

Endometriosis

Providing precise, organ-preserving surgery across different phenotypes

01

Surgical demands in everyday practice

Managing endometriosis in surgery presents different challenges, from treating superficial lesions to working in complex and critical anatomical areas.

How Erbe supports your workflow

Erbe offers technologies designed to assist with precision and control, providing options for uniform tissue effects, adaptable hemostasis, and efficient dissection. The focus is on supporting surgical workflows and facilitating work in and around sensitive structures.

Understanding a complex condition

Endometriosis is a chronic disease in which tissue similar to the lining of the uterus (endometrium) grows outside the uterine cavity. This tissue responds to hormonal changes along the cycle and can affect various organs, causing pain and other complications.¹

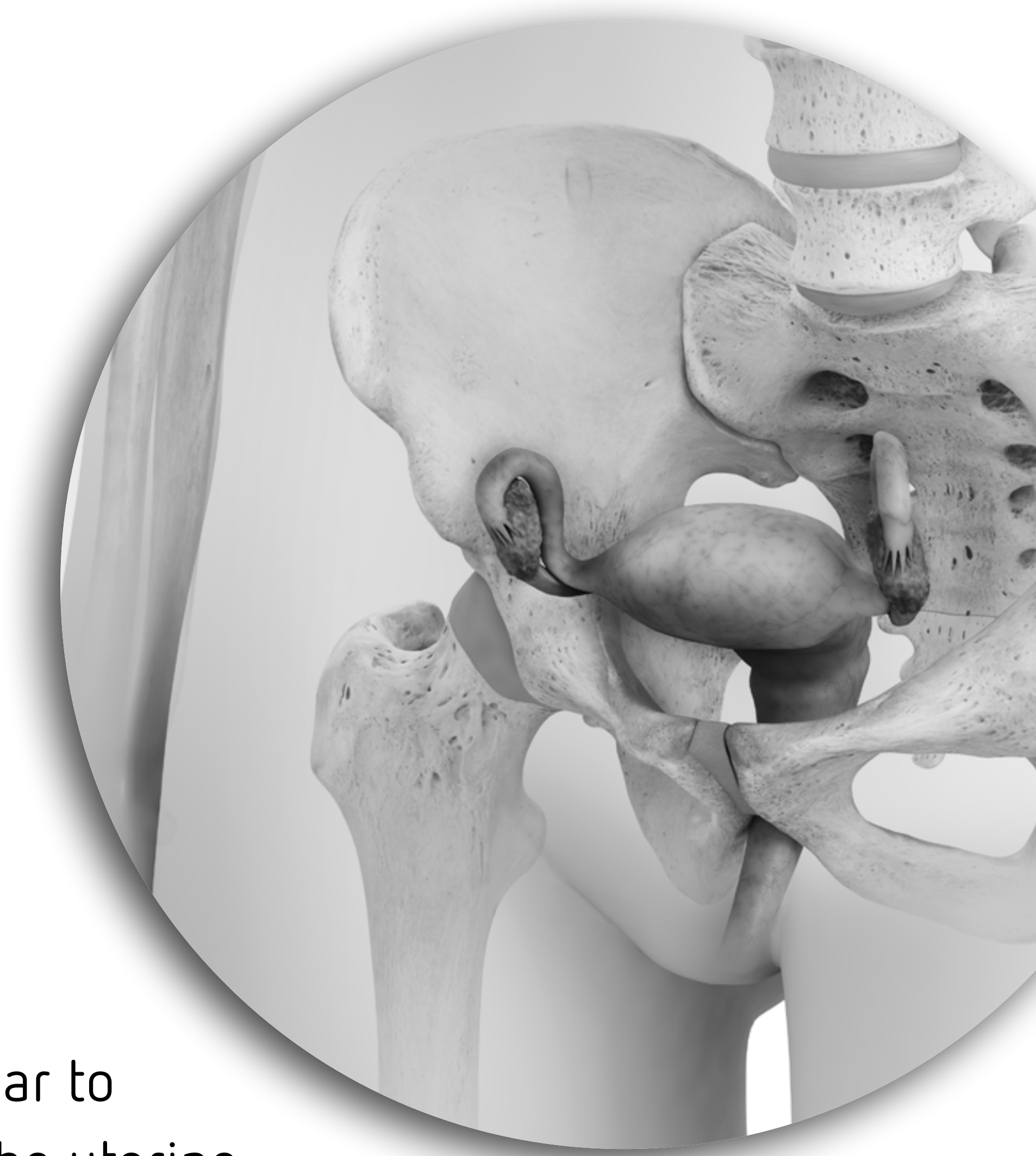
It is estimated that 10 % of women of reproductive age are affected.¹ Among women with chronic pelvic pain, the prevalence is as high as 40–50 %, and 30–40 % among women with infertility.²

