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Original Article

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Comparison of oncologic outcome of preoveratively presumed low-risk endometrial cancer patients who underwent only bilateral pelvic sentinel lymph node (SLN) removal and those who underwent pelvic lymphadenectomy in addition to bilateral pelvic SLN removal: Turkish Gynecologic Oncology Group (TRSGO-SLN-009)

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ABSTRACT

Objective: We aimed to compare the oncological outcomes of patients with bilateral sentinel lymph nodes (SLNs) detection and removed with those who underwent pelvic lymphadenectomy (PLA) in addition to bilateral SLNs removal.
Methods: This multicenter, retrospective study included cases of endometrioid type, grade I–II endometrial cancer, in which bilateral SLNs were detected and removed. Patients who had only bilateral SLNs detected and removed (group I) and patients who had bilateral SLNs detected and removed and subsequent additional bilateral PLA (group II) were included in the evaluation.
Results: In group I (n=216), SLN metastasis rate was 5.5% and in group II (n=251), it was 10.3%. The low-volume disease detection rate was 4.6% in group I and 4.8% in group II. In group II, in patients with SLN macrometastasis had also 28.6% non-SLN macrometastasis.

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No false-negative results occurred in group II. Recurrence was detected 1.8% in group I and 5% in group II; however, there was no significant difference (p=0.083). Disease-free survival and overall survival, were almost same between the groups (hazard ratio [HR]=2.11; 95% confidence interval [CI]=0.681–6.588; p=0.187) and (HR=1.531; 95% CI=0.392–5.975; p=0.537), respectively.
Conclusion: SLN mapping, ultrastaging, and immunohistochemical staining can identify low-volume metastases that may not be identified with classic lymphadenectomy and hematoxylin & eosin staining. It has been observed that adding PLA beyond SLN mapping did not provide an additional positive contribution to survival. For endometriod type grade I–II patients, detection of bilateral SLNs in both hemipelvis only, if detectable, is an adequate approach.

Keywords: Endometrial Cancer; Sentinel Lymph Node; Recurrence; Survival; Surgical Procedures, Operative/Adverse Effects

Synopsis
We compared the oncological outcomes of low-risk endometrial cancer patients who underwent sentinel lymph node (SLN) mapping alone and patients who underwent pelvic lymphadenectomy (PLA) in addition to SLN. The results showed no significant difference in outcomes between the 2 groups, indicating that adding PLA to SLN does not provide additional survival benefits.

INTRODUCTION

Endometrial cancer (EC) is the most common gynecological cancer in developed countries [1]. The majority of affected patients (85%) are diagnosed postmenopause, with a mean age at diagnosis of >60 years [2]. EC is histopathologically classified into 2 types: type I (80%–90%) includes grade 1 and 2 endometrioid carcinomas, which are associated with estrogen and have a favorable prognosis; and type II (10%–20%) includes grade 3 endometrioid and non-endometrioid type carcinomas, which are unrelated to estrogen and have a poorer prognosis [3].

The primary treatment for EC confined to the uterus is surgery, typically involving bilateral salpingo-oophorectomy and total hysterectomy. Surgical staging is used to determine prognosis and identify women who may benefit from adjuvant therapy. It is crucial to detect lymph node metastases to plan postoperative treatment and gauge prognosis [4]. However, lymphadenectomy remains a controversial topic in EC management. A prospective surgical staging study by the Gynecologic Oncology Group (GOG-33) reported that pelvic and para-aortic lymph node metastases accounted for 9% and 6% of stage 1 EC cases, respectively [5]. Both the A Study in the Treatment of Endometrial Cancer (ASTEC) trial and the study by and Benedetti Panici et al. [6,7] demonstrated that lymphadenectomy does not provide therapeutic benefits in early stage EC. Pelvic and/or para-aortic lymphadenectomy was the standard method for node assessment until the recent use of sentinel lymph node (SLN) mapping. SLN mapping offers benefits, such as higher diagnostic accuracy, increased detection of low-volume metastasis, such as micrometastases, and isolated tumor cells (ITCs) via ultrastaging, reduced vascular injury, and decreased risk for lymphedema.

