



MIS Radical Hysterectomy in Cervical Cancer

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Introduction

Should MIS Radical Hysterectomy Still Be Performed?

A practical decision framework synthesizing the evidence presented in this deck

Where things stand

The 2018 LACC trial halted routine use of MIS radical hysterectomy after it showed markedly worse recurrence and survival than open surgery. But accumulating evidence — covered in this deck — shows the excess harm was concentrated in patients and techniques that lacked spillage-prevention, not in MIS as a modality itself. The question is no longer simply “MIS or open?” but “in whom, and with which technique?”

✓ MIS Is Reasonable

- Tumor diameter < 2 cm
- Preoperative conization performed
- No uterine manipulator + protective vaginal cuff closure (or endoscopic stapler)
- High-volume, experienced MIS surgeon / center

△ Individualize With Caution

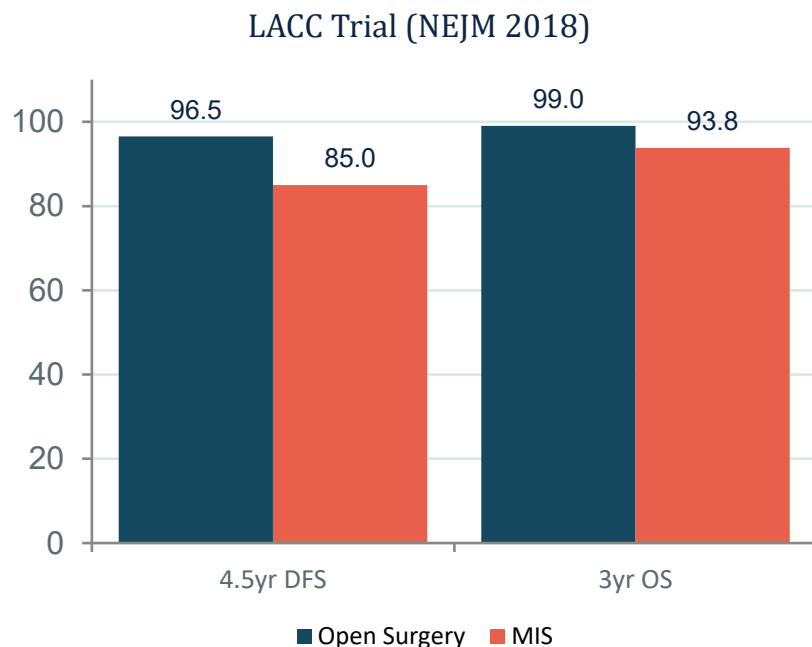
- Tumor 2–4 cm without conization
- Spillage-prevention technique available but track record limited
- Requires explicit shared decision-making, discussing LACC-era data
- Consider sentinel node navigation to limit added morbidity

✗ Prefer Open Surgery

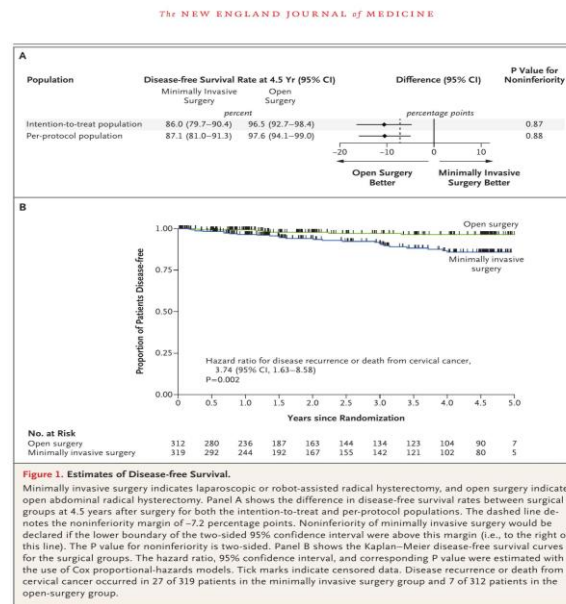
- Tumor ≥ 2 cm, no conization, unmodified MIS technique only
- No spillage-prevention measure available (manipulator required, no cuff closure/stapler)
- Low-volume center or surgeon inexperienced in radical MIS
- Patient declines shared decision-making discussion of risk

The Alarm: LACC Changed Everything in 2018

MIS radical hysterectomy showed markedly worse survival than open surgery



HR for death (any cause): 6.00 [95% CI 1.77–20.30]
HR for recurrence/death: 3.74 [95% CI 1.63–8.58]



94.3% vs. 98.3%; hazard ratio for locoregional recurrence, 4.26; 95% CI, 1.44 to 12.60 (Fig. 2C).

DISCUSSION

In this prospective, randomized trial, patients who underwent minimally invasive radical hysterectomy for early-stage cervical cancer had lower rates of disease-free survival and overall

survival and a higher rate of locoregional recurrence than patients who underwent open abdominal radical hysterectomy. Our results call into question the findings in the literature suggesting that minimally invasive radical hysterectomy is associated with no difference in oncologic outcomes as compared with the open approach.

In a recent meta-analysis, Wang et al.⁷ evalu-

Ramirez et al., NEJM 2018 — Fig. 1
(DFS forest plot & KM curve)

Confirmed in 2024

Final 4.5-yr OS analysis
(JCO 2024) :

90.6% vs 96.2% OS
HR 2.71 [1.32–5.59]

22/28 MIS deaths were
cervical-cancer specific
vs 8/10 in the open arm.

But the LACC Protocol Had a Blind Spot

Two technique variables were left completely uncontrolled

“...the trial did not require that surgeons perform a vaginal protective maneuver nor did it restrict use of a uterine manipulator. In addition, the trial did not require the centers to document whether a protective maneuver or uterine manipulator was used...”

— Ramirez et al., Appendix 1, JCO 2024 (LACC Trial Final Analysis)

Why this matters

- Low recurrence rate in open surgery arm
- Early termination and short follow-up period
- Surgeons' proficiency issue
- Incompleteness of data (e.g., uterine manipulator and colpotomy methods)
- Confirmation studies are warranted
- MIS patients in LACC could have had a **uterine manipulator** inserted through the tumor — or not — with no record kept