Endometriosis is often called the 'chameleon of gynecology' because it manifests with a wide range of symptoms and is frequently overlooked. Despite its high prevalence, the average time between symptom onset and diagnosis is seven to ten years.³

The disease occurs in different phenotypes:

1. Deep infiltrating endometriosis (DIE)
2. Ovarian endometriosis (OE)
3. Peritoneal/superficial endometriosis (PE/SE)

Depending on the phenotype, endometriosis can involve structures that require careful dissection, reliable hemostasis, and controlled energy application. Surgeons face the challenge of restoring anatomy while protecting healthy tissue and safeguarding future fertility when possible.



What experts say

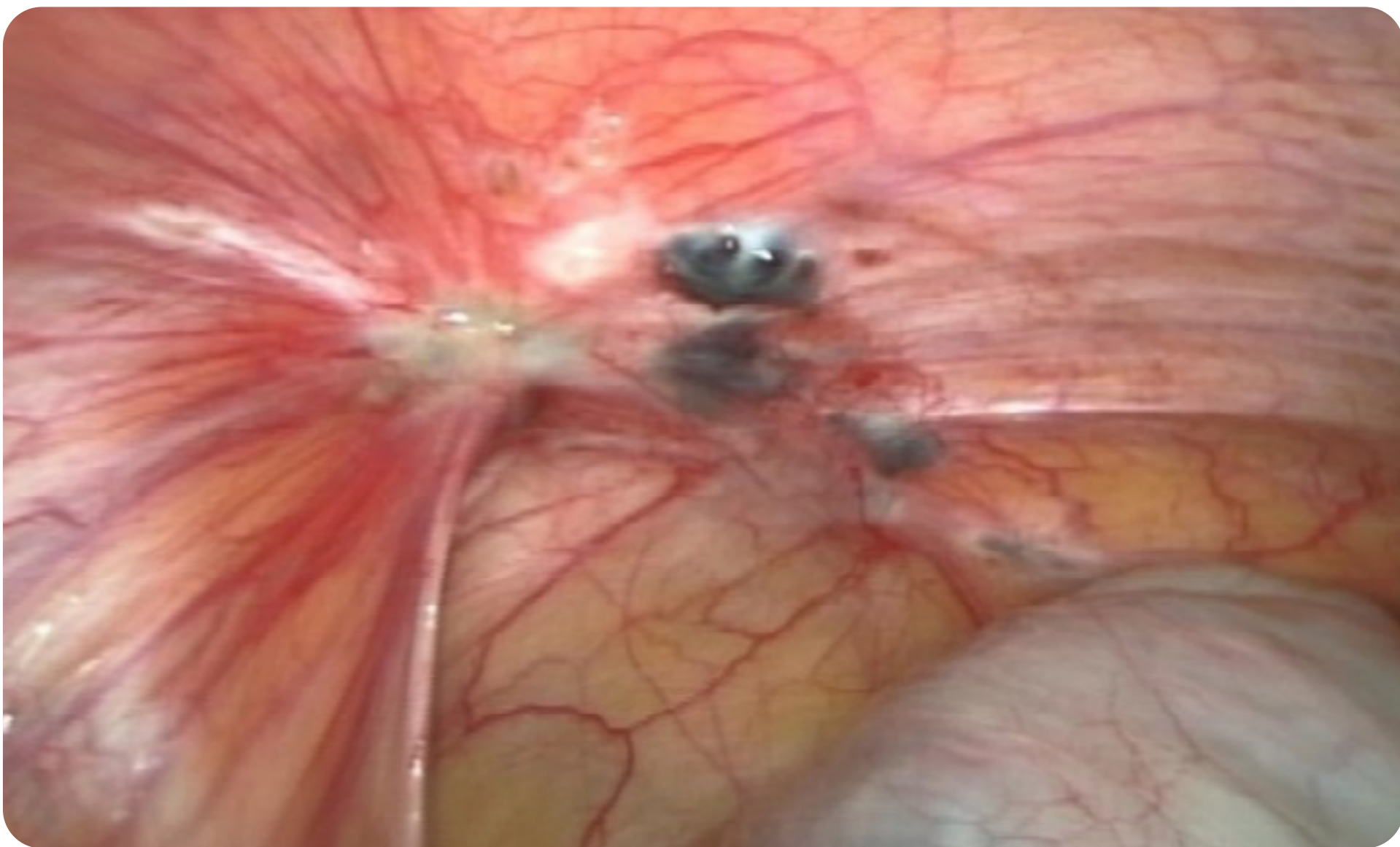
Dr. Carlo Alboni
Modena, Italy



“The TriSect rapide® is an instrument that makes surgery easier when we treat deep endometriosis, particularly parametrial disease, which – along with many of my colleagues – I consider to be the most challenging form of endometriosis.

Some surgeons argue that when deep endometriosis involves the lateral part of the parametrium, the vessels cannot be spared when removing that tissue completely. I disagree. With the right instrument, a thorough understanding of the anatomy, and the optimal technique in hand, the TriSect rapide® allows us to preserve those vessels. This is crucial for women who wish to retain their uterus for future pregnancy. Moreover, the device enables safe, controlled, yet highly effective hemostasis, as demonstrated in the videos that showcase its combined dissection and thermal capabilities”

Deep infiltrating endometriosis



Supporting complex dissection with controlled, predictable energy

A demanding phenotype

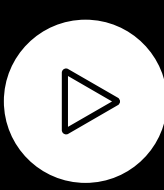
Deep infiltrating endometriosis often involves dense adhesions and lesions close to critical structures. Effective excision requires precise energy delivery, reliable tissue control, and minimal lateral thermal spread. A solution that supports consistent performance and dependable hemostasis helps surgeons work efficiently in these challenging conditions.

How TriSect rapide® supports your approach:

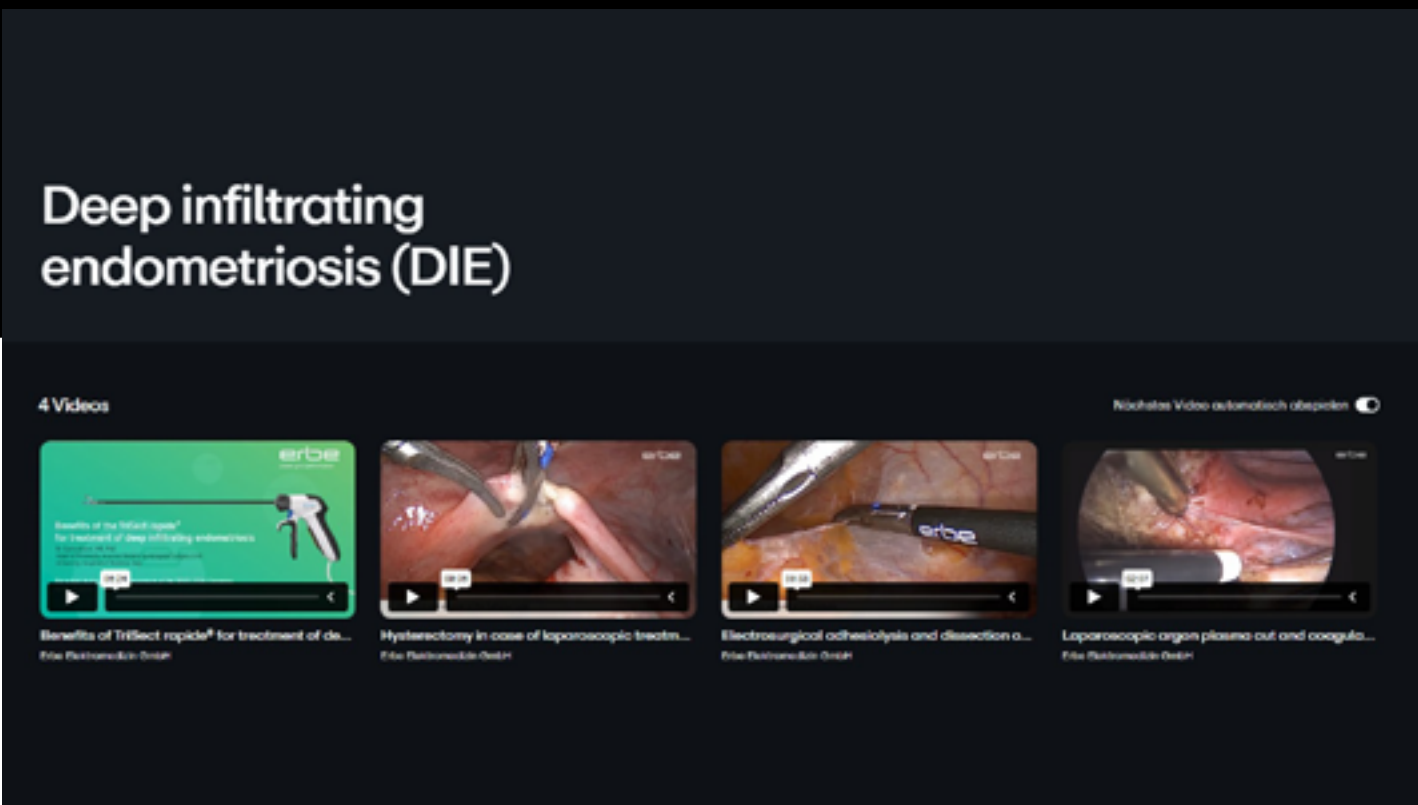
- **Operate with a cooler impact:** TriSect rapide® reduces thermal spread to adjacent tissue and enables working closely to critical structures thanks to lateral thermal spread lower than 1 mm. The jaw cools quickly to 60 °C after single dissect and seal activation, helping ensure safe handling.
- **Use variable hemostasis:** softCOAG bipolar mode provides immediate hemostasis with a powerful initial coagulation effect when needed.
- **Speed up your dissection:** The innovative jaw design enables both precise and blunt dissection, helping surgeons work efficiently in sensitive structures and tissues.

Technical data TriSect rapide®

Compatibility	VIO® 3, VIO® seal
Connection	MF-2 connector
Length of instrument	350 mm
Shaft diameter	5 mm
Cable length	4 m
Max. electrical capacity	220 Vp
Single-use/reusable Product	Single-use