Furthermore, SLN mapping can help identify and remove lymph nodes in the internal iliac and presacral areas, which are often overlooked during standard lymphadenectomy. Thus, SLN mapping is replacing lymphadenectomy in EC staging [8,9]. It has been emphasized in the literature that SLN mapping and biopsy may result in less morbidity and are more accurate methods than lymphadenectomy for assessing nodal spread in early stage EC [4].

However, the impact of SLN mapping on oncological outcomes remains under investigation. In one of our centers (Department of Gynecological Oncology, Cerrahpaşa Faculty of Medicine), pelvic lymphadenectomy (PLA) in addition to SLN mapping has not been used in most patients with low-risk EC since 2016 if bilateral SLN detection can be performed. Our aim was to compare the results of this approach with patients who underwent SLN + PLA, which was a method much more frequently used in other centers at that time. Accordingly, we conducted a multicenter study to investigate whether there was a difference in survival between those who only underwent bilateral SLN removal and those who received additional PLA.

The primary aim of our study was to evaluate the recurrence and survival of presumed low-risk patients with a histopathological diagnosis of grade 1–2 endometrioid type EC, in whom SLN mapping was performed and whether the addition of PLA to SLN mapping contributed to oncological outcomes.

MATERIALS AND METHODS

The present study collected and retrospectively evaluated data from patients who underwent surgery at multiple centers between February 2010 and December 2022. Ethics committee approval was obtained from Istanbul University-Cerrahpaşa Rectorate Clinical Research Ethics Committee (15.06.2023, number: E-83045809-604.01.01-712066). Patients included in the present study underwent SLN mapping, and those in whom SLNs were detected and removed from both hemipelves were selected. Intraoperatively, grossly suspicious nodes were not labeled as SLN, although they were removed.

Patients were divided into 2 groups: group I included those who had only SLNs removed in both hemipelvises; and group II, in which SLNs were removed bilaterally followed by PLA. All patients underwent hysterectomy and bilateral salpingo-oophorectomy.

The inclusion criteria for this study were as follows: SLN(s) removed bilaterally after SLN mapping; histopathology of endometrioid type, grade I–II EC; and no sign or suspicion of lymph node metastasis on radiological imaging. The exclusion criteria were as follows: previous different cancer diagnosis; non-endometrioid or grade 3 endometrioid histopathology; and undergoing PLA on only 1 side after unilateral SLN detection.

The tumor stage and histological differentiation (i.e., grade) of the patients were classified according to the International Federation of Gynecology and Obstetrics (i.e., "FIGO") 2009 Staging System [10]. Postoperative risk stratification was performed in accordance with the 2021 European Society of Gynaecological Oncology/European Society for Radiotherapy and Oncology/European Society of Pathology consensus report [11]. Because the present study was conducted retrospectively and molecular testing was not available at all centers during the study period, molecular classification was not used for postoperative risk stratification. All surgeries were performed by certified gynecological oncology specialists.

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In the study centers, either methylene blue (10 mg/mL) or indocyanine green (ICG-25 mg ICG/flacon diluted with sterile water in the range of 0.625 mg/mL to 1.25 mg/mL) was used for SLN mapping. ICG is expensive and requires specialized equipment and, because not every center had access to this agent and resources, methylene blue was used in some cases. A Da Vinci (Intuitive Surgical, Sunnyvale, CA, USA) robotic console and pinpoint laparoscopic cameras were used for SLN detection after cervical injection of ICG. Because methylene blue is visible to the naked eye, it has been used in both open and laparoscopic surgeries. The dosage of ICG and methylene blue varied according to the practice of each center and was generally administered through deep stromal and superficial injections of 2 cc each at the 3 o'clock and 9 o'clock positions of the cervix, totaling 4 cc. All of the stained primary and secondary SLNs were removed. SLNs were examined using hematoxylin and eosin staining. Subsequently, ultrastaging was performed for micrometastases/ITCs if no macrometastasis was observed on hematoxylin and eosin staining. Non-SLNs were conventionally evaluated and adjuvant therapy was decided by the multidisciplinary councils of each center.

Statistical analyses were performed using SPSS version 21.0 (IBM Corp., Armonk, NY, USA). Clinicopathological variables, including categorical data, were analyzed using the χ^2 or Fisher's exact tests. Survival outcomes, including disease-free survival (DFS) and overall survival (OS), were calculated using the Kaplan–Meier method. Differences with $p<0.05$ were considered to be statistically significant.

RESULTS

This study evaluated 467 patients diagnosed with endometrioid type, grade I–II EC, in whom SLNs were detected and removed in both hemipelves; the median age of the patients was 57 years (interquartile range [IQR], 30–87 years), and the median follow-up was 34 months (IQR, 1–142 months). Demographic characteristics of the patients are summarized in **Table 1**.

There were no significant differences in demographic characteristics between the 2 groups; however, in group I, methylene blue was used in 36.5% and 63.5% of the patients, respectively. In group II, methylene blue was used in 49.4% and 50.6% of patients, respectively (p=0.005). In group I, laparoscopy/robotic surgery was preferred by 181 (83.8%) patients and open surgery by 35 (16.2%). In group II, laparoscopy/robotic surgery was preferred by 164 (65.3%) patients and open surgery by 87 (34.7%) (p=0.000). In group I, the median number of removed SLNs was 3.5 (mean, 4.13 [range, 2–14]),while in group II, the median was 3 (mean, 4.27 [range, 2–14]). The mean number of pelvic lymph nodes removed in the SLN + PLA group was 18.2 and, for para-aortic lymph nodes, was 11.7.

SLN metastasis was found in 12 (5.5%) patients in group I and 26 (10.3%) in group II. SLN metastases in group I were distributed as follows: macrometastasis (n=2); micrometastasis (n=6); and ITC (n=4). SLN metastases in group II were distributed as follows: macrometastasis (n=14); micrometastasis (n=5); and ITC (n=7). Among the 14 patients in group II with SLN macrometastasis, 4 (28.6%) also had non-SLN metastasis, and no metastasis was observed in non-SLNs. Ultrastaging has enabled the identification of patients with micrometastases and ITC and thus enabled adjuvant therapy to be administered to these patients. In group II, there were no SLN-negative but non-SLN-positive (false-negative) patients, and the low-volume disease detection rates were similar: 4.6% (group I) versus 4.8% (group II) (p=0.939).

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Table 1. Distribution of demographic characteristics of the patients after postoperative histopathologic evaluation

Characteristics	Group I* (n=216)	Group II† (n=251)	p-value
Age			0.733
<60 yr	129	146	
≥60 yr	87	105	
LVSI			0.707
Absent	177	209	
Present	39	42	
MI			0.321
<1/2	171	189	
≥1/2	45	62	
Tumor size			0.238
<2 cm	96	98	
≥2 cm	120	153	
SLN metastasis			0.058
Absent	204	225	
Present	12	26	
Postoperative stage			0.051
Stage 1–2	201	220	
Stage 3–4	15	31	
ESGO/ESTRO/ESP risk classification			0.321
Low/intermediate	171	189	
High-intermediate/high	45	62	
Recurrence			0.083
Absent	212	239	
Present	4	12	

ESGO, The European Society of Gynaecological Oncology; ESP, The European Society of Pathology; ESTRO, The European Society for Radiotherapy and Oncology; LVSI, lymphovascular space invasion; MI, myometrial Invasion; SLN, sentinel lymph node.
*Only the SLN removed in bilateral hemipelvis.
†Bilateral hemipelvis SLN removal + pelvic lymphadenectomy.

Postoperatively, adjuvant treatment was administered to 23% (n=50) of patients in group I, distributed as follows: brachytherapy (n=29); external beam radiation therapy (EBRT) ± intracavitary brachytherapy (ICBT) (n=13); and chemotherapy (CT) + radiotherapy (RT) (n=8). Adjuvant treatment was administered to 31.9% (n=80) of patients in group II, distributed as follows: internal radiation therapy (n=35); EBRT ± ICBT (n=30); CT (n=3); and CT + RT (n=12).

