부인암 수술에서 동결절편생검의 효용성

김정미
(충북의대)

DECLARATION OF INTERESTS

Nothing to declare

Subject

Key questions on each gynecologic cancer

Q1. Cervical Cancer: Sentinel lymph node biopsy 는 PLND 를 안전하게 대체할 수 있는가? (False-negative problem)

Q2. Endometrial Cancer: Sentinel lymph node mapping 후 수술 중 동결절편 결과를 반드시 확인해야 하는가?

1. Cervical cancer

Sentinel lymph node mapping 은 Pelvic lymph node dissection 을 안전하게 대체할 수 있는가?

2011

Bilateral Negative Sentinel Nodes Accurately Predict Absence of Lymph Node Metastasis in Early Cervical Cancer: Results of the SENTICOL Study

Fabrice Lécuru, Patrice Mathevet, Denis Querleu, Eric Leblanc, Philipe Morice, Emile Daraï, Henri Marret, Laurent Magaud, Florence Gillaizeau, Gilles Chatellier, and Daniel Dargent†

1A1-LVSI positive to 1B1 (FIGO 2009)
N=136, 92.0% sensitivity and 98.2% Negative predictive value
No false-negative results were observed in whom SLN were identified bilaterally.

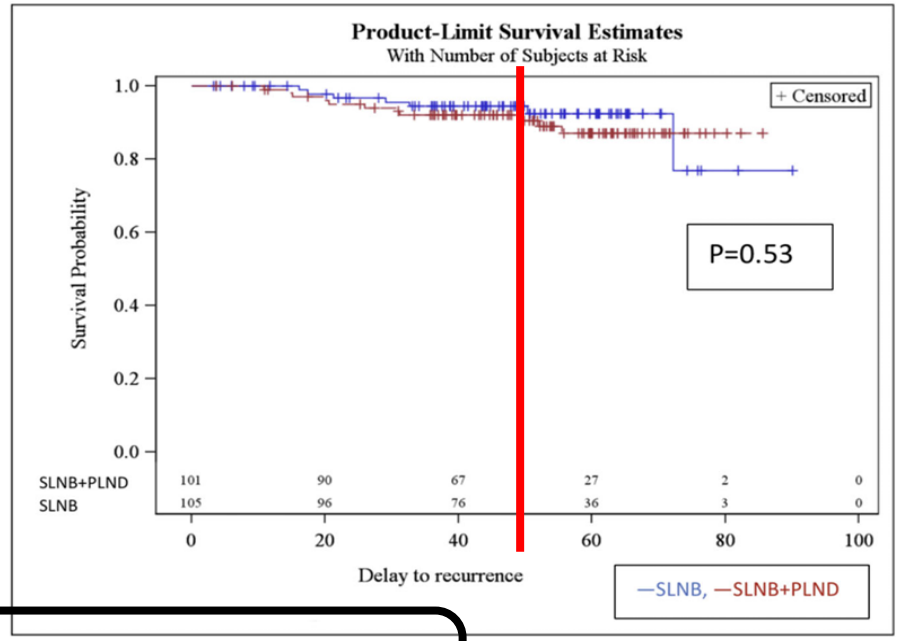
1. Cervical cancer

1) 2021 SENTICOL-2 trial: Multicenter, prospective randomized trial

- Histology:squamous cell carcinoma, adenocarcinoma, or adenosquamous carcinoma
- Stage 1A1-LVSI positive, 1A2, 1B1, IIA1 (FIGO 2009)
- Underwent laparoscopic radical hysterectomy or radical trachelectomy
- (N=206)

Sentinel lymph node resection only (N=105)

Sentinel lymph node resection and Full lymphadenectomy (N=101)



- Disease-free survival after 4 years in the SLNB and SLNB+PLND groups was 89.5% and 93.1% (p=0.53).
- Overall survival (OS) for SLNB was 95.2% and 96% for SLNB+PLDN(P=0.97).