Watch our application videos on deep infiltrating endometriosis



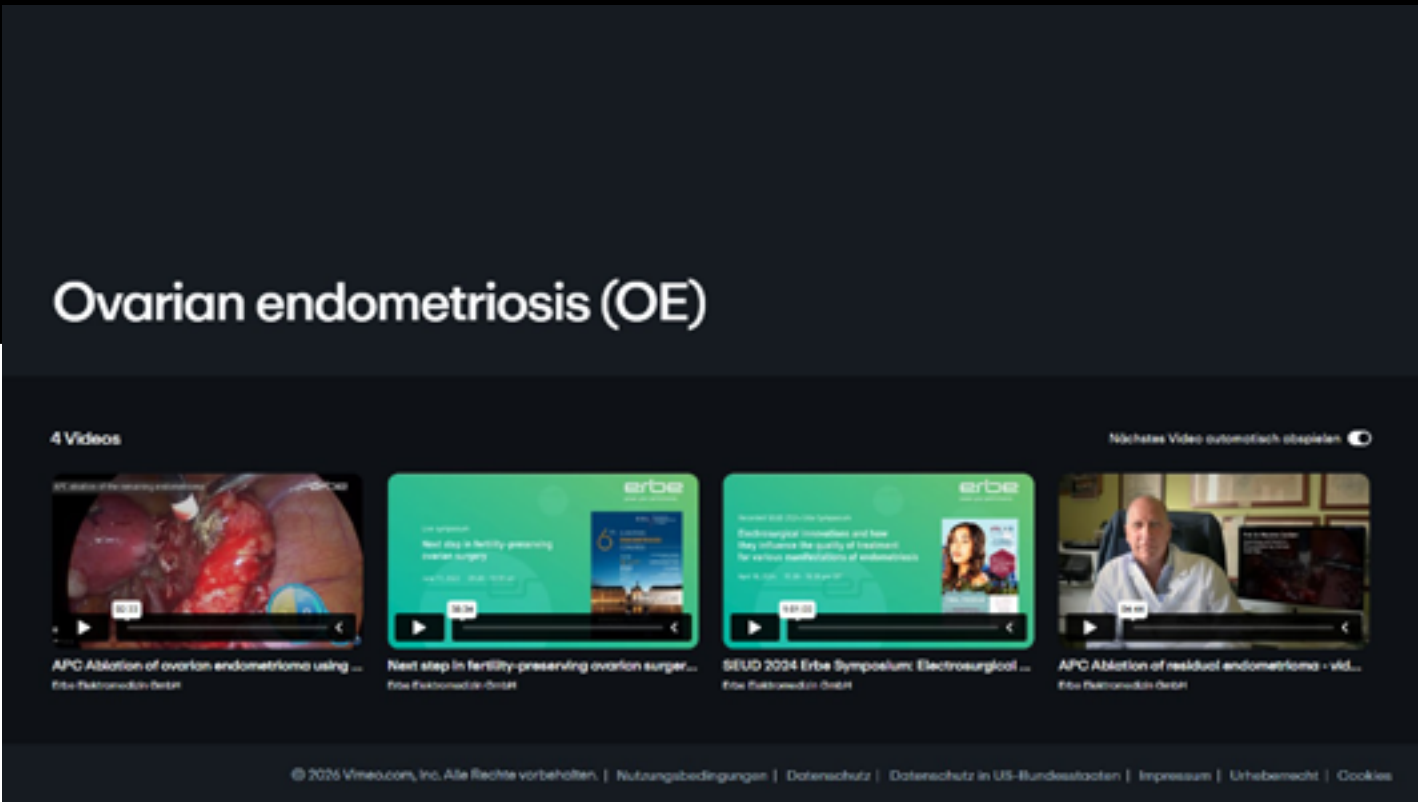
What experts say



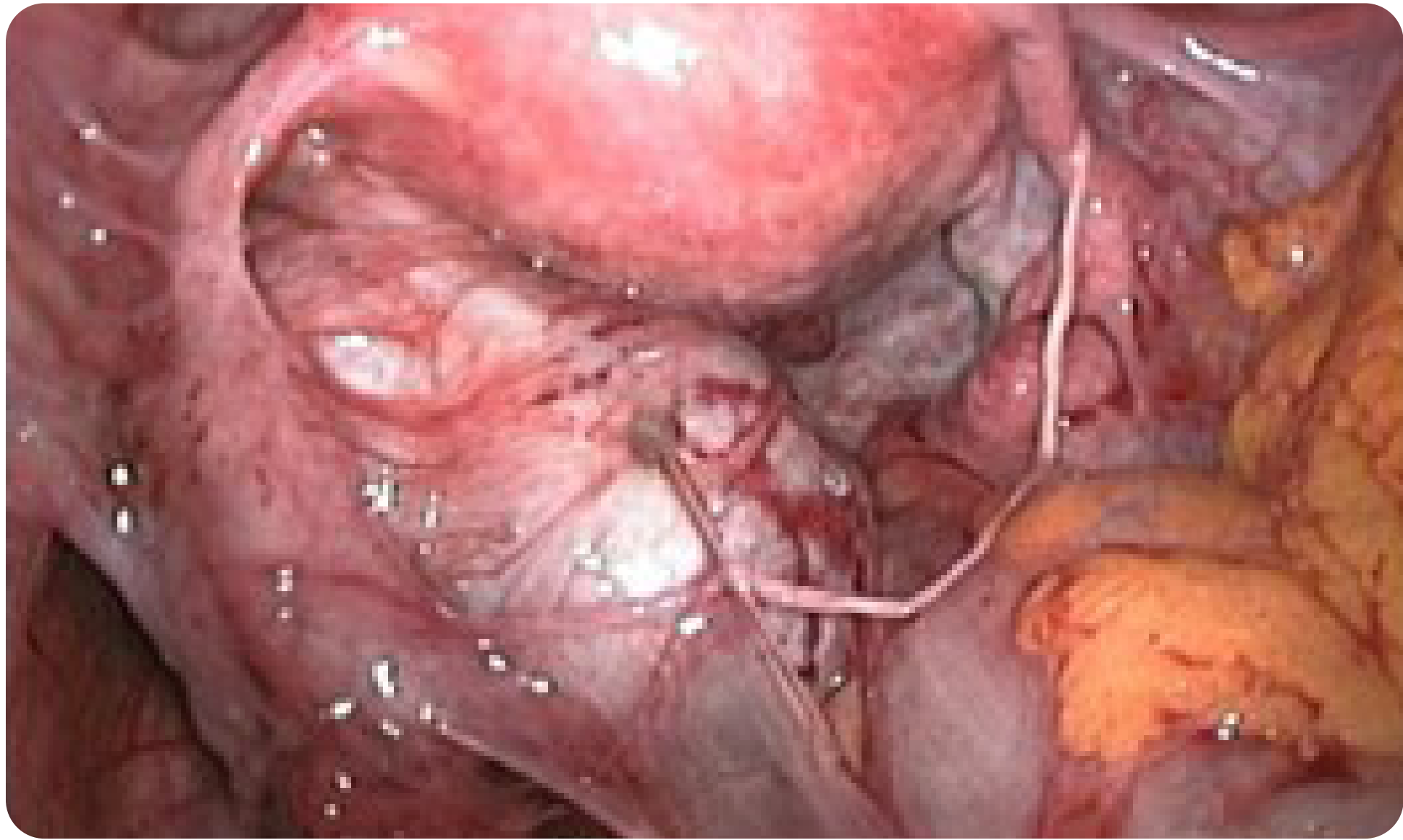
Prof. Massimo Candiani
Milan, Italy

"We tested how this instrument would work with preciseAPC and observed minimal thermal spread, thus preserving healthy ovarian tissue. In our experience, compared with a CO₂ laser, APC Endo produces a similar thermal effect but is less expensive and less dangerous: since it eliminates the potential for laser reflections off metallic instruments, you don't need to keep so much distance to the work area. And relative to the PlasmaJet, APC achieves a deeper, homogeneous ablative effect on the cyst without leaving untreated zones, which may reduce recurrence rates and lower overall costs."

▶ Watch our application videos on ovarian endometriosis



Ovarian endometriosis



Supporting organ-preserving surgery

Ovarian endometriosis at a glance

Ovarian endometriosis calls for treatment that removes or ablates the cyst wall while sparing ovarian tissue to preserve fertility. The cyst wall is often only shallowly infiltrated, which makes controlled superficial ablation and predictable coagulation depth essential. Cystectomy using the stripping technique is considered as the gold standard for complete removal of endometriotic tissue. However, it is associated with unavoidable loss of healthy ovarian tissue and a potential reduction in ovarian reserve. Ablation techniques such as argon plasma coagulation (APC) are found to be an option for endometriotic tissue confined to the superficial cyst lining. This technique may better preserve ovarian parenchyