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ORIGINAL ARTICLE

vNOTES scarless and painless endometrial cancer staging surgery

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Abstract

Aims: Sentinel lymph node dissection is performed in endometrial cancer surgery instead of staging surgery, particularly when the disease is advanced and confined to the uterus. The aim of this study is to share our sentinel lymph node detection rates via the vaginal natural orifice transluminal endoscopic surgery method with the literature and to demonstrate a safer and more comfortable surgical treatment process.

Methods: The analysis includes the patients who underwent surgery sentinel lymph node dissection for endometrial cancer utilizing indociyanin green in our center between January 2022 and June 2024.

Results: In all, of 24 endometrial cancer patients underwent surgery sentinel lymph node dissection, nonendometrioid (serous) pathology was observed in only 1 (4%) patient, our other patients (96%) had endometrioid adenocarcinoma pathology. The rates of our sentinel lymph node dissection bilateral and symmetric are 96% (23/24), 94% (22/24), and 79% (19/24), respectively. We would like to emphasize that we successfully used vaginal natural orifice transluminal endoscopic surgery approach on four of our patients who were unsuitable for laparoscopic and robotic surgery due to pain scores of 2 at the 12th hour after surgery and low lung capacity.

Conclusions: Vaginal natural orifice transluminal endoscopic surgery and sentinel lymph node dissection will be considered as surgical options in other gynecological cancers due to the comfort it brings to the patient in endometrial cancer.

KEYWORDS
endometrium cancer, gynecologic oncology, surgery in gynecologic cancers

INTRODUCTION

The most diagnosed gynecological cancer in developed countries is endometrial cancer (EC). The incidence and associated mortality rates of EC are continually increasing globally.[1,2] Most patients have diseases confined to the uterus, and their care is primarily dependent on surgical staging, including lymph node (LN) status.[3] Sentinel lymph node (SLN) sampling in EC restricted to the uterus has been indicated as adequate surgical treatment for all types and grades of EC.[4] Especially compared with pelvic and pelvic-paraaortic lymphadenectomy, SLN mapping improves surgical outcomes while maintaining trustworthy staging results.[5] In addition, pelvic and pelvic-paraaortic lymphadenectomy did not increase the long-term survival time in patients with advanced EC.[6]

Typically, SLN in EC is performed by conventional laparoscopy or robotic surgery.[7] Recently, the definition of the vNOTES (Vaginal Natural Orifice Transluminal Endoscopic Surgery) approach and its application to hysterectomy, bilateral salpingo-oophorectomy (BSO), omentectomy, pelvic and para-aortic LN removal have demonstrated that scarless staging surgery can be performed in EC surgery.[8–10] The vNOTES approach is utilized in EC surgery in the retroperitoneal area during SLN dissection, whereas transperitoneal is used for hysterectomy, BSO, and omentectomy when needed.[11] The transperitoneal vNOTES technique appears comparable to conventional laparoscopy in terms of safety and efficacy, while eliminating transabdominal incisions, exhibiting reduced postoperative pain, and shorter hospital stays.[12] Better visibility of lymphatic afferent arteries and pelvic LN, as compared with retroperitoneal versus

transperitoneal SLN detection methods, may allow for earlier LN appraisal and a more frequent examination of the caudal to cranial lymphatic systems.[11] Identifying the genuine SLN, which is the most proximal LN in the sentinel pathway, could help avoid harvesting secondary or upper-echelon nodes incorrectly.[13] Based on our experience, we believe that the primary advantage of the vNOTES approach is that it allows us to operate on patients with limited lung capacity and who cannot tolerate significant intra-abdominal carbon dioxide pressure.

Our primary goal was to share our SLN detection rates using the vNOTES approach with the literature. Second, we also wanted to point out that vNOTES surgery may be a good choice for surgical staging in patients with poor lung capacity.

MATERIALS AND METHODS

This is a retrospective and observational study. It was carried out as a single center at Bakırköy Dr. Sadi Konuk Training and Research Hospital, a tertiary cancer center. The study comprised patients who were pathologically diagnosed with EC between January 2022 and June 2024 and had SLN dissection via indocyanine green (ICG) performed with vNOTES surgery. The institutional review board (University of Health Sciences, Bakırköy Dr. Sadi Konuk Education and Research Hospital, Turkey) approved the study (Approval no. 2024/135).