1. Cervical cancer

2) 2026-2027 SENTICOL-3 trial: International, Multicenter, prospective randomized trial

- Histology:squamous cell carcinoma, adenocarcinoma, or adenosquamous carcinoma
- Stage 1A1-LVSI positive, 1A2, 1B1, IIA1 (FIGO 2009)
- Underwent laparoscopic radical hysterectomy or radical trachelectomy

→ Sentinel lymph node resection only

→ Sentinel lymph node resection and Full lymphadenectomy

- Disease-free survival after 3 years in the SLNB and SLNB+PLND groups
- Health-related Quality of Life

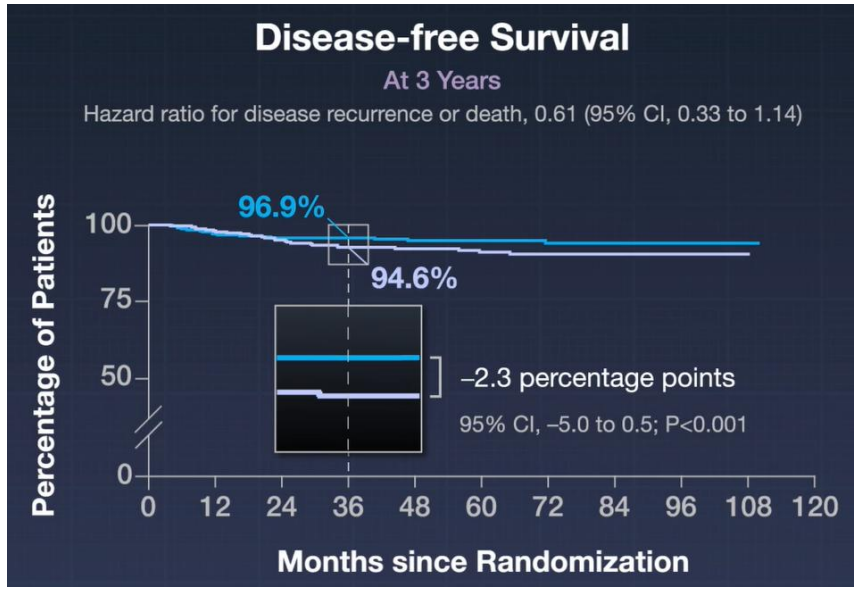
1. Cervical cancer

3) 2025 PHENIX trial: Phase 3, multicenter, randomized trial

- Histology: squamous cell carcinoma, adenocarcinoma, or adenosquamous carcinoma
- Stage 1A1-LVSI positive, 1A2, 1B1, IIA1 (FIGO 2009)
- Underwent radical hysterectomy and received adjuvant therapy per protocol
- (N=838)

Sentinel lymph node biopsy (N=420)

Full lymphadenectomy (N=418)



- Primary endpoint : 3-year disease-free survival
- Non-inferiority analysis(non-inferiority margin, 5 percentage points
- Secondary endpoint : retroperitoneal nodal recurrence and cancer-specific survival

1. Cervical cancer

4) 2025 SENTIX trial: Prospective single-arm study

- Histology: squamous cell carcinoma, adenocarcinoma, or adenosquamous carcinoma
- Stage 1A1-LVSI positive, 1A2, 1B2 (FIGO 2018)
- Underwent radical hysterectomy and received adjuvant therapy per protocol
- (N=731)

→ Sentinel lymph node biopsy (N=594)

- Recurrence rate at 2 years: 6.1% (7% of non-inferiority margin)
- SLN metastases were identified in 82 patients(12%), 56.1% intraoperatively and 43.9% by ultrastaging.

- Primary endpoint : recurrent rate at 2 years

1. Cervical cancer

2026 ESMO Clinical Practice Guideline

- Sentinel lymph nodes should be processed according to the ultrastaging procedure with at least five serial sections and immunohistochemistry(IHC) for cytokeratins in at least on level.
- FIGO 2018 stage 1A1 with LVSI-positive, 1A2, 1B1, 1B2, IIA1
- The intraoperative assessment of SLNs by frozen section may miss micrometastases and isolated tumour cells and is, therefore, only recommended for grossly suspicious SLNs.
- If an SLN is not detected on either pelvic side, systematic pelvic LN dissection (PLNE) should be completed.

NCCN (Version 1. 2027)

- Consideartion of SLN mapping algorithm and emphasize that best detection and mapping results are in tumors< 2 cm diameter.
- Surgeons should perform side-specific nodal dissection in any cases of failed mapping and remove all suspicious or grossly enlarged nodes regardless of SLN mapping.

1. Cervical cancer

이러한 연구 결과에도 연구자들이 sentinel lymph node mapping 으로 shifting 하지 못하는 장벽은?