Real-World Check

Levin et al., AJOG 2025 — NSQIP database, 2012–2022

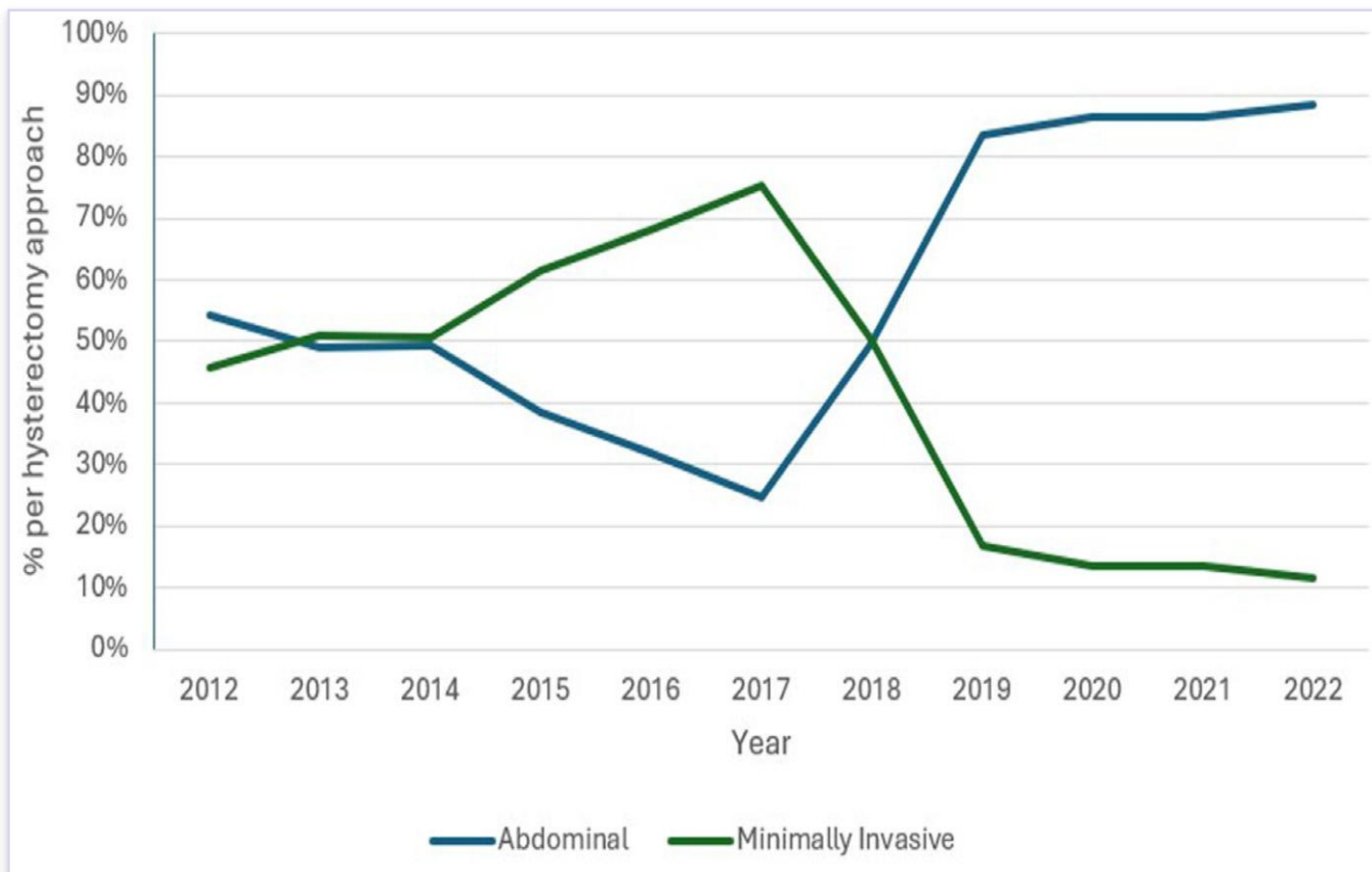


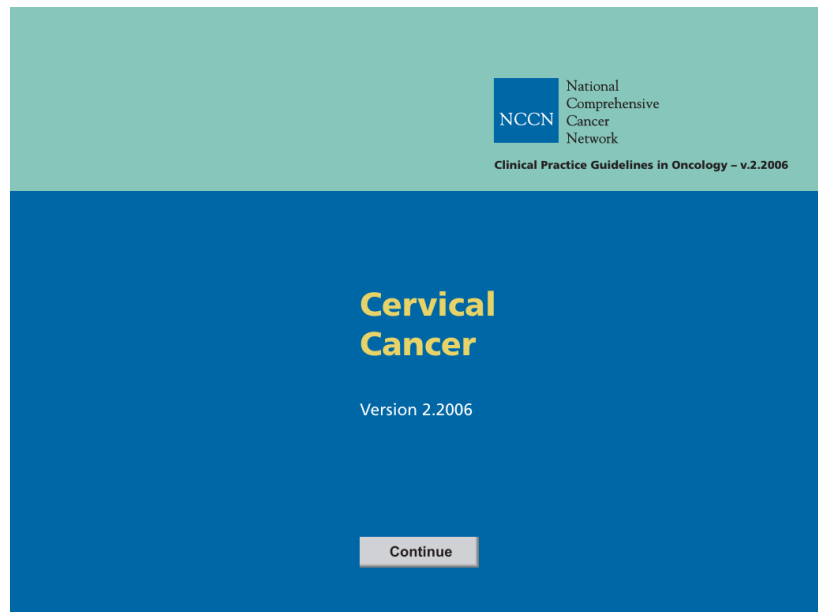
Fig. 1 — Percentage of MIS vs abdominal radical hysterectomy by year, showing the post-LACC reversal

What the shift to open surgery bought

- Major complication rate: unchanged (7.4% pre-LACC vs 5.8% post-LACC, $P=.27$)
- Minor complications rose after LACC — driven by transfusion & superficial SSI, expected with laparotomy
- Across the full cohort, MIS still had a LOWER overall complication rate than open (16.5% vs 26.2%)
- Surgical approach was not an independent predictor of major complications (aOR 1.02, 95% CI 0.63–1.65)



MIS Radical hysterectomy – When?



NCCN [®] Practice Guidelines in Oncology – v.2.2006		Cervical Cancer		Guidelines Index Cervical Cancer TOC Staging, MS, References
CLINICAL STAGE	PRIMARY TREATMENT			
Stage IA1	Extrafascial hysterectomy or Observe if patient desires fertility or if inoperable (only if cone biopsy has negative margins) or Modified radical hysterectomy + pelvic lymph node dissection if lymphovascular invasion (category 2B)			See Surveillance (CERV-8)
	Radical hysterectomy + pelvic lymph node dissection ± para-aortic lymph node sampling			See Surgical Findings (CERV-3)
Stage IA2	Brachytherapy + pelvic RT (point A dose: 75-80 Gy) ^b or Radical trachelectomy + lymph node dissection for fertility preservation			See Surveillance (CERV-8)
	Radical hysterectomy + pelvic lymph node dissection + sample para-aortic nodes (category 1)			See Surgical Findings (CERV-3)
Stage IB1 and stage IIA (≤ 4 cm) ^a	Pelvic RT + brachytherapy (point A dose: 80-85 Gy) ^b			See Surveillance (CERV-8)
	Radical hysterectomy + pelvic lymph node dissection + para-aortic lymph node sampling (category 2B)			See Surgical Findings (CERV-3)
Stage IB2 and stage IIA (> 4 cm) ^a	Pelvic RT + concurrent cisplatin-containing chemotherapy + brachytherapy (point A dose ≥ 85 Gy) ^b (category 1) or Pelvic RT + concurrent cisplatin-containing chemotherapy + brachytherapy (point A dose 75-80 Gy) ^b + adjuvant hysterectomy (category 3)			See Surveillance (CERV-8)
				See Surveillance (CERV-8)

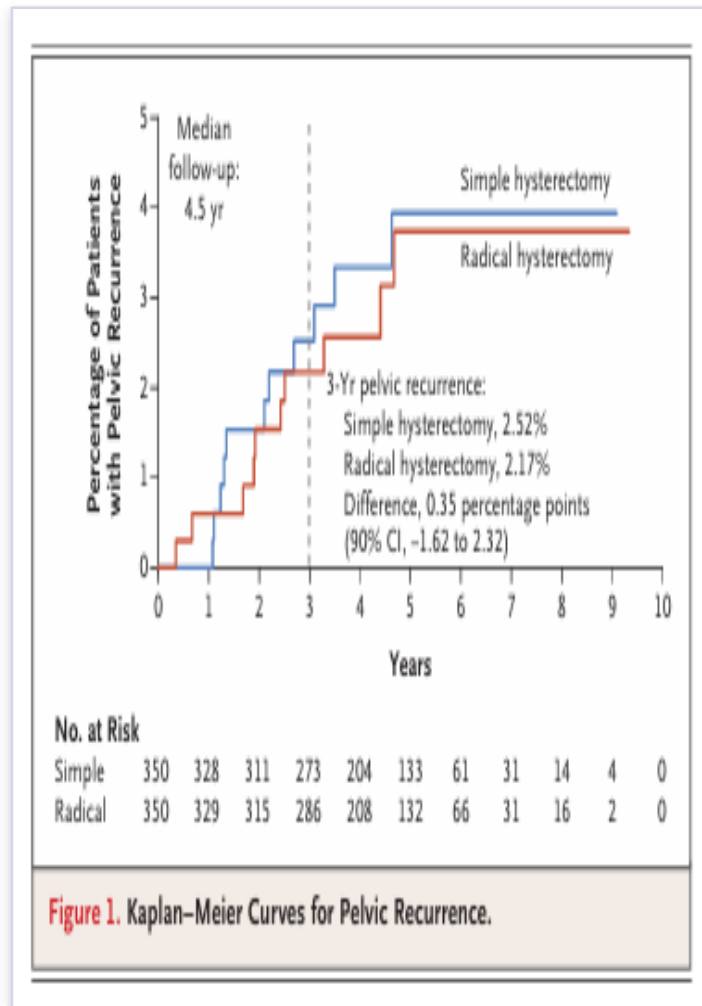
^aFor suspicion of bladder/bowel involvement, cystoscopy/proctoscopy with biopsy is required.
^bThese doses are recommended for most patients based on summation of conventional external-beam fractionation and low-dose rate (40-60 cGy/h) brachytherapy equivalents. Modify treatment based on normal tissue tolerance.

Note: All recommendations are category 2A unless otherwise indicated.
Clinical Trials: NCCN believes that the best management of any cancer patient is in a clinical trial. Participation in clinical trials is especially encouraged.

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Corroborating Data: SHAPE Trial's Approach-Stratified Results

Plante et al., NEJM 2024 — low-risk cervical cancer ($\leq 2\text{cm}$, limited invasion)



Plante et al., NEJM 2024 — Table 2 / Fig. 1
(pelvic recurrence, full page)

Pelvic recurrence by surgical approach, within each hysterectomy type

Simple hysterectomy

MIS: 3.2% (9/281) vs Open: 3.5% (2/57)

Radical hysterectomy

MIS: 2.9% (7/243) vs Open: 3.0% (3/99)

In this contemporary, prospective, low-risk cohort — with modern technique standards — MIS and open surgery produced essentially identical 3-year pelvic recurrence rates within both the simple- and radical-hysterectomy arms.

Takeaway: in a well-selected, low-risk population, approach (MIS vs open) may matter far less than the extent of surgery and the technique used.

