4 (10%)	3 (5%)	0.433
Surgical history			
Cesarean delivery	7 (17.5%)	10 (16.7%)	0.913
Appendectomy	5 (12.5%)	6 (10%)	0.695
Laparotomy	3 (7.5%)	2 (3.3%)	0.386
Laparoscopy	11 (27.5%)	12 (20%)	0.469
Personal cancer history			0.455
Breast	2 (5%)	5 (8.3%)	
Thyroid	0	1 (1.7%)	
Pancreas	0	1 (1.7%)	
Granulosa cell tumor (concurrent)	1 (2.5%)	1 (1.7%)	
Means of diagnosis			0.793
Endometrial pipelle	25 (62.5%)	35 (58.3%)	
Dilation & curettage	2 (5%)	2 (3.3%)	
Hysteroscopy	13 (32.5%)	23 (38.3%)	
Endometrial stripe thickness, mm (±)	22.39 (31.87)	11.78 (5.17)	0.023
Endometrial stripe ≥ 15 mm	18 (45%)	18 (30%)	0.016
Endometrial stripe ≥ 20 mm	8 (20%)	3 (5%)	0.006
Cannot rule out underlying carcinoma	14 (35%)	6 (10%)	0.003
Operating room time (minutes), mean	232 (± 60.4)	218 (± 40.7)	0.153
Estimated blood loss? (mL), mean	130.5 (± 217.8)	72 (± 52.9)	0.051
Perioperative blood transfusion (yes/no)	1 (2.5%)	1 (1.7%)	1
Lymph node assessment			0.396
Full	2 (5%)	1 (1.7%)	
Sentinel	30 (75%)	51 (85%)	
None	8 (20%)	8 (13.3%)	
Length of stay (days), mean	2.2 (± 0.66)	2 (± 0.95)	0.504
ED visit within 30 days (yes/no)	3 (7.5%)	3 (5%)	0.681
Readmission within 30 days (yes/no)	0	1 (1.7%)	1

Abbreviation: ED, emergency department.

Table 5. Characteristics of Patients Based on Mayo Criteria (N = 40)

	Meets Mayo (n = 12)	Does Not Meet Mayo (n = 28)	*P* value
Age (years), mean	55.58 (± 10.9)	55.7 (± 10.7)	0.092
Body mass index kg/m^2, mean	45.3 (± 12.4)	40.1 (± 11.2)	0.195
Race			1
Non-Hispanic White	11 (91.7%)	25 (89.3%)	
Non-Hispanic Black	0	1 (3.6%)	
Hispanic	1 (8.3%)	1 (3.6%)	
Asian	0	1 (3.6%)	
Menopausal status			0.589
Premenopause	4 (33.3%)	13 (46.4%)	
Postmenopause	8 (66.7%)	15 (53.6%)	
Medical history			
Hypertension	10 (83.3%)	15 (53.6%)	0.152
Diabetes	5 (41.7%)	5 (17.9%)	0.111
Polycystic ovary syndrome	1 (8.3%)	3 (10.7%)	0.818
Surgical history			
Cesarean delivery	2 (16.7%)	5 (17.9%)	1
Appendectomy	2 (16.7%)	3 (10.7%)	0.627
Laparotomy	0	3 (10.7%)	0.541
Laparoscopy	2 (16.7%)	9 (32.1%)	0.451
Personal cancer history			0.541
Breast	0	2 (7.1%)	
Granulosa cell tumor (concurrent)	0	1 (3.6%)	
Means of diagnosis			0.51
Endometrial pipelle	7 (58.3%)	18 (64.3%)	
Dilation & curettage	0	2 (7.1%)	
Hysteroscopy	5 (41.7%)	8 (28.6%)	
Stage			0.308
IA	10 (83.3%)	27 (96.4%)	
IIIA	1 (8.3%)	0	
IIIC1	1 (8.3%)	0	
Microsatellite status (MS)			0.515
MSS	11 (91.7%)	27 (96.4%)	
MSI	1 (8.3%)	1 (3.6%)	
Endometrial stripe thickness, (mm) mean	20.28 (± 56.73)	15.25 (± 8.35)	0.058

Abbreviations: MSS, microsatellite stable; MSI, microsatellite instability.

nificant increased risk of endometrial cancer on final pathology (22.39 mm ± 31.87 vs 11.78 ± 5.17, $P = 0.023$). This effect increased when endometrial stripe thickness was dichotomized at 20 mm (8 [20%] vs 3 [5%], $P = 0.003$), respectively. Additionally, a preoperative biopsy demonstrating "endometrial intraepithelial neoplasia – cannot rule out carcinoma" was significantly predictive of carcinoma on final pathology (14 [35%] vs 6 [10%], $P = 0.003$). Of the 16 patients who did not undergo lymph node assessment, 8 patients ultimately were diagnosed with endometrioid adenocarcinoma. Table 4 displays analyzed risk factors for carcinoma on final pathology.