The median follow-up in groups I and II were 29 and 38 months, respectively. Recurrence was detected in 4 (1.8%) patients in group I and 12 (5%) in group II; however, the difference was not statistically significant (p=0.083). There was no statistical difference between the groups in terms of DFS (hazard ratio [HR]=2.11; 95% confidence interval [CI]=0.681–6.588; p=0.187) (**Fig. 1**). The characteristics of patients who experienced recurrence are detailed in **Table 2**.

In terms of OS, 3 deaths were observed in group I, with 7 deaths in group II; the difference was not statistically significant (HR=1.531; 95% CI=0.392–5.975; p=0.537) (**Fig. 2**).
The characteristics of patients who died are summarized in **Table 3**.

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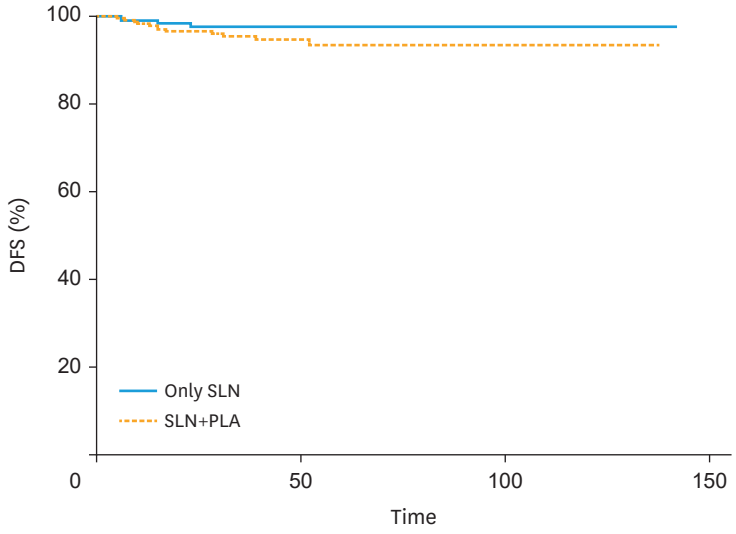

No. at risk				
Only SLN	216	38	8	0
SLN+PLA	251	77	19	0

Fig. 1. DFS.
DFS, disease-free survival; PLA, pelvic lymphadenectomy; SLN, sentinel lymph node.

Table 2. The characteristics of patients with disease recurrence

Characteristics	Patients	The time to recurrence (mo)	Recurrence site	Recurrence treatment	Death	OS (mo)
SLN group (group 1)	1	15	Right external iliac lymph node and right inguinal lymph node	CT + RT	Alive	41
	2	23	Vaginal cuff	ICRT	Alive	36
	3	6	Pelvic central	RT	Alive	26
	4	6	Vaginal cuff	Surgery + RT	Alive	33
SLN + PLA group (group 2)	1	31	Right common iliac, paraaortic interaortocaval lymph nodes	Surgery + RT	Alive	43
	2	7	Left pelvic paraaortic lymph nodes	03/2014 L/S PLA + PALA (lymphadenectomy) followed by 6 cycles of CT (last 08/2015) + RT	Alive	112
	3	39	First recurrence 05.2016, vaginal cuff /2nd recurrence 01.2018, metastasis in the pelvis and pelvic bone	EBRT/2nd relapse oral Megace 160 mg/day	CAD/MI**	96
	4	10	Right iliac fossa (10×10 cm) (extraperitoneal mass)	Surgery + CT + RT	Alive	111
	5	52	Vaginal cuff	Surgery	Alive	89
	6	15	Vaginal cuff	ICRT + EBRT	Alive	28
	7	28	Peritoneum and omentum (bilateral nephrostomy due to tumour-related stasis)	CT	Alive	29
	8	5	Bilateral inguinal nodal recurrence	Bilateral inguinal lymphadenectomy + 6 cycles of CT	Alive	10
	9	17	Intra-abdominal, peritonitis carcinomatosa	CT	Disease-related ex	28
	10	13	Pelvic central	RT	Alive	25
	11	15	Pelvic central	RT	Alive	45
	12	9	Lung	CT	Alive	13