Meta-Analysis > *Gynecol Oncol* (IF: 5.48; **Q2**). 2023 Oct:177:157-164.
doi: 10.1016/j.ygyno.2023.08.019. Epub 2023 Sep 11.

Diagnostic accuracy of sentinel lymph node frozen section analysis in patients with early-stage cervical cancer: A systematic review and meta-analysis

Nuria Agustí [1], David Viveros-Carreño [2], Nathalia Mora-Soto [3], Pedro T Ramírez [4], Alejandro Rauh-Hain [5], Chi-Fang Wu [6], Juliana Rodríguez [7], Carlos Fernando Grillo-Ardila [8], Catherin Salazar [3], Kirsten Jorgensen [5], Blanca Segarra-Vidal [9], Enrique Chacón [10], Alexander Melamed [11], René Pareja [12]

Frozen section analysis detected 159 to 292(54.5%) patients with lymph node metastasis. In 281 patients the type of volume metastasis was reported: 1 of 41(2.4%) patients had isolated tumor cells, 21 of 78(26.9%) patients had micrometastasis, and 133 of 162(82.1%) patients had macrometastasis. The pooled sensitivity of intraoperative SLN frozen section analysis was 65% (95% CI 51-77%) for macrometastasis, micrometastasis, and isolated tumor cells.

1. Cervical cancer

▸ Gynecol Oncol. Author manuscript; available in PMC: 2018 Apr 1.

Published in final edited form as: Gynecol Oncol. 2017 Feb 8;145(1):96–101. doi: 10.1016/j.ygyno.2017.02.005

Sensitivity and negative predictive value for sentinel lymph node biopsy in women with early-stage cervical cancer

Gloria Salvo [a], Pedro T Ramirez [a], Charles F Levenback [a], Mark F Munsell [b], Elizabeth D Euscher [c], Pamela T Soliman [a], Michael Frumovitz [a,*]

Logistic regression for factors affecting rates of detection of sentinel lymph nodes (SLNs) and bilateral SLNs

Factor	OR (95% CI)	
	Overall SLN detection	Bilateral SLN detection
Prior conization (versus no conization)	0.96 (0.3–3.0)	0.58 (0.27–1.20)
Body mass index > 30 kg/m^2 (versus ≤ 30 kg/m^2)	1.89 (0.55–6.48)	0.49 (0.25–0.96)
Tumor ≥ 2 cm (versus < 2 cm)	0.42 (0.13–1.32)	0.90 (0.43–1.87)

Stage, N(%)	
1A1	13(6.9)
1A2	34(18)
1B1	136(72)
1B2	3(1.6)
IIA1	2(1.1)

1. Cervical cancer

이러한 연구 결과에도 연구자들이 sentinel lymph node mapping 으로 shifting 하지 못하는 장벽은?

High risk group (by Peters' criteria)
Positive surgical margins
Microscopic parametrial invasion
Positive pelvic lymph nodes (including micrometastases)