NCCN Guideline



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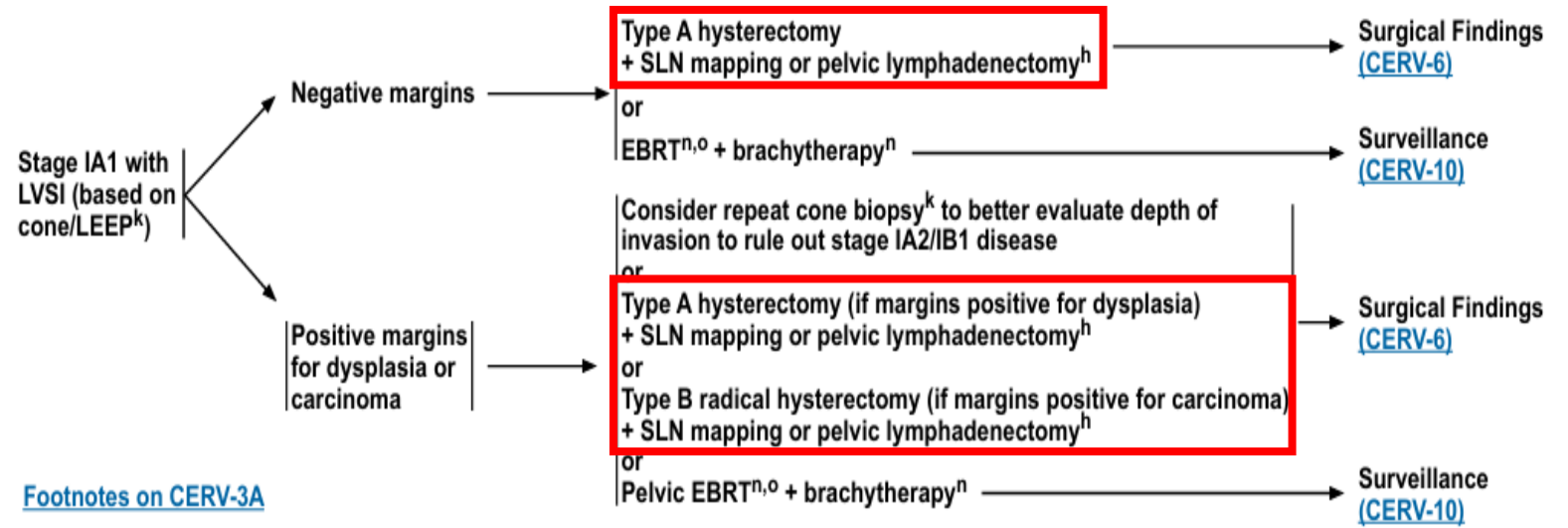
Cervical Cancer

Version 2.2026 — November 10, 2025

NCCN.org

NCCN recognizes the importance of clinical trials and encourages participation when applicable and available. Trials should be designed to maximize inclusiveness and broad representative enrollment.

NCCN Guidelines for Patients® available at www.nccn.org/patients



[Footnotes on CERV-3A](#)

Note: All recommendations are category 2A unless otherwise indicated.

NCCN Guideline

Stage IA2–IB1 cervical carcinoma
(All conservative surgery criteria met):

- Cone biopsy^k (preferred)
- No LVSI (preferred)
- Negative cone margins for cancer (preferred)
- Squamous cell (any grade) or usual type adenocarcinoma (grade 1 or 2) (preferred)
- Tumor size ≤2 cm
- Depth of invasion <10 mm on cone.^k If no conization, MRI^c must show <50% cervical stromal invasion
- Negative imaging for metastatic disease (MRI recommended)

Type A hysterectomy
+ SLN mapping or pelvic lymphadenectomy^h

Surgical Findings
([CERV-6](#))

Stage IB1 not meeting
conservative surgery criteria
Stage IB2
Stage IIA1

Type C1 radical hysterectomy
+ SLN mapping^m or pelvic lymphadenectomy^h (category 1)
± para-aortic lymphadenectomy^h (category 2B)

Surgical Findings ([CERV-6](#))

Pelvic EBRT^{n,o}
+ brachytherapyⁿ
± concurrent platinum-containing chemotherapy^p

Surveillance ([CERV-10](#))

Stage IB3 and Stage IIA2

Pelvic EBRT^{n,q}
+ concurrent platinum-containing chemotherapy^p
+ brachytherapyⁿ
(category 1)

Surveillance ([CERV-10](#))

or
Type C1 radical hysterectomy
+ pelvic lymphadenectomy^h
± para-aortic lymphadenectomy^h (category 2B)

Surgical Findings ([CERV-6](#))

or
Pelvic EBRTⁿ
+ concurrent platinum-containing chemotherapy^p
+ brachytherapyⁿ
+ selective completion hysterectomy^r
(category 3 for completion hysterectomy)

Surveillance ([CERV-10](#))

NCCN Guideline



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NCCN Guidelines Version 2.2026 Cervical Cancer

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PRINCIPLES OF EVALUATION AND SURGICAL STAGING^a

Types of Resection and Appropriateness for Treatment of Cervical Cancer

- Radical hysterectomy with bilateral pelvic SLN mapping or lymphadenectomy is a treatment option for FIGO stage IA2, IB1, IB2, and select IB3–IIA1 lesions when fertility preservation is not desired. Radical hysterectomy (Type B or C) results in resection of much wider margins compared with a simple Type A hysterectomy, including removal of parts of the paracervix and uterosacral ligaments and the upper 1–2 cm of the vagina; in addition, pelvic and sometimes para-aortic nodes are removed. The Querleu and Morrow classification system⁵ is a modern surgical classification that describes degree of resection and nerve preservation in three-dimensional (3D) planes of resection.⁶ Procedural details for the most commonly used types of hysterectomy are described in Table 1 ([CERV-C 6 of 9](#)).
- The standard and recommended approach for radical hysterectomy is with an open abdominal approach (category 1). A prospective randomized trial¹⁰ demonstrated that minimally invasive radical hysterectomy was associated with lower rates of disease-free survival (DFS) and overall survival than open abdominal radical hysterectomy. Moreover, two recent epidemiologic studies also demonstrated that minimally invasive radical hysterectomy was associated with shorter overall survival than open surgery among patients with stage IA2–IB1 cervical cancer.¹¹ See [Discussion](#) for additional details. Studies comparing robotic versus open approach are ongoing.
- Based on a randomized trial comparing simple to radical hysterectomy,¹² select patients with stage IA2–IB1 disease who meet all the conservative surgery criteria listed below may be treated with a simple Type A hysterectomy with SLN mapping or bilateral pelvic lymphadenectomy:
 - ▶ Cone biopsy (preferred)
 - ▶ No LVSI (preferred)
 - ▶ Negative cone margins for cancer (preferred)
 - ▶ Squamous cell (any grade) or usual type adenocarcinoma (grade 1 or 2) (preferred)
 - ▶ Tumor size ≤2 cm
 - ▶ Depth of invasion <10 mm on cone. If no conization, MRI must show <50% cervical stromal invasion
 - ▶ Negative imaging for metastatic disease (MRI recommended)
- Definitive treatment with a conization or Type A hysterectomy has not been studied in the more aggressive histologies such as gastric type adenocarcinoma, clear cell, and small cell neuroendocrine carcinoma.

Ongoing Trials



The RACC trial – Robot-assisted Approach to Cervical Cancer

- International, multicenter, open-label randomized controlled trial
- Hypothesis: RALS is non-inferior to laparotomy for early stage cervical cancer
- Primary endpoint: Recurrence-free survival (RFS) at 5 year
- Secondary endpoints:
 - Overall survival
 - Complications
 - Patients reported outcomes
 - Accuracy of a sentinel lymph node algorithm
 - Health care costs
- Quality assessment of participating sites and surgeons
- Sample size: 768 women
 - One-sided α 5%
 - Power 80%
 - Non-inferiority margin (NIM) 7.5%
 - Assumed RFS 85%
 - 127 events during 5 years inclusion and 3 years additional FU
- To date: 19 sites so far (Scandinavia, Germany, Belgium, Czech Republic, Spain, Italy)
- Trial launched in May 2019