CAD, coronary artery disease; CT, chemotherapy; EBRT, external beam radiation therapy; ICRT, internal radiation therapy; MI, myocardial infarction; OS, overall survival; PLA, pelvic lymphadenectomy; RT, radiation therapy; SLN, sentinel lymph node.

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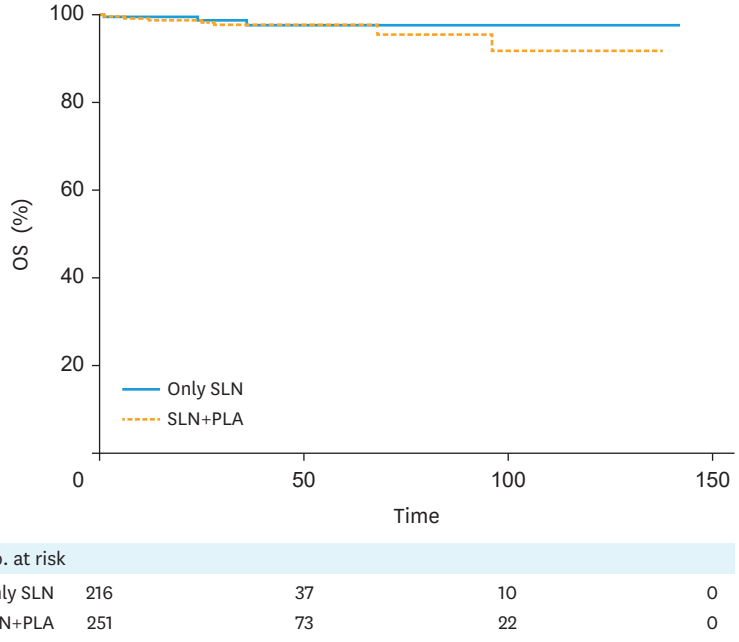
Table 3. The characteristics of patients with death

Characteristics	Patients	OS (mo)	Recurrence	Recurrence treatment	Cause of death
SLN group (group 1)	1	24	No	No	COVID-19
	2	25	No	No	Unrelated to the disease/cause unknown
	3	1	No	No	Sepsis
SLN + PLA group (group 2)	1	6	No	No	DVT and embolism
	2	96	05.2016. vaginal cuff recurrence/ 2nd recurrence 01.2018 metastasis in the pelvis and pelvic bone	EBRT/2nd relapse oral Megace 160 mg/day	CAD/MI
	3	68	No	No	Unrelated to the disease/ex due to second primary lung ca
	4	28	Peritonitis carcinomatosa	CT	Disease-related ex
	5	<1	No	No	Ex due to surgical complications
	6	25	No	No	Unrelated to the disease/cause unknown
	7	12	No	No	Unrelated to the disease/ex due to second primary lung ca

CAD, coronary artery disease; COVID-19, coronavirus disease 2019; CT, chemotherapy; DVT, deep vein thrombosis; EBRT, external beam radiation therapy; MI, myocardial infarction; OS, overall survival; PLA, pelvic lymphadenectomy; SLN, sentinel lymph node.



No. at risk				
Only SLN	216	37	10	0
SLN+PLA	251	73	22	0

Fig. 2. OS.
OS, overall survival; PLA, pelvic lymphadenectomy; SLN, sentinel lymph node.