Finally, we investigated factors correlating with high-risk and low-risk criteria for cancer on postoperative pathologic specimens based on validated guidelines from the Mayo Clinic (Table 5). In patients with a diagnosis of endometrioid carcinoma on final pathology, 12 patients (30%) met high-risk criteria based on tumor size ≥ 2cm. Other high-risk features considered included grade 3 histology or ≥50% of myometrial invasion; however, no patients in our cohort met these criteria. Age, BMI, menopausal status, mechanism of diagnosis, and preoperative endometrial thickness were not predictive of meeting high-risk criteria. Two of the 8 patients in whom lymph node assessment was not performed yet had a final diagnosis of

endometrioid adenocarcinoma met high-risk criteria based on tumor size alone.

DISCUSSION

The incidence of lymph node metastasis in patients with a preoperative diagnosis of EIN is low. Only 1 (1.2%) patient was identified to have lymph node involvement following surgical staging. Forty percent of patients in our cohort ultimately were diagnosed with endometrial cancer on final pathology, similar to rates reported elsewhere.[10,21] Patients with an increasing preoperative endometrial stripe thickness correlated with an increased risk of endometrial cancer ($P = 0.023$). Similarly, a preoperative diagnosis of "EIN – cannot rule out carcinoma" was significantly associated with endometrial cancer on final pathology ($P = 0.003$). The majority of patients (70%) diagnosed with endometrial cancer in our study notably were deemed low risk for lymph node metastasis by Mayo Clinic criteria, and nodal assessment guided adjuvant therapy recommendations in only 1 patient. When examining preoperative risk factors for a final pathologic diagnosis of endometrioid adenocarcinoma, our data confirm characteristics previously reported in other literature.[10,22]

It is important to differentiate a diagnosis of cancer from EIN insofar as it necessitates a different course of management upon diagnosis. Patients with EIN are recommended to have an extrafascial hysterectomy. In patients with low-risk endometrial cancer on hysterectomy pathology, adjuvant treatment is not recommended.[23] Prior literature has focused on predicting the individuals who will have a final post-hysterectomy diagnosis of cancer for those with a pre-hysterectomy finding of EIN. Our data support established data that a cohort of patients with increasing endometrial stripe thickness and histopathologic concerns for underlying carcinoma may benefit from surgical staging. Additionally, this information can be utilized for counseling regarding rates of nodal involvement in patients with preoperative diagnosis of EIN.

Our results are consistent with rates of lymph node involvement in the setting of EIN reported elsewhere. Touhami et al evaluated the risk of lymph node involvement in patients with a preoperative diagnosis of "EIN – cannot rule out carcinoma" compared to EIN, reporting a rate of lymph node involvement of 3.3% in a cohort of 120 patients undergoing hysterectomy with SLND.[10] Of these patients, 41.6% carried a preoperative diagnosis of "EIN – cannot rule out carcinoma," suggesting this cohort as higher risk for endometrial carcinoma on final pathology. Notably, rates of adjuvant treatment following surgical staging were not reported in this study.[10] Mueller et al found similar rates of lymph node involvement to our current study when evaluating operative outcomes for patients undergoing hysterectomy and SLND for a preoperative diagnosis of EIN. In 161 patients undergoing hysterectomy with SLND, 1 patient (0.6%) was found to have a positive sentinel lymph node.[21] Of the 98 patients diagnosed with endometrioid endometrial cancer, 10 received adjuvant treatment, with the majority receiving recommendations for adjuvant treatment based on high intermediate risk criteria[23] and not lymph node factors. Our study finds similar consistency, with 1 patient receiving adjuvant treatment based on lymph node metastatic disease, and 1 patient receiving adjuvant treatment based on serosal involvement. The demonstrated rate of lymph node involvement in patients with EIN has been repeatedly low; therefore, universal staging in this population likely subjects a low-risk group of these patients to unnecessary intervention.

Recent research has sought to determine risk factors and reliable methods for identifying patients with EIN who would benefit from staging surgery with a gynecologic oncologist. Intraoperative surgeon assessment of the specimen, as well as frozen-section pathologic analysis to assess for myometrial invasion and tumor size have been utilized. These methods have limitations and are associated with poor concordance with final pathology due to poor reproducibility across various institutions and surgeons.[24-26] These methods also require removal of the uterine specimen to determine the need for lymph node assessment, which precludes the use of SLND in this setting given disruption of lymphatic channels inherent to hysterectomy. Focus has thus shifted towards identifying risk factors suggestive of underlying endometrial cancer in the setting of EIN. Furthermore, Touhami et al reported a significantly increased risk of endometrial carcinoma in patients with a preoperative diagnosis of "EIN – cannot rule out carcinoma" compared to EIN alone, similar to our findings here.[10] Abt et al evaluated 378 patients with EIN undergoing hysterectomy to identify risk factors for endometrial carcinoma on final pathology.[22] Similar to our findings, they report a relative risk (RR) of 1.8 (95% CI, 1.2-2.5) for endometrial cancer on final pathology in EIN patients with a preoperative endometrial stripe thickness ≥ 15 mm. This effect was even more pronounced with an endometrial stripe thickness ≥ 20 mm (RR 2.0; 95% CI, 1.3-2.9), suggesting that increasing endometrial stripe thickness may be utilized preoperatively to risk stratify patients who may benefit from lymph node assessment and surgical staging with a gynecologic oncologist.

Current recommendations from the American College of Obstetricians and Gynecologists and the Society of Gynecologic Oncology suggest that premalignant endometrial lesions may be managed by a benign gynecologist or gynecologic oncologist. Given multiple reasonable options for treatment, this can lead to a management dilemma for patients with EIN.[4] Universal referral of patients with EIN to gynecologic oncology will result in unnecessary utilization of specialty services. This may have detrimental unintended consequences on certain populations or low resource areas where access to subspecialists is limited. However, it is also imperative to identify patients preoperatively who will benefit from referral to gynecologic oncology for surgi-

cal staging, so that the correct patients receive adjuvant therapy. Additionally, the benefits of multidisciplinary care, including a gynecologic oncologist, may be more readily extended to patients in the form of survivorship resources, sexual wellness following treatment, and clinical trial enrollment for patients with preinvasive disease.

Our study is strengthened by a consecutive cohort of patients recommended for and undergoing lymph node assessment, reducing selection bias for our patient population. Similarly, the majority of patients included completed lymph node assessment, whereas other series have relied on intraoperative decision-making to delineate need for lymph node evaluation—potentially skewing results towards a more high-risk patient population.[9,22] Given the relatively small sample size, we were unable to perform multivariate analysis related to our primary outcome.

Additional limitations of our study include those inherent to a single institutional retrospective review, and, as such, our results may not be applicable to patient populations largely different than our own. The majority of our patients diagnosed with endometrial cancer on final pathology were diagnosed with low-risk, stage IA disease. All patients identified in our cohort were diagnosed with endometrioid histology, thus our results have limited applicability to patients with high-grade or nonendometrioid histologies. Similarly, we did not incorporate comprehensive molecular characteristics of this low-grade group of carcinomas as this was not routinely performed at our institution during the specified time period. Given that the present study was conducted at a single academic institution with a predominantly non-Hispanic White population, our findings may not be generalizable to a population different than our own. We did not consider the cost-effectiveness of universal SLND, as this has been explored elsewhere, with findings suggesting that this practice is not universally cost effective due to the small proportion of patients who benefit from SLND.[26,27] Future research will seek to identify additional factors associated with elevated risk of high-risk endometrial cancer in patients with EIN, as well as incorporating molecular subtyping into risk stratification for patients with premalignant endometrial lesions.

CONCLUSIONS

This study reports a low incidence of lymph node involvement with a pre-hysterectomy diagnosis of EIN. The rate at which surgical lymph node assessment influences adjuvant treatment decisions is low in this patient population. With proper risk stratification, a low-risk group of patients with preoperative diagnosis of EIN may be spared surgical lymph node assessment.

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