Actual Study Start Date: May, 2019

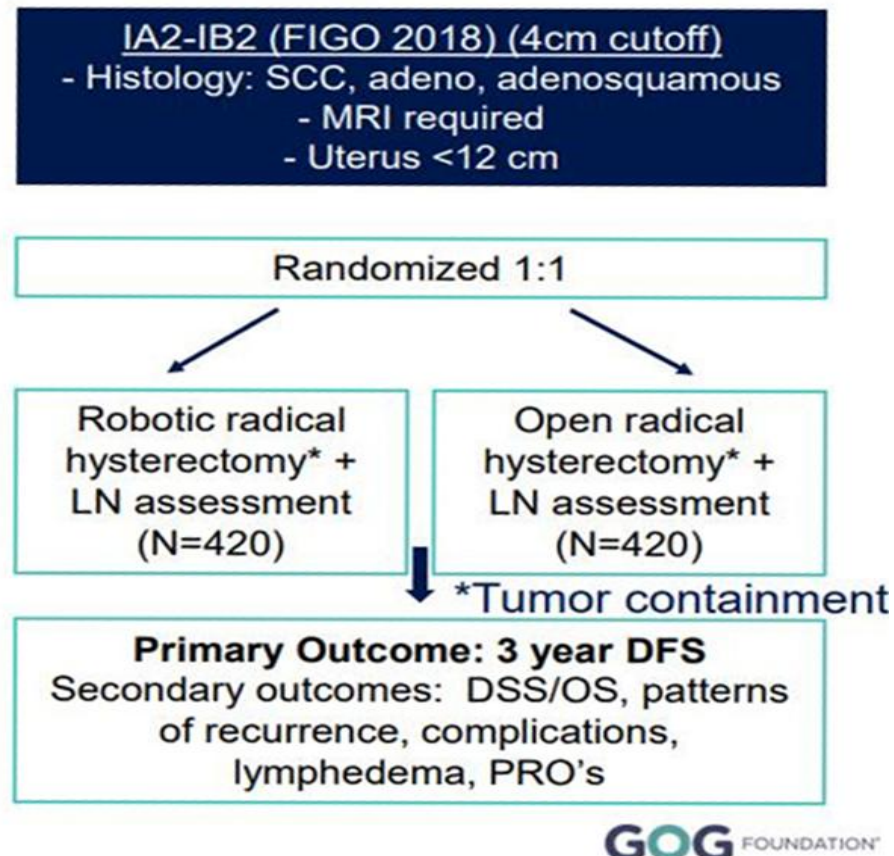
Estimated Primary Completion Date: Feb 2024

Estimated Study Completion Date: Feb 2027

Ongoing Trials



PI: Kristin Bixel
Mario Leitao



Actual Study Start Date: March 2022

Estimated Primary Completion Date: August 2028

Estimated Study Completion Date: August 2029



MIS Radical hysterectomy – How?

Mechanistic Evidence: How Tumor Cells Actually Spill

Ryu et al., J Clin Med 2025 — vaginal washing cytology study

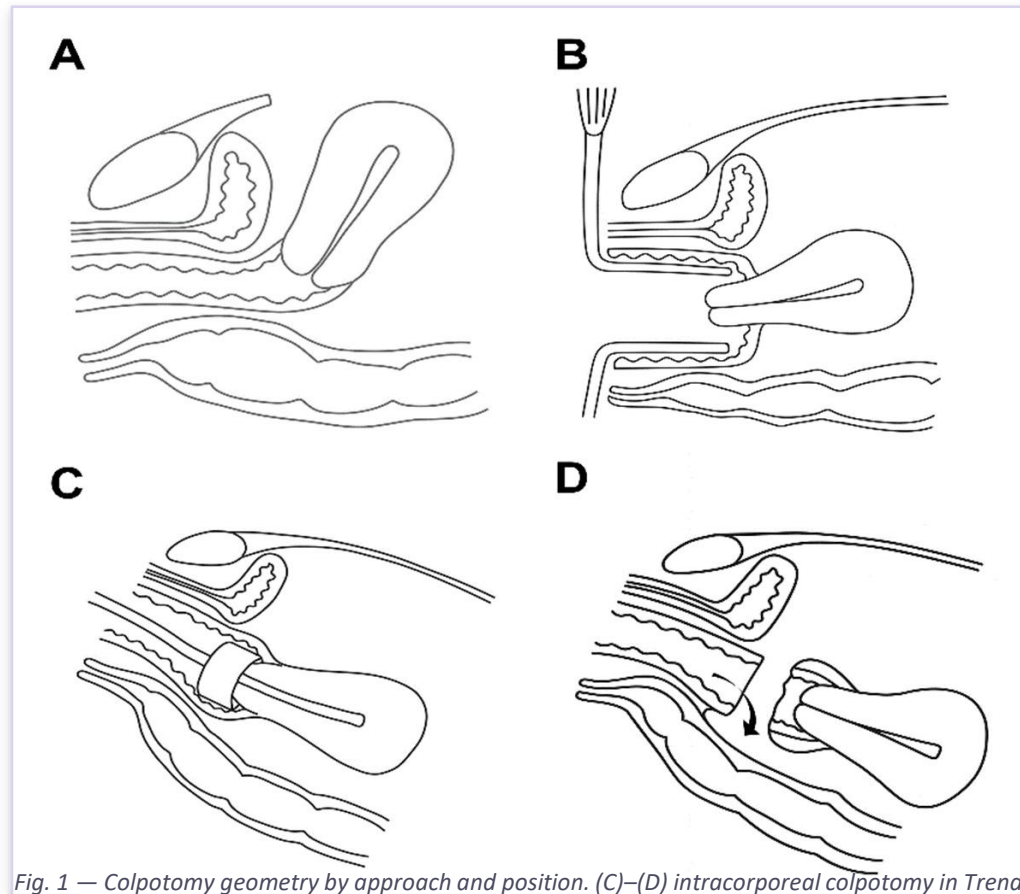


Fig. 1 — Colpotomy geometry by approach and position. (C)–(D) intracorporeal colpotomy in Trendelenburg tilts the upper vagina toward the peritoneal cavity, raising spillage risk vs. (A)–(B) horizontal-axis colpotomy

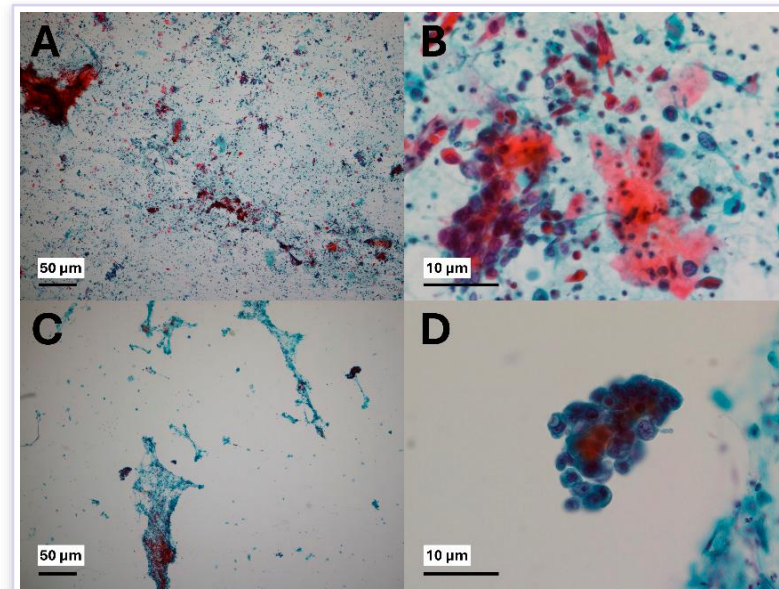


Fig. 2 — Malignant cells recovered from vaginal washing cytology (H&E)

33.3%

vs 6.5% positive cytology
(cervical vs endometrial
cancer)

24.0%

vs 0% in early-stage
disease (P=0.003)

**Cervical cancer sheds
tumor cells into the
vagina — a mechanism
intracorporeal colpotomy
can exploit.**

Technique Fix #1 — Remove the Uterine Manipulator

SUCCOR study (Chiva et al., Int J Gynecol Cancer 2020), cited in LACC's 2024 discussion

HR 2.76

[95% CI 1.75–4.33], $P < 0.001$

Risk of relapse when a uterine manipulator WAS used during MIS

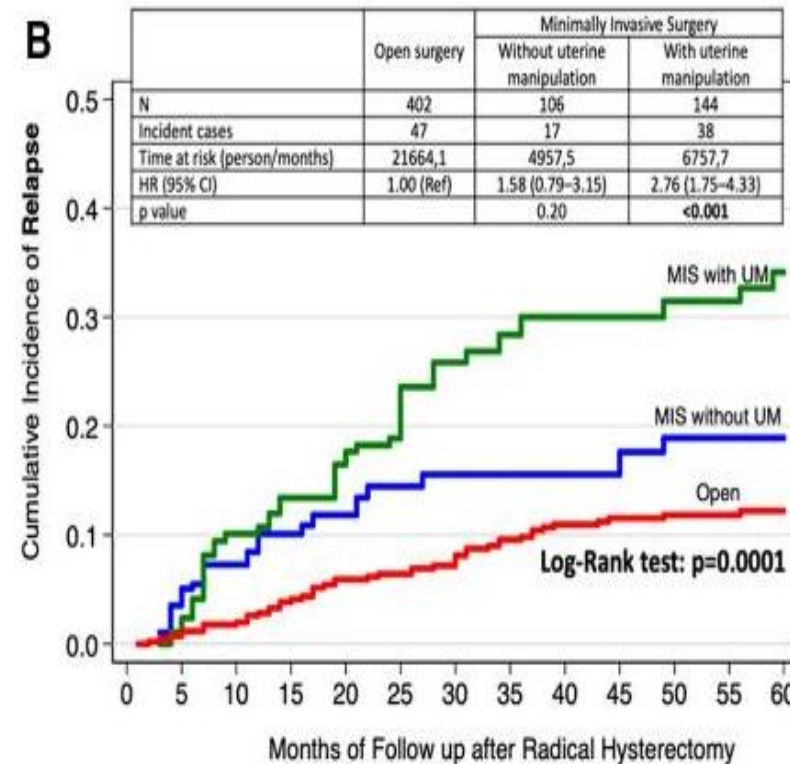
HR 1.58

[95% CI 0.79–3.15], $P = 0.20$

Risk of relapse when NO manipulator was used — not significantly different from open surgery

Interpretation

The excess recurrence risk in SUCCOR was concentrated almost entirely in patients whose surgeon used a uterine manipulator. When the manipulator was avoided, MIS recurrence risk was statistically indistinguishable from open surgery. This is consistent with the vaginal-cytology mechanism on the previous slide, and it is the single most actionable, low-cost technique change available to a MIS surgeon.