The participants whose probe curettage procedures resulted in EC and whose disease was only detected in the uterus using imaging methods (computed tomography [CT], magnetic resonance imaging, or Fluorine-18 fluorodeoxyglucose positron emission tomography/CT) are included in our study. Patients having prior gynecological or abdominal malignancy surgery, deep infiltrative endometriosis, or a big uterus that might be forcibly removed vaginally were excluded from our study.

Demographic information of the patients, the duration of the surgery, problems during and after the surgery, the length of hospital stay, and postoperative pain levels are acquired from the patient file records. We successfully performed an SLN dissection technique utilizing vNOTES, on those whom we could not do with robotic surgery because of limited lung capacity. As a result, we diligently monitored our patients for any problems that arose. We wanted to present the results of this study immediately.

All patients had vNOTES hysterectomy with BSO and retroperitoneal vNOTES SLN mapping in accordance with the Memorial Sloan Kettering Cancer Center procedure.[14] Lymphatic channels are monitored and structures that are stained with fluorescent green with ICG, appropriate to the expected anatomical location (usually between the internal iliac and external iliac veins or in the obturator region), and are thought to be bilateral and symmetrical SLNs are removed. In cases where unilateral or bilateral SLNs cannot be determined, side-specific or total pelvic lymph node dissection is performed. Suspicious and bulky lymph nodes, as well as secondary SLNs stained green with ICG, are all removed.

Patients were put in a horizontal dorsal lithotomy position while receiving general anesthesia. ICG was injected into the cervix at the three and nine o'clock locations, with a total of 2–4 mL solution at a concentration of 1.25 mg/mL. The pelvic retroperitoneal space was accessed through 2–3 cm incisions made sequentially through the lateral vaginal fornix. To access the obturator fossa, a blunt and sharp dissection was performed laterally toward the internal obturator muscle. A 7 cm GelPoint V-Path Transvaginal Access Platform (Applied Medical, Rancho Santa Margarita, CA, USA) was utilized as a vNOTES port, and CO_2 was insufflated to expand the retroperitoneal space with a pressure of 12 mmHg. One 12-mm trocar were used to introduce a 30-degree scope, and two 10-mm trocars for bipolar graspers, and a bipolar sealing device. The ureter, iliac bifurcation, internal and external iliac arteries and veins, and obturator nerve were all recognized after entering the obturator space. Fluorescence imaging was used to identify the SLN in the retroperitoneum. The lymphatic system is investigated from caudal to cranial. Extension from caudal to cranial is the natural course of the lymphatic system. Identification and dissection of the fluorescent green-stained lymphatic duct and LN throughout the entire upper paracervical tract region, including the internal and external iliac and obturator regions, were performed consecutively. The SLN was excised and taken out transvaginally. Side-specific pelvic lymphadenectomy was performed in suspicious cases if a stained LN could not be located or when a bulky LN was suspected. The same technique was conducted on the contralateral side. All patients underwent a vaginally assisted notes hysterectomy (VANH) with BSO after having their sentinel nodes removed bilaterally. After passing the Douglas pouch and vesicouterine pouch, as in the initial stages of classical vaginal hysterectomy, it was determined that the abdomen was reached, a gel point was placed and monitored laparoscopically. Just before starting the hysterectomy, the independence of the uterus and peritoneal surfaces were evaluated and abdominal washing fluid was collected.

When performing a VANH vaginal hysterectomy, the pouch of Douglas and the vesicouterine pouch are accessed under direct vision, like in a traditional vaginal hysterectomy, and the rest of the hysterectomy is conducted endoscopically.

Statistical analysis

In our study, we wanted to evaluate our SLN detection rates with the vNOTES method. In particular, we

determined our rates of detecting at least one SLN in both pelvic areas, bilateral SLN, and symmetrical sentinel lymph as a percentage. We also calculated the proportion of the anatomical distribution and metastatic positivity of the detected SLN.

RESULTS

The vNOTES approach was used on 24 patients for SLN dissection. Preoperative pathology results for these patients confirmed EC. The demographic, clinical, and postoperative pathological information of patients are summarized in Table 1. The mean age of the patients was 56.5 years, median BMI (body mass index) was 31 kg/m^2. The average surgery time was determined as 125 min and the estimated blood loss was 70 mL. The average pain scale evaluation from 0 to 10 for the patients during the 12th hour after operation was 2. We kept our patients under observation for an average of 1 day.

All four (17%) of our patients suffered from severe COPD (chronic obstructive pulmonary disease). These patients had BMIs of 30, 32, 32, and 34, respectively. These patients' anesthesia department was ruled inadequate for laparoscopic and robotic surgery. Because the patients' intra-abdominal CO_2 pressure would not be significantly increased and they would not tolerate the reverse Trendelenburg position. Table 2 detailing the severity of COPD.