→ CCRT

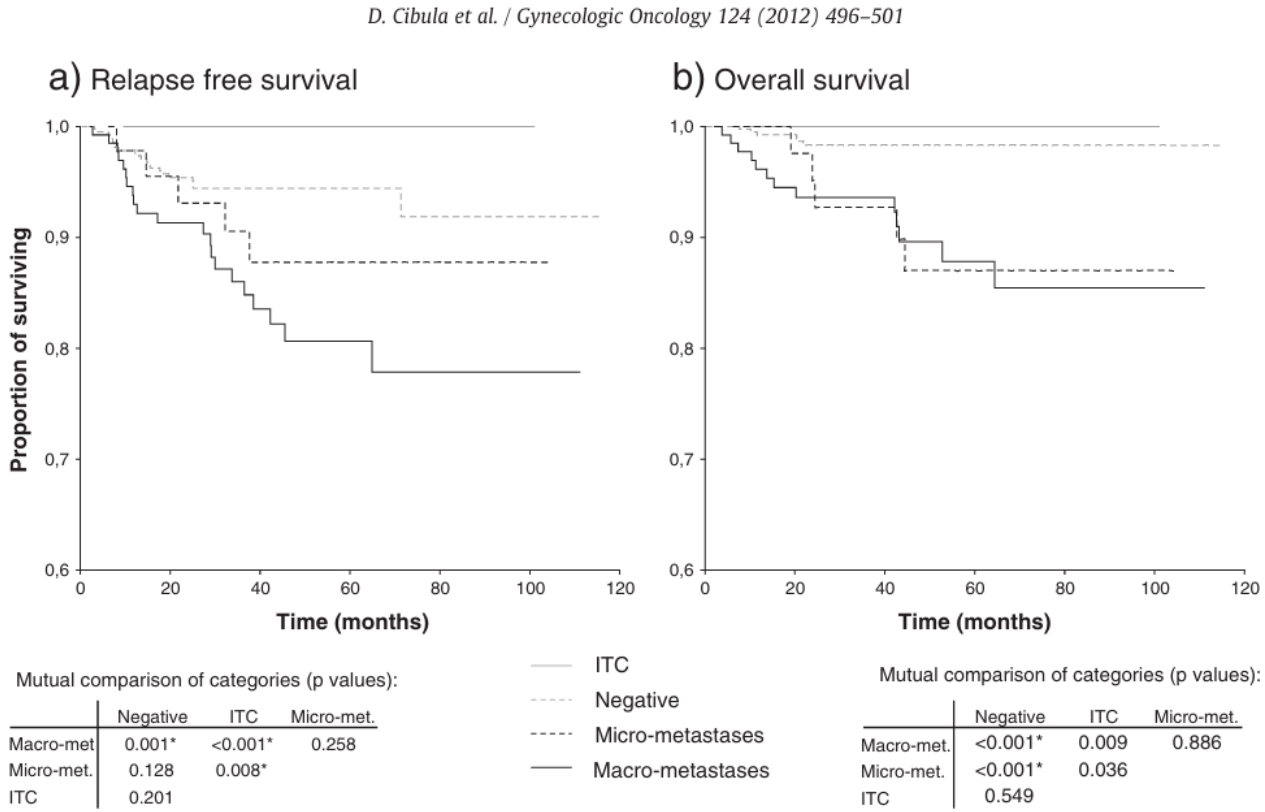


Fig. 2. Survival endpoints stratified according to final lymph node status (based on SN ultrastaging and pelvic nSN evaluation).

1. Cervical cancer

2024 The POHIM-CCRT Nonrandomized Controlled Trial :Multicenter, Phase 2 non-randomized trial

- Histology: squamous cell carcinoma, adenocarcinoma, or adenosquamous carcinoma (1 with other)
- 1 or more: Positive lymph node metastases, parametrial invasion and positive resection margin
- Underwent radical hysterectomy and pelvic lymph node dissection
- (N=79)

→ Hypofractionated IMRT

- Primary endpoint : Incidence of acute grade 3 or higher gastrointestinal tract, genitourinary, and hematologic toxic effects during RT or within 3 months after RT completion.
- Secondary endpoint : Patient-reported quality of life and Disease free survival

Table 2. Physician-Reported Acute Toxic Effects During or Within 3 Months After Radiotherapy Completion Based on the National Cancer Institute Common Terminology Criteria for Adverse Events, Version 4.0

Toxic effect	Patients, No. (%)
Any acute	
None	13 (16.5)
Grade 1	45 (57.0)
Grade 2	19 (24.1)
Grade 3	2 (2.5)
Gastrointestinal tract	
None	19 (24.1)
Grade 1	49 (62.0)
Grade 2	10 (12.7)
Grade 3	1 (1.3)
Genitourinary	
None	64 (81.0)
Grade 1	15 (19.0)
Hematologic	
None	56 (70.9)
Grade 1	10 (12.7)
Grade 2	11 (13.9)
Grade 3	2 (2.5)

1. Cervical cancer

Hypofractionated IMRT: 3-year DFS rate of 79.3% and an OS rate of 98.0%
GOG-109 Peters et al : 4-year DFS : 80%, 4 year OS rate 81.0% (2000)

	Conventional CCRT	Hypofractionated IMRT
총 방사선 선량	45.0-50.4 Gy	40.0 Gy
1회당 선량 (Fraction size)	1.8-2.0 Gy/회	2.5 Gy/회
총 치료 횟수	25-28 회	16 회
치료 기간	약 5-5.5주	약 3.2주(16일)
병동 항암제	Cisplatin 주1회($40mg/m^2$)	Cisplatin 주1회($40mg/m^2$)

POHIM-P3 Trial (Phase III RCT) : conventional CCRT vs. Hypofractionated IMRT 3-year DFS surviva
l non-inferiority

1. Cervical cancer

2024 대한부인종양학회 자궁경부암 진료권고안

KQ-5. 자궁경부암 환자 수술에서 감시 림프절 탐색이 골반림프절 절제술과 유사한 생존율을 보이는가?