Chiva et al., SUCCOR study, IJG 2020 — Fig. 3B (HR by manipulator use vs open)

Long-Term Confirmation — No Gap Re-Emerges at 10 Years

Manzour et al. (SUCCOR 10-Year Study), *Int J Gynecol Cancer* 2025 — 556 patients, median follow-up 102 months

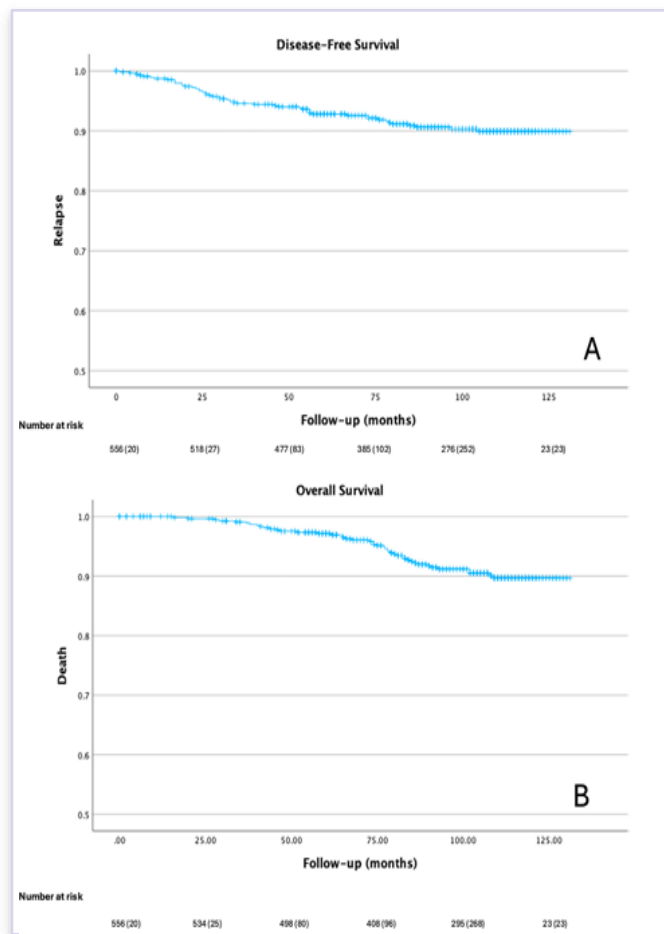


Figure 2 (Manzour et al.) — 10-year disease-free survival (A) and overall survival (B) of the full cohort

90% / 89%

10-yr disease-free / overall survival

Full cohort, n=556 — 9% of patients (n=49) experienced any recurrence

92% vs 88%

10-yr DFS, MIS vs open surgery

P=.12, not significant — no gap between approaches at 10 years

78%

of all recurrences occurred within 5 yrs

22% were late (>5yr); post-recurrence survival was 47% at 5 years overall

92% vs 88%

10-yr OS, MIS vs open surgery

P=.12, not significant — consistent with the DFS result above

Key point

A full decade of follow-up shows the **MIS-vs-open gap** seen in LACC does not reappear once modern spillage-prevention technique and careful case selection are applied.

Technique Fix #2 — Transvaginal Closure, Validated at Scale

Köhler et al., Int J Gynecol Cancer 2019 — 389 patients, no uterine manipulator, vaginal cuff created transvaginally

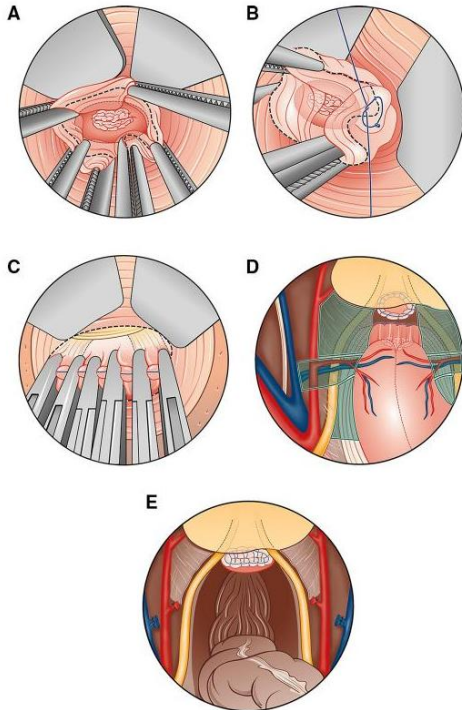


Figure 2 (A–E) Selected surgical steps of vaginal-assisted laparoscopic radical hysterectomy (VALRH). (A) Vaginal creation of the vaginal cuff in iodine-positive area using 6 straight Kocher clamps. (B) Closing of the vaginal cuff by continuous suture. (C) Grasping the closed vaginal cuff using serrated clamps to open the cul-de-sac and vesico-vaginal space. (D) Extension of laparoscopic parametrial resection (green areas) following transvaginal creation and closure of vaginal cuff. (E) Final situs.

Fig. 2 — VALRH: cuff creation (A–B), transvaginal access to cul-de-sac (C), extended parametrial resection (D), final situs (E)

96.8/95.8/93.1%

3- / 4.5- / 10-yr disease-free survival

n=389 — vs 87.1% / 86% at 3yr in LACC's MIS arm

98.5/97.8/95.8%

3- / 4.5- / 10-yr overall survival

n=389 — vs 93.8% at 3yr in LACC's MIS arm

0%

Conversions to laparotomy

Across all 389 patients treated 1994–2018 at 5 European centres

9 of 20

Recurrences occurred beyond 3 years

Detected 39–108 months after surgery — argues for long-term follow-up

Key point

No uterine manipulator was ever used; the vaginal cuff was always created and closed transvaginally before parametrial resection — the same principle as Technique Fix #2, now confirmed in a much larger multicentre cohort.

Technique Fix #2 — Protective Vaginal Cuff Closure

Togami et al., Gynecol Minim Invasive Ther 2025 — actual surgical technique

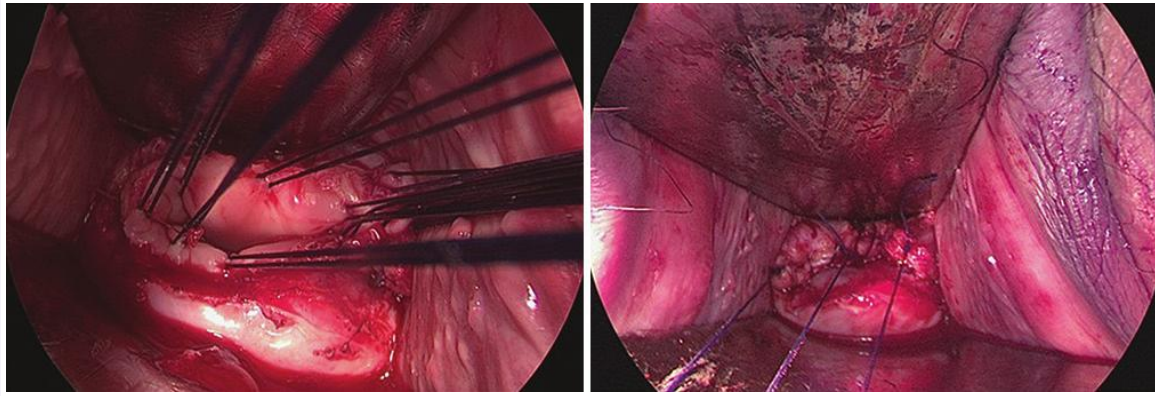


Fig. 1 — Creation of a vaginal cuff. (a) Incision 2cm from the tumor margin; (b) suturing to enclose the cervical canal before laparoscopic colpotomy