When histopathological results of patients observed, 17 of our patients (10 patients were Stage 1A1, 7 patients were 1A2, for a total of 72%) were determined in the early stage and 3 (12.5%) of patients as Stage 3c. We used the NCCN clinical practice guidelines in oncology for uterine neoplasms, version 1.2023–24, when managing our patients. Patients with more than 1/2 myometrium invasion, G3, and serous carcinoma had final pathology results following surgery. We did not send frozen section during surgery. In all of our patients' imaging examinations, the cancer was limited to the uterus, and we exclusively used the SLN dissection procedure to treat nonendometrioid kinds, as recommended by the guidelines.

TABLE 1 Patients' clinical, demographic, and histological characteristics.

Patients characteristics	Median	Range
Age (years)	56.5	(51–65)
Body mass index (kg/m^2)	31	(29–38)
Hospital stay in days after surgery	1	(1, 2)
Blood loss (mL)	70	(50–130)
Operation time (min)	125	(100–160)
Pain scores[a] (12 h)	2	(1–4)
Conversion to traditional laparoscopy	—	
Intraoperative complications	—	
	***N*: 24**	**Percentage**
Comorbidity		
Severe Chronic obstructive pulmonary disease)caused low lung capacity	4	16
Previous vaginal delivery	18	75
Previous cesarean section	6	25
Previous pelvic/abdominal surgery	16	67

[a]Using numeric rating scale−11 ranging from 0 (no pain) to 10 (worst imaginable pain).

TABLE 2 Global initiative for chronic obstructive lung disease (GOLD), chronic obstructive pulmonary disease (COPD) severity.

	Charecteristics	
COPD severity	**FEV1/FVC**	**FEV1**
GOLD Stage I (mild)	<70%	—
GOLD Stage II (moderate)	<70%	<50%–70%
GOLD Stage III (severe)	<70%	<30%–50%
GOLD Stage IV (very severe)	<70%	<30% or Insufficiency

Abbreviations: FEV1, forced expiratory volume in 1 s; FVC, forced vital capacity.

TABLE 3 Patients endometrial histology and stage.

Endometrial histology and stage		
FIGO stage[a]	***N*: 24**	**Percentage**
IA1	10	42
IA2	7	30
IB	1	4
IC	1	4
IIA	1	4
IIB	1	4
IIIC1	1	4
IIIC1i	2	8
Histology		
Endometrioid	23	96
Nonendometrioid (serous)	1	4
Grade		
1	19	80
2	4	16
3	1	4
Depth of myometrial invasion		
No infiltration	2	8
<%50	16	67
>%50	6	25
Presence of lymphovascular space invasion	7	30

[a]Staging following the 2023 FIGO (International Federation of Gynecology and Obstetrics) classification system.

TABLE 4 Sentinel lymph node (SLN) characteristics.

Detection rates of SLN	*N*: 24	Percentage
Overall	23	96
Bilaterally	22	91
Symmetric bilateral	19	79
Unilaterally	1	4
Undetected	1	4

Anatomical location and numbers of SLNs in endometrial cancer			
	Total	Left	Right
Total number of SLN detected	58	28	30
Median number of SLN detected	2 (1–4)	1 (1–3)	1 (1–3)

Site of SLN localization	Left	Percentage	Right	Percentage
Obturator area	23	82	26	86
External iliac area	5	18	3	10
Internal iliac area	—		1	4
Total number of SLN detected	28	100	30	100

While micrometastasis was observed in the SLN identified in 2 (8%) of these patients, we could not identify a SLN in the other patient, determined to be metastatic as a result of dissection of both pelvic LN. Nonendometrioid (serous) pathology was observed in only 1 (4%) patient, our other patients (96%) had endometrioid adenocarsinom pathology. Lymphovascular space invasion was observed in 4 (16%) of patients. Our histopathological findings were described in Table 3. Our rates of detecting SLN in at least one pelvic region, bilateral SLN and symmetric bilateral SLN are 96% (23/24), 94% (22/24), and 79% (19/24), respectively. In one (4%) of patients, we could not find a unilateral SLN even after repeated ICG injection 10 min than the first injection. Side-specific pelvic lymphadenectomy was performed in this patient. Despite administering the second dose of ICG to one of patients, we were unable to detect bilateral SLN. The patient's bilateral pelvic lymphadenectomy was performed utilizing the vNOTES approach. The histopathology of this patient revealed Grade 3 EC with metastases in both pelvic LN. The anatomical regions where we determined SLN are 82%(23/28) left, 86%(26/30) right obturator area, 18%(5/28) left, 10% (3/30) right external iliac area, and 4%(1/30)right internal iliac area. These rates are summarized in Table 4. Evaluated the pathology results of the SLN identified, micrometastasis was observed in 2 (%8) patients in whom we detected SLN. The details of these patients are given in Table 5. As we did not detect any sentinel paraaortic lymph nodes then we did not need to perform paraaortic lymph node dissection.