P: Cervical cancer

I: Sentinel lymph node biopsy

C: Pelvic lymph node dissection

O: Survival

- 권고사항: 자궁경부암 환자 수술에서 감시 림프절 탐색을 선택적으로 시행할 수 있다.
- 권고수준: 약하게/조건부 권고(Weak/Conditional for)

2. Endometrial cancer

Sentinel lymph node mapping 후 수술 중 동결절편 결과를 반드시 확인해야 하는가?

2. Endometrial cancer

1) 2017 FIRES trial: a multicenter, prospective, cohort study

- Stage I endometrial cancer of all histologies and grades
- Underwent **robotic** staging
- Standardised cervical injection of **indocyanin green** and sentinel lymph node mapping followed by pelvic lymphadenectomy w/ or w/o para-lymphadenectomy
- (N=340)

Sentinel lymph node mapped (N=293)

- Sensitivity to detect node-positive disease of 97.2%(95% CI 85.0-100)
- Negative predictive value of 99.6% (97.9-100)

- Primary endpoint : Sensitivity and negative predictive value of the sentinel lymph node mapping
- At least one sentinel lymph node should be mapped.

2. Endometrial cancer

2) 2021 SENTOR trial: prospective, multicenter cohort study

- Stage I grade 2 endometrioid or high-grade EC
- Underwent **laparosopic or robotic**
- Grade 2 endometrioid ED underwent pelvic lymphadenectomy alone, and high – grade EC underwent PLND and para-aortic lymphdenectomy
- (N=156)

Sentinel lymph node biopsy with PLND (N=55)

Sentinel lymph node biopsy with PLND, PALND (N=101)

- Sensitivity to detect node-positive disease of 97.4%(95% CI 93.6%-99.3%)
- Negative predictive value of 99% (96%-100%)

- Primary outcomes : Sensitivity of the sentinel lymph node biopsy algorithm.
- Secondary outcomes : diagnostic accuracy, sentinel lymph node detection rates, and adverse events.

2. Endometrial cancer

3) 2026 PORTEC-4a trial: Randomised, open-label, phase 3, a multicenter, non-inferiority trial

- High-intermediate group (FIGO 2009); stage IA (with invasion), grade 3 (any age, with or without LVSI), stage IB(grad 1-2 and age≥60) , stage 1B(grade 1-2 with LVSI), stage 1B(grade 3 w/o LVSI), stage II(grade 1)
- Endometrial Endometrioid adenocarcinoma
- Lymphadenectomy, lymph node sampling, sentinel lymph node mapping.
- (N=564)

Molecular profile group(N=367)

2

(Favorable) POLEmutated, NSMP-CTNNB1wt → observation (N=168)

(Intermediate) MMRd, NSMP-CTNNB1mutated→ brachytherapy (N=148)

(Unfavorable) P53abn, substantial LVSI, L1CAM overexpression → pelvic radiotherapy (N=51)

1

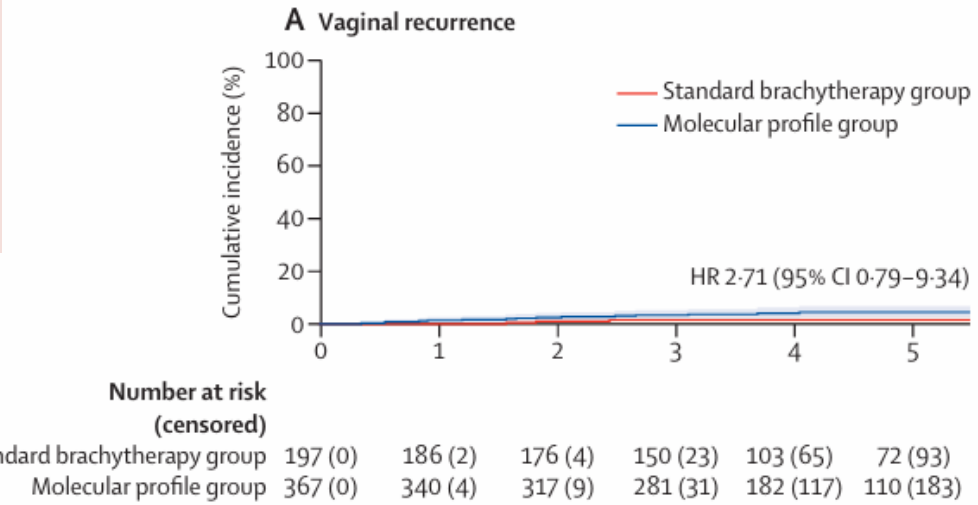
Standard vaginal brachytherapy (N=197)

- Primary endpoint : overall 5-year cumulative incidence of vaginal recurrence as first event.