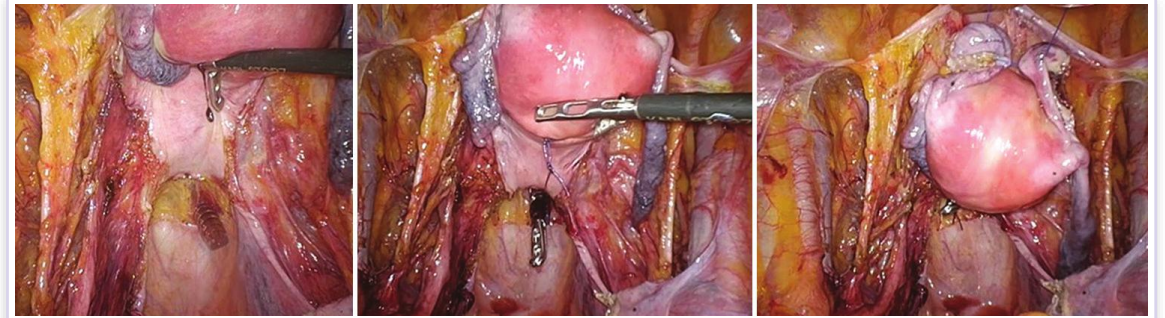


Fig. 2 — Uterine manipulation WITHOUT a manipulator: a 5-mm port + Vicryl loop through the posterior vaginal fornix

The combined protocol

- Vaginal cuff sutured closed BEFORE the abdominal laparoscopic procedure begins — the tumor is sealed off before any CO₂ exposure
- No uterine manipulator — a Vicryl-loop "handle" through a 5-mm posterior fornix port replaces it
- Combined with sentinel node navigation surgery (SNNS) to minimize additional pelvic dissection



**Step 1: Creation and closure of a vaginal cuff
(no-look technique)**

Does the Modified Protocol Actually Work? — Yes

Togami et al. 2025: LRH + SNNS (no manipulator, cuff closure) vs open surgery, n=103

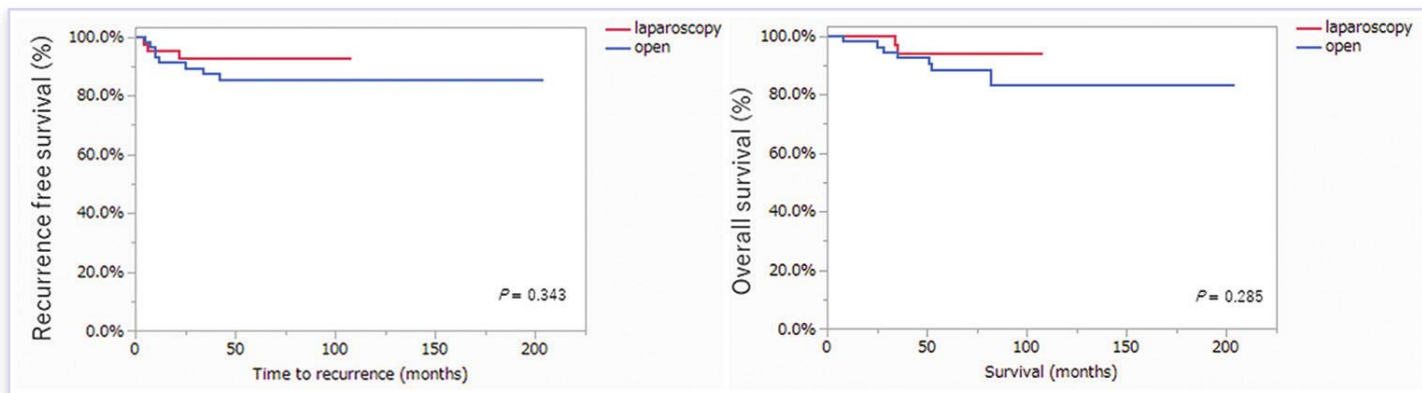


Fig. 3 — Kaplan–Meier recurrence-free (a) and overall survival (b): no significant difference (P=0.343 and P=0.285)

92.7% vs 94% 5-yr RFS, LRH vs Open (P=0.343)

85.5% vs 88.3% 5-yr OS, LRH vs Open (P=0.285)

0% Peritoneal dissemination / recurrence in the LRH group

100% Sentinel node identification rate

Also demonstrated

- Blood loss: 71mL vs 850mL (P<0.001)
- Hospital stay: 7 vs 17 days (P<0.001)
- Lower-extremity lymphedema / pelvic lymphocele: 0% vs 14–17% (P<0.05) — SNNS avoided full lymphadenectomy
- No surgical margin positivity in either group
- Limitation: single-center, retrospective, n=44 MIS — awaiting confirmatory RCTs

Technique Fix #3 — Sealed Colpotomy with an Endoscopic Stapler

Park et al., SOLUTION trial (BMC Cancer 2022) — prospective, multi-centre, single-arm phase II protocol

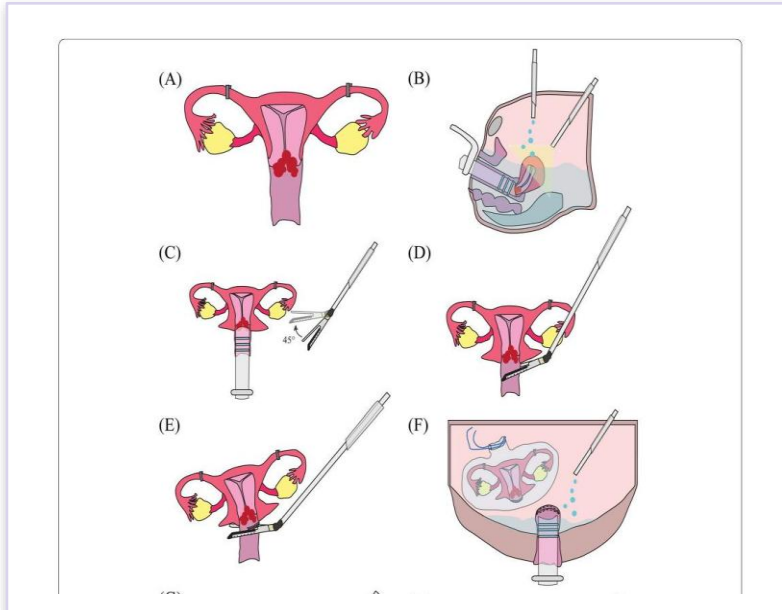


Fig. 1 — Tubal ligation (A), washing cytology (B), stapler flexion (C), sequential vaginal stapling (D–E), specimen retrieval (F–G), final cytology (H)

Trial design & rationale

- Prospective, multicentre (10 Korean centres), single-arm, non-inferiority phase II study (NCT04370496); 124 patients planned
- Vagina is resected AND sealed with an endoscopic stapler before specimen retrieval — tumor never exposed to CO₂ pneumoperitoneum
- Bilateral tubal ligation performed before uterine manipulator insertion — blocks a second spillage route via the fallopian tubes
- Primary endpoint: 4.5-yr disease-free survival; non-inferiority margin 7.2% vs a 90.9% open-surgery benchmark
- Peritoneal washing cytology performed 3 times intraoperatively — directly measures whether spillage occurred