We did not have to modify the surgical procedure in any of our patients, and there were no intraoperative or postoperative issues. In fact, the best part of this study is that we could not make most of the patients believe having had surgery. Only vaginal tampons were removed after surgery.

DISCUSSION

The study was conducted to determine our SLN dissection rates, utilize the vNOTES method and ICG in the treatment of EC and to compare our findings with the current literature. The study showed that the pain scores of the patients at the 12th hour after surgery were very low and that patients with low lung capacity could be operated easily.

In the study, it was observed that our SLN detection rates using ICG were similar to the literature.[12,13] In particular, our percentages of bilateral and symmetrical LN detection, which boosts the SLN's negative predictive value, are very similar to the literature.[15,16] Although challenges in SLN in obese patients have been noted earlier,[17] our patients had an average BMI of 31. When comparing the VNOTES method to laparoscopic and robotic methods, we discovered that our LN detection rates in obese individuals were greater than those described in the literature. We can attribute this to the fact that we did the SLN from caudal to cranial, parallel to the lymphatic system. As a result, the chances of discovering secondary LN decline.[18] Set against robotic and laparoscopic procedures, the vNOTES technique causes less bleeding when determining SLN from the retroperitoneum. It is crucial for our study to emphasize that the vNOTES method is preferable to other laparoscopic methods due to reduced bleeding and anatomically simpler access to the SLN, as previously indicated in the literature.[18]

TABLE 5 Characteristics of patients with sentinel lymph node (SLN) metastasis.

No.	Age	Body mass index (kg/m^2)	Histology	Preoperative grade	Postoperative grade	Myometrial invasion	SLN	Location of SLN
1	57	34	Endometrioid	1	2	>50%	Micrometastasis	Left obturatuar area
2	54	31	Endometrioid	1	2	<50%	Micrometastasis	Left obturatuar area
3	59	36	Endometrioid	2	3	>50%	Undetected	Left pelvic

In the patient for whom there could not be any detected SLN, metastases was discovered in both pelvic LNs on final pathology. It has previously been documented in the literature that the SLN we were unable to detect is metastatic, and that the presence of a metastatic LN diminishes the likelihood of finding the sentinel node.[19]

When observed, the postoperative 12-h pain scores and average hospital stay in our patients who were operated on with the diagnosis of EC using the vNOTES technique were similar to the literature.[20] As previously stated in the literature, the study found that even if the average BMI is 31 and they are not eligible for robotic or laparoscopic surgery due to insufficient lung capacity, they may be operated on safely, successfully, and without complications using the vNOTES approach.[10–18] Precisely, we operate on patients in the lithotripsy position. However, we do not need to place the patient in the maximum Trendelenburg position. Furthermore, beginning with a traditional vaginal hysterectomy and then progressing to vNOTES surgery and completing the remainder of the surgery is much faster than the laparoscopic method, and we can complete the procedure without creating too much intra-abdominal CO2 pressure by keeping the intra-abdominal CO_2 pressure at 10–12 mmHg. Because vNOTES surgery has previously been employed in benign cases at our center,[21,22] learning process for SLN evaluation via vNOTES was not necessary at all for our surgery team.

Our study has limitations such as being retrospective and having a small number of cases; nonetheless, the fact that it is single-centered, performed by the same surgical team, and our SLN detection rates and anatomical locations are comparable to the literature demonstrate the strength of our study.

The fact that patients have no incision scars, are discharged quickly after surgery, and are even discharged so easily after surgery despite being advised by anesthesia department that they may not be appropriate for surgery due to insufficient lung capacity, makes the vNOTES procedure an appealing option.

The utilization of vNOTES procedure, which is scarless, painless, and has nearly no consequences, will rise in EC staging surgery. Prospective trials with a greater number of cases are required to conclude that SLN dissection using the vNOTES approach is a reliable surgical procedure for the treatment of EC.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data available on request due to privacy/ethical restrictions. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. In particular, our clinical director and coauthors did not find it appropriate to share the data unless the study was published.

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