2. Endometrial cancer

3) 2026 PORTEC-4a trial: Randomised, open-label, phase 3, a multicenter, non-inferiority trial

Vaginal recurrence (first)			
All patients			
Molecular profile group	17/367	4·5% (2·23–6·76)	2·71 (0·79–9·34)
Standard brachytherapy group	4/197	1·6% (0·00–3·32)	Ref
Patients with a favourable risk profile			
Molecular profile group	6/168	4·1% (0·81–7·37)	3·97 (0·48–32·95)
Standard brachytherapy group	1/109	0·9% (0·00–2·78)	Ref
Patients with an unfavourable risk profile			
Molecular profile group	3/51	4·3% (0·00–10·09)	0·48 (0·07–3·30)
Standard brachytherapy group	3/23	8·7% (0·00–20·21)	Ref



- 5-year cumulative incidence of vaginal recurrence was 4.5%(95% CI 2.23-6.76) in molecular profile group and 1.6% (0.00-3.32) in the standard group(HR 2.71, 95% CI 0.79-9.34)

2. Endometrial cancer

ESMO 2026

Sentinel lymph node mapping can be considered as a strategy for ndal assessment in low-risk/intermediate-risk EC(stage 1A G1-G3 and stage 1B G1-G2). It can be omitted in cases without myometrial invasion. Systematic lymphadenectomy is not recommended in this group.

Surgical lymph node staging should be carried out in patients with high-intermediate-risk/high-risk disease. Sentinel lymph node biopsy is an acceptable alternative to systematic lymphadenectomy for lymph node staging in high-intermediate/high-risk stage I-II.

2. Endometrial cancer

2026 NCCN guideline>
Prospective and retrospective studies demonstrate that compared to systemic lymphad enectomy(LND), SLN mapping with ultrastaging may increased the detection of lymph node metastasis with low false-negative rates in patients with apparent uterine-confine d disease.

Recent evidence indicates that SLN mapping may also be used in high-risk histologies.

Low-volume nodal metastasis to SLN detected only by enhanced pathologic ultrastagin g is another potential value to staging with SLN.

2. Endometrial cancer

2024 대한부인종양학회 자궁체부암 진료권고안

핵심질문 4: 조기 자궁내막암 수술에서 감시림프절탐색은 기존의 림프절절제술과 비교하여 재발율의 차이가 있는가?

P	Early-stage endometrial cancer
I	Sentinel lymph node mapping
C	Conventional lymphadenectomy
O	Recurrent rate

· 권고사항: 조기 자궁내막암 수술에서 감시림프절탐색을 시행할 수 있다.
· 권고수준: 약하게/조건부 권고

Take-home messages

자궁경부암에서 감시림프절 생검은 골반림프절 절제술을 대체할 수 있는가?

A. 4 cm 미만의 자궁에 국한된 경우, 적절한 술기로 수행된다면 비열등하고, 합병증이 적은 진단검사로써 수행될 수 있다. 2 cm 미만 종양에서 정확도는 더욱 신뢰할 만 한다. 수술 후 ultrastaging 을 시행해야 하며 최종조직결과에 따른 방사선 치료를 할 때 hypofractionated radiation therapy 를 고려해볼 수 있다.

자궁에 국한된 자궁내막암에서 Sentinel lymph node mapping 후 수술 중 동결절편 결과를 반드시 확인해야 하는가?

A. 분자학적 분류와 영구절편 ultrastaging 결과가 보조치료를 결정하는 현재의 패러다임에서 수술 중 감시림프절의 동결절편 검사를 routine 하게 시행하는 것은 생략하는 방향이 타당할 수 있다.



2026년
대한부인종양학회
제31차 추계 심포지엄

2026.10. 23. (금) - 24. (토)

정부세종컨벤션센터 / 세종 코트야드 바이 메리어트

대한부인종양학회
Korean Society of Gynecologic Oncology