DISCUSSION

The most accurate and objective data for preoperative evaluation of patients is the histopathological diagnosis and grade obtained by endometrial curettage. Tumor size, myometrial invasion (MI), lymphovascular space invasion, and lymph node status can be determined through postoperative pathological examination. Because these parameters were not known preoperatively, we used histopathological type and grade as the main criteria for patient selection in our study. SLNs were removed after detection in the bilateral hemipelvis in all patients, which enabled us to evaluate oncological outcomes in a homogeneous group. In this study, the addition of lymphadenectomy to SLN removal was retrospectively evaluated to determine whether it conferred an additional benefit to oncological outcomes.

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Based on the main oncological outcomes, PLA after bilateral SLN removal did not provide any additional benefits, and survival rates were similar between the 2 groups. To our knowledge, no study in the literature has examined cases with only bilateral pelvic SLN detection and removal for the purpose of comparing oncological results.

The methodology and extent of lymphadenectomy in patients diagnosed with EC remains controversial, and determining the status of lymph nodes is crucial for patient management and planning adjuvant treatment(s). In patients with disease considered to be limited to the uterus, the rate of lymph node metastasis is in the range of 10%–15%. Therefore, lymphadenectomy was not necessary in most patients. According to some studies, the observed increase in survival with an increasing number of lymph nodes removed in lymph node-negative cases support the therapeutic effect of lymphadenectomy [12-14]. This survival advantage may arise from the removal of low-volume disease(s) that cannot be detected using standard routine histopathological examinations. However, according to the results of the ASTEC randomized clinical trial, routine pelvic lymph node dissection in early stage EC did not improve survival rates [9]. A Cochrane database review found no evidence that lymphadenectomy decreased the risk for death or disease recurrence compared with no lymphadenectomy in women with presumed stage I disease [15].

The potential survival benefit associated with complete lymphadenectomy in EC should be weighed against the early and long-term morbidity risks of the procedure. The concept of SLN mapping was developed to reduce the surgical morbidity associated with full lymph node dissection while accurately identifying lymph node metastases. As demonstrated in previous studies, a high SLN detection rate, along with a low false-negative rate and low nodal recurrence rate, indicates that the likelihood of missing occult nodal disease during SLN mapping alone is minimal [16,17]. Therefore, the SLN algorithm could be considered potentially more effective than traditional complete lymphadenectomy. Our study included patients in whom SLNs were detected in both hemipelvises in the low-risk group. In the SLN + PLA group, no false-negative case (SLN negative and non-SLN positive) was detected. Our results support the safety of performing only SLN mapping without lymphadenectomy in patients in whom SLN is detected and removed in both hemipelvises.

Garzon et al. [18] found no significant differences in OS between the SLN alone or SLN + PLA groups compared with the lymphadenectomy group and concluded that the method of lymph node assessment did not impact OS in EC, irrespective of lymph node metastasis, histopathological subtype, or the number of nodes removed during lymphadenectomy.

In the SENTI-ENDO study [19], lymphadenectomy was performed after the SLN removal. No difference in recurrence-free survival (RFS) was observed between patients with and without SLN (p=0.09). There was also no difference in RFS between SLN-positive and -negative cases (p=0.5). The results support the impact of SLN biopsy on surgical management and indications for adjuvant therapies.

Imboden et al. [20] retrospectively investigated the relationship between the lymph node evaluation method and oncological outcomes in patients with low-risk EC (FIGO stage 1, endometrioid histology, grade 1–2). While no statistical differences were observed in the disease-specific survival, DFS, or OS between the groups, the SLN group exhibited the lowest recurrence and disease-related death rates.

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The Sloan Kettering (New York, NY, USA) and Mayo Clinic (Rochester, MN, USA) study [21] compared SLN mapping procedure (performing lymphadenectomy on the side where SLN was not detected) to total lymphadenectomy (pelvic ± para-aortic) procedure in low-risk EC (endometrioid histology, any grade, and MI <50%). As a result, the implementation of the SLN mapping algorithm has been reported to not adversely affect oncological outcomes and, for patients with endometrioid-type histology and <50% MI, it has been suggested that the use of the SLN mapping algorithm may be more reasonable than comprehensive lymphadenectomy. The findings of this study suggest that a greater number of metastatic lymph nodes were identified in the SLN group than in the lymphadenectomy group, leading to adjuvant treatment for these patients. A summary of the studies and comparisons with our investigation is presented in **Table 4**.

Table 4. Summary of the studies and comparison with our study

Studies	Study design	Results	Conclusions
Garzon et al. [18]	• Total (n=68,614) patients with stage I–III disease. • SLN alone or SLN + lymphadenectomy.	• A 64,796 (94.4%) lymphadenectomy only, 1,777 (2.6%) SLN only, and 2,041 (3.0%) underwent both. • The median follow-up was 34.5 months. • The 5-year OS was 82.1% for the entire population, 90.9% in SLN only group, 81.9% in the lymphadenectomy group, and 88.1% in patients who underwent both procedures.	The study concluded that the method of lymph node assessment did not impact OS in EC, irrespective of lymph node metastasis, histopathological subtype, or the number of nodes removed during lymphadenectomy.
The SENTI-ENDO study [19]	• Total (n=125). • Stage I–II EC. • Pelvic lymphadenectomy was performed in all cases after SLN removal.	• The median follow-up was 50 months. • A 14.4% recurrences. • The 50-month RFS was 84.7%, and there was no significant difference between patients with and without detected SLN (p=0.09). • Among patients with detected SLNs, no difference in RFS was observed between those with and without positive SLN (p=0.5).	SLN biopsy on surgical management and indications for adjuvant therapies. Hence, despite the absence of a difference in RFS, probably linked to the sample size, further studies focusing on management of EC should take into account not only SLN biopsy results but also stratifying adjuvant therapies according to SLN status.
Imboden et al. [20]	• Total (n=279). • Low-risk endometrial cancer (FIGO stage 1, endometrioid histology, grades 1 and 2). • Only SLN (42%)/ lymphadenectomy (21%)/without lymphadenectomy (37%).	• While no statistical differences were observed in terms of DSS, DFS, and OS between the groups. • SLN group exhibited the lowest recurrence and disease-related death rates.	In early-stage, endometrial cancer, grade 1 and 2, sentinel lymph node removal offers a convincing balance between oncological safety and perioperative morbidity. Especially in LVSI-positive cases, lymph-node evaluation in any form is crucial.
Sloan Kettering and Mayo Clinic study [21]	• Total (n=1,135). • Compared SLN mapping procedure to total lymphadenectomy (pelvic ± para-aortic) procedure in low-risk EC (endometrioid histology, any grade and MI <50%).	• The median follow-up time was 2.1 years in the SLN cohort, 3.5 in the LND cohort. • A 642 (57%) were managed with an SLN approach and 493 (43%) with an LND approach. • Positive pelvic lymph nodes were found in 5.1% of SLN mapping patients and 2.6% of lymphadenectomy patients (p=0.03). • Adjuvant treatment was given to 27.1% of SLN group and 10.8% of lymphadenectomy group (p<0.001). • There was no significant difference between the 2 groups in the 3-year PFS and OS rates (p=0.07).	As a result, the implementation of the SLN mapping algorithm has been reported not to adversely affect oncological outcomes. For patients with endometrioid-type histology and less than 50% MI, it has been suggested that the use of the SLN mapping algorithm may be more reasonable than comprehensive lymphadenectomy.
Our study	• Total (n=467) with endometrioid type, grade I–II. • Group I, patients who had only SLNs removed in both hemipelvises, group II, SLNs removed bilaterally followed by pelvic lymphadenectomy.	• In group I, patients had a median follow-up time of 29 months, while in group II it was 38 months. • Recurrence was detected in 4 cases (1.8%) in group I and in 12 cases (5%) in group II. However, there was no significant difference between the groups (p=0.083). DFS showed no statistical difference between the groups. • In terms of OS, 3 deaths were observed in group I, while 7 deaths were observed in group II. There was no significant difference in OS between the groups.	SLN mapping, ultrastaging, and immunohistochemical staining can identify low-volume metastases that may not be identified with classic lymphadenectomy and hematoxylin & eosin staining. It has been observed that adding pelvic lymphadenectomy beyond SLN mapping did not provide an additional positive contribution to survival. For endometriod type grade I–II patients, detection of bilateral SLNs in both hemipelvis only, if detectable, is an adequate approach.