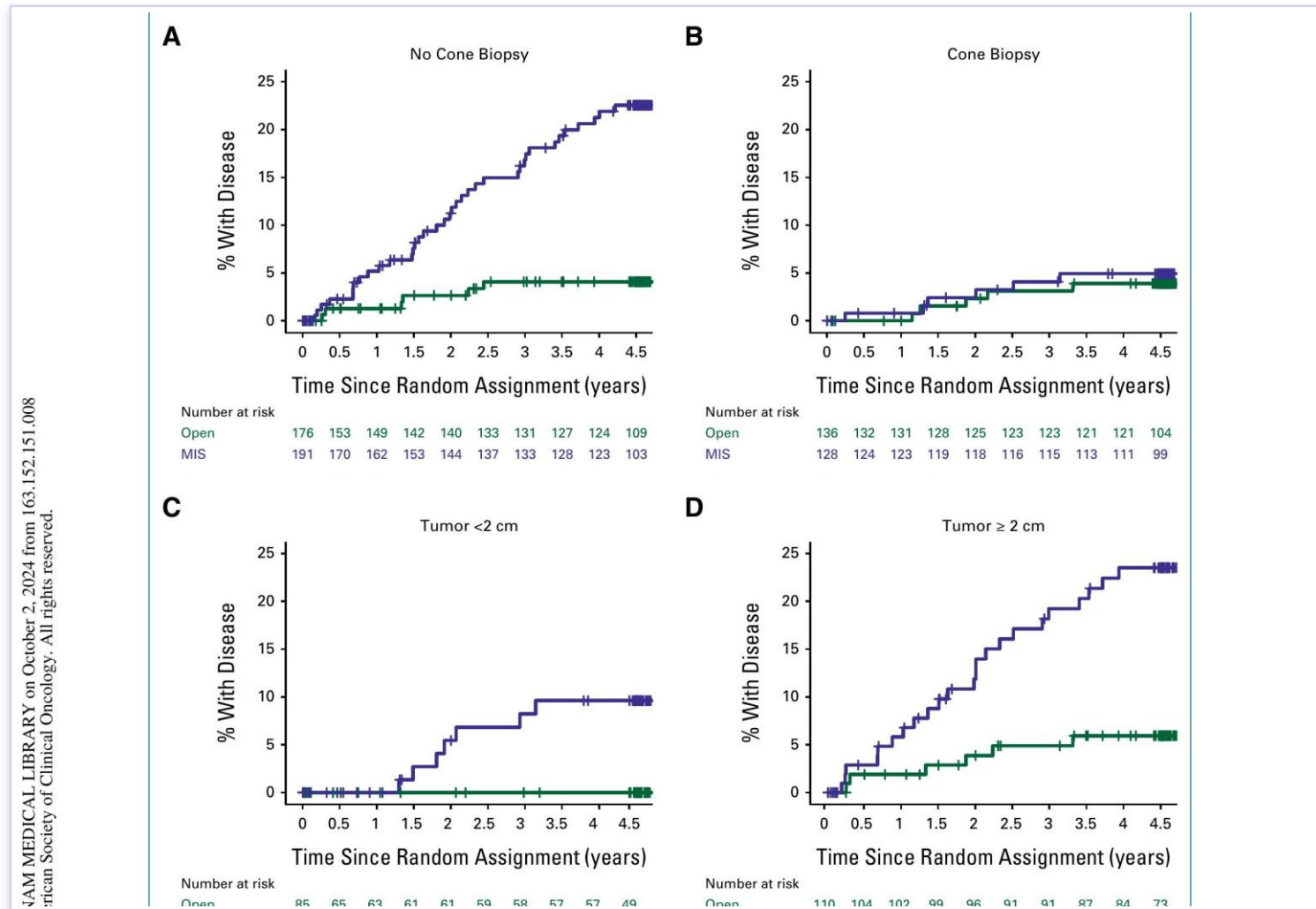
Why it matters

A mechanical seal at the colpotomy line — complementing (not replacing) manipulator avoidance and vaginal cuff closure — tested in a prospective trial rather than retrospectively.



Technique Fix #4 — Patient Selection: Not All Tumors Carry the Same Risk

LACC Trial subgroup analysis (JCO 2024) — tumor size & prior conization



Key subgroup signals

Tumor <2cm

0/85 events (Open) vs 7/90 (MIS) — too few events to estimate HR; trial not powered for this subgroup

Tumor ≥2cm

HR 4.25 [1.73–10.4] — strong effect favoring open surgery

Prior conization

HR 1.27 [0.39–4.17], P=.69 — no difference

No prior conization

HR 5.85 [2.47–13.9], P<.0001 — large effect

Fig. 2 — Recurrence curves by prior conization (A, B) and tumor size (C, D). Panels B & C show minimal separation between MIS and open.

Technique Fix #4 — Conization Is the Dominant Protective Factor

Polen-De et al., Gynecol Oncol 2025 (7 centers, n=761) · Wang et al. meta-analysis, Eur J Surg Oncol 2023 (12 studies, n=3,919)

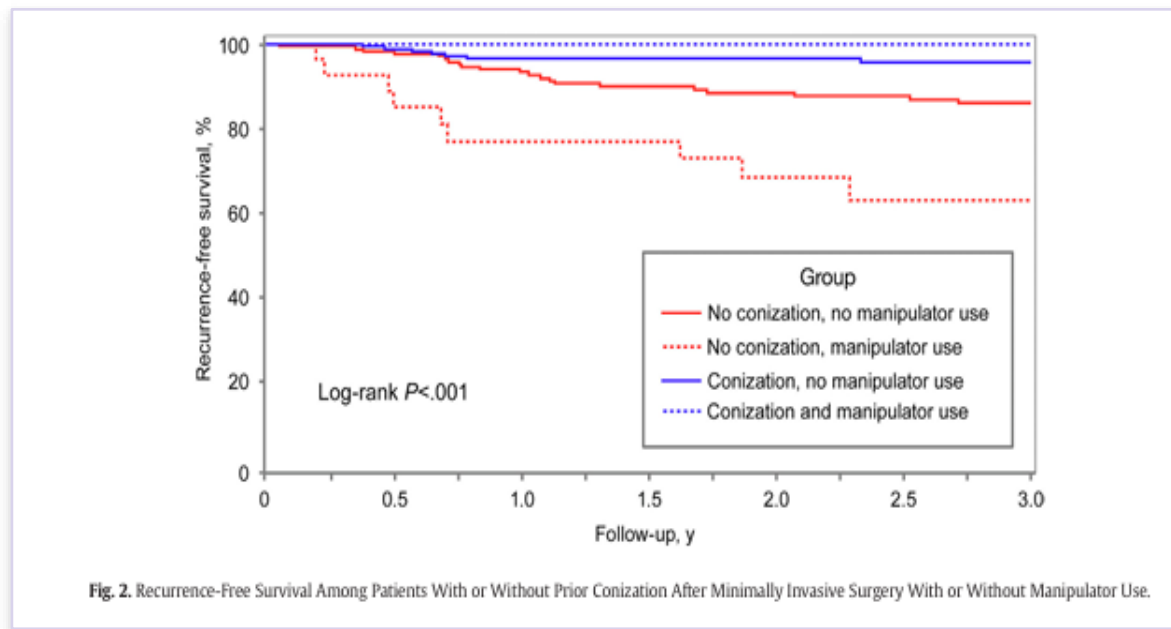
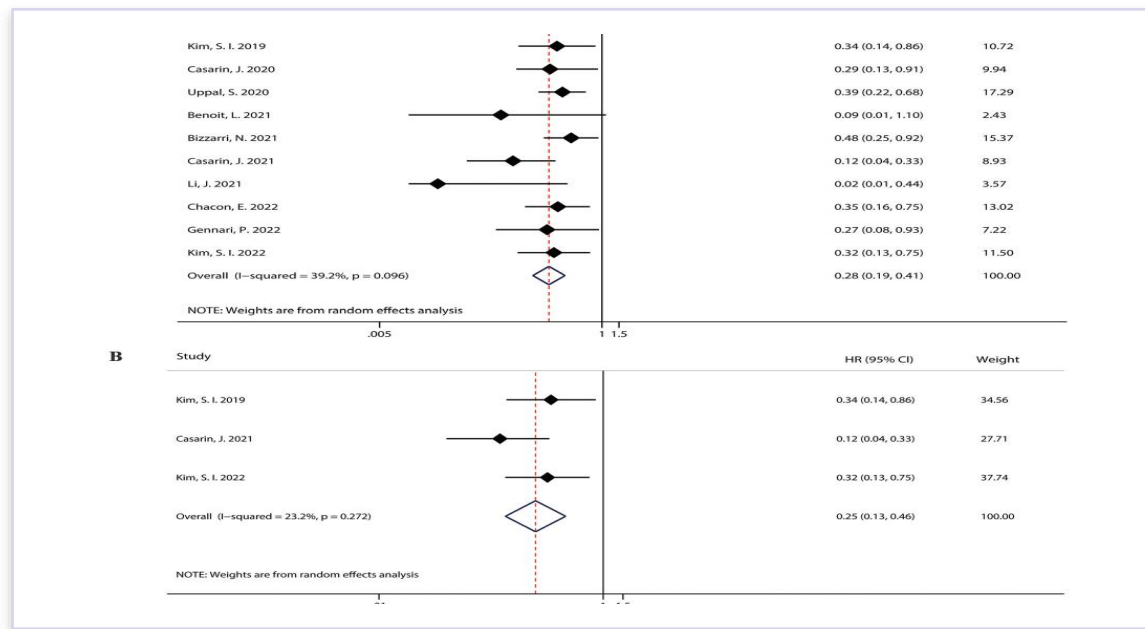


Fig. 2 (Polen-De et al.) — RFS after MIS by conization & manipulator status: manipulator only worsens RFS when conization was NOT performed (log-rank $P < .001$)



What the interaction analysis shows

- Conization cut recurrence risk regardless of surgical approach (MIS HR 0.15; open HR 0.31) and regardless of manipulator use (Polen-De, n=761)
- Manipulator use significantly raised recurrence ONLY without conization and with tumors $\geq 2\text{cm}$ (HR 9.65–10.90); no added risk once conization was performed (HR 2.11, NS)
- Meta-analysis: pooled DFS benefit of conization = 72% overall, 75% in stage IB1 (HR 0.25) — and the benefit persisted within the MIS subgroup alone (HR 0.21)

Technique Fix #4 — Conization Is the Dominant Protective Factor

S.I. Kim et al. *Gynecologic Oncology* 173 (2023) 88–97 (6 centers, n=1254)

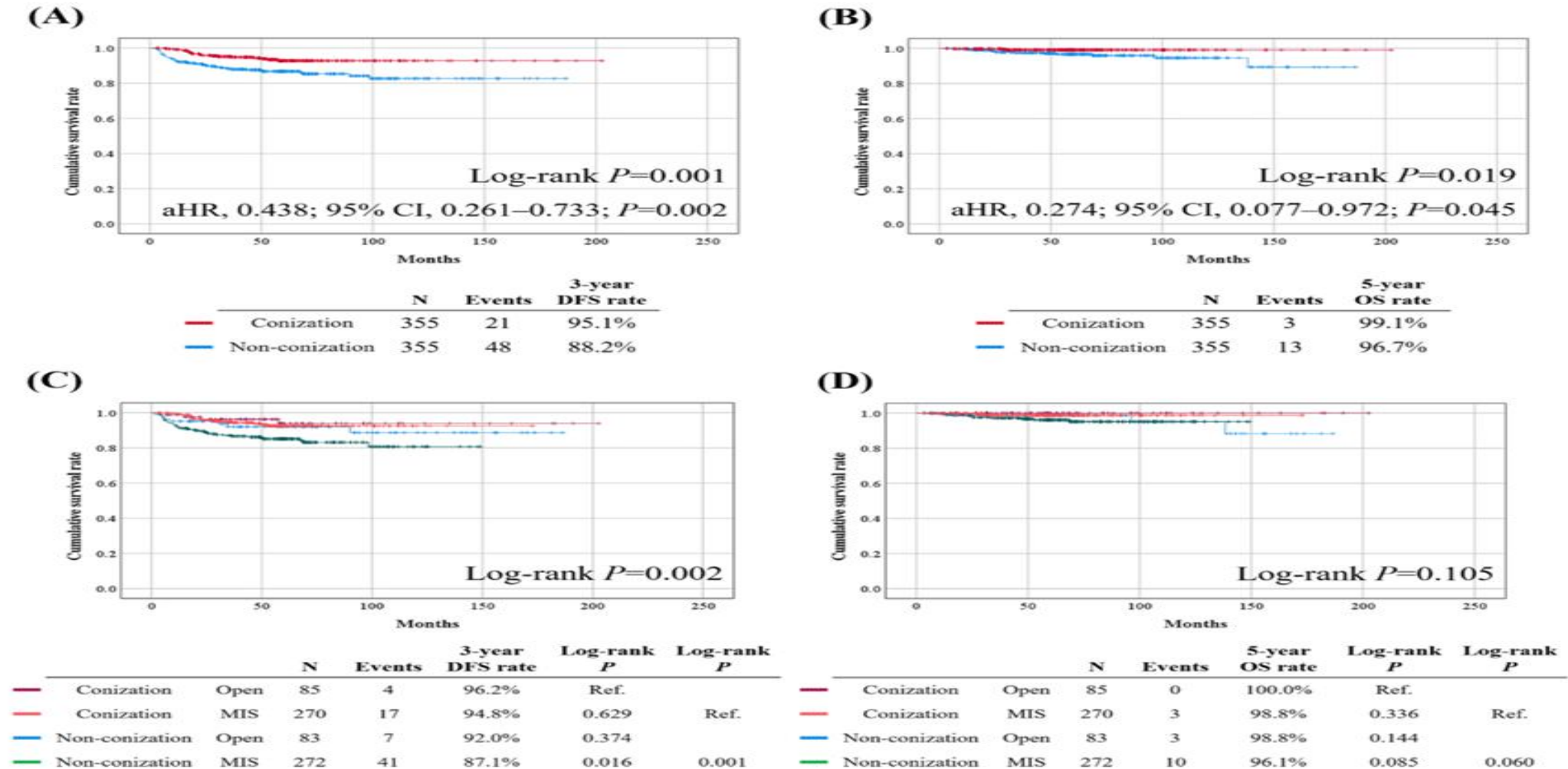


Fig. 1. Comparison of the survival outcomes for matched patients (Upper); and further stratified survival analyses according to the conization status and surgical approach (Lower). (A and C) Disease-free survival; (B and D) overall survival.

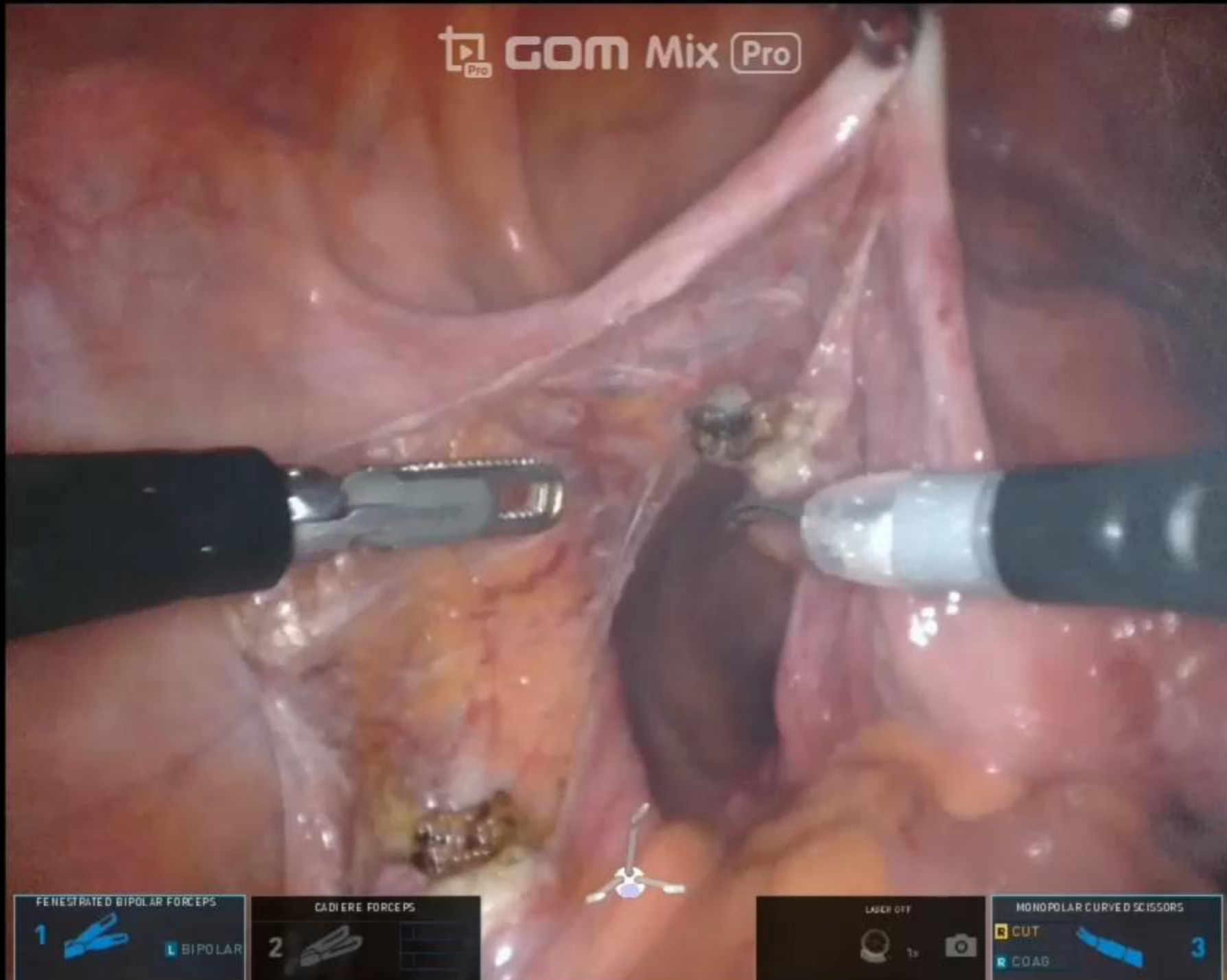
2026년 대한부인종양학회 하계학술대회

| 일자 2026년 8월 8일(토) 장소 위례 밀리토피아 마린 호텔

제20차 젊은의사 워크숍 · 제9차 분과전문의 연수강좌 · 제1차 부인종양간호사 연수강좌



Video Clips



FENESTRATED BIPOLAR FORCEPS

1



BIPOLAR

CADIERE FORCEPS

2



LASER OFF



1x



MONOPOLAR CURVED SCISSORS

3

CUT

COAG





A Practical Framework: When and How Can MIS Be Offered?

Synthesizing patient selection and technique requirements

① Patient Selection

- Tumor diameter < 2cm
- No deep stromal invasion (< 1/2), no LVSI if possible
- Negative preoperative imaging for nodal/parametrial disease
- Prior conization with negative margins (associated with markedly lower MIS-specific risk)
- Discussion of LACC-era data as part of informed consent

② Technique Requirements

- No uterine manipulator (alternative atraumatic uterine handling)
- Protective vaginal cuff closure before colpotomy — seal the tumor off from CO₂ exposure
- Minimize intraoperative tumor handling ("no-look, no-touch")
- Consider sentinel node navigation to reduce dissection extent
- Performed by a high-volume, accredited MIS surgeon/center