EC, endometrial cancer; DFS, disease-free survival; DSS, disease-specific survival; FIGO, International Federation of Gynecology and Obstetrics; LND, lymph node dissection; LVSI, lymphovascular space invasion; MI, myometrial invasion; OS, overall survival; PFS, progression-free survival; RFS, recurrence-free survival; SLN, sentinel lymph node.

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In our study, SLNs were removed in both groups and lymphadenectomy was added in 1 group. Although there was a slightly higher proportional difference in detecting SLN metastasis in the SLN + PLA group compared with the SLN-only group, no statistical difference was found and we cannot explain this difference. In the SLN + lymphadenectomy group, in which SLN mapping identified all metastatic nodes, additional lymphadenectomy revealed metastasis in non-SLNs in only 4 patients. Because SLN metastasis was present in these 4 patients, lymphadenectomy did not provide an additional contribution in terms of adjuvant treatment. There was no significant difference in survival between the groups in our study. Our study used SLN mapping before total PLA to identify low-volume metastases in the lymph nodes. Considering recent studies, it appears that total lymphadenectomy does not provide any survival advantage in patients who undergo SLN mapping. Therefore, it appears to be a logical approach to use only SLN mapping in patients with endometrioid histology and disease limited to the uterus, who are likely to be in the low-risk group based on preoperative evaluation.

The strengths of our study include the large number of patients, adequate follow-up period, data obtained from a tertiary gynecological oncology center, and the fact that all cases were patients with bilateral SLN detection in both hemipelvises and removed, thus enabling us to evaluate a homogeneous group. A limitation of our study was that we used both methylene blue and ICG dye for SLN mapping. Methylene blue has lower sensitivity than ICG for detecting SLNs, particularly bilaterally. Considering that only patients with bilateral SLNs were included in the study, the aim of detecting the first and secondary SLNs was achieved in both methylene blue and ICG groups. However, it is clear that if ICG were used instead of methylene blue, the total number of removed SLNs—especially secondary—would likely have increased. Because the use of ICG is costly and requires specialized equipment, and not every center has access to these resources, centers with few resources may use methylene blue dye for SLN mapping. Additionally, although the characteristic distributions of the groups were similar, this was a retrospective study.

This method is almost entirely effective in revealing metastatic spread, and the unnecessary removal of regional lymph nodes without metastasis may potentially eliminate the lymph node defense barriers where T lymphocytes are present. This warrants further investigation.

Ongoing prospective studies are investigating the oncological consequences of SLN mapping. One such study in Korea, SELYE, aimed to compare SLN mapping using ICG with conventional pelvic lymph node dissection in patients with clinical stage I–II EC (NCT04845828). The investigators will assess survival rates in groups undergoing SLN mapping versus those undergoing standard pelvic lymph node dissection for EC at clinical stages I and II. Primary and secondary outcome measures included DFS and OS [22]. Additionally, an observational prospective study titled “Validity of Sentinel Lymph Node Dissection (SLND) in Patients with Apparent Early-Stage EC” (NCT02834988) recently completed participant recruitment. The secondary outcome measures in this study were the rates of progression-free survival and OS in patients with nodal metastasis [23]. Once the results of these studies are published, clearer insights into the oncological outcomes of SLN mapping will be gained.

The most important feature of SLN mapping is its ability to detect low-volume lymphatic metastases; one-third of patients with macrometastases in SLNs also have metastases. In cases with low-volume SLN metastasis, non-SLN metastasis was not detected. When patients with bilateral SLN detection and removal were compared with those in whom bilateral SLN +

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PLA was performed, there was no significant difference in terms of DFS or OS. The addition of PLA after bilateral SLN detection and removal did not positively contribute to survival. As such, the identification of SLNs on both sides of the pelvis was deemed adequate for this particular patient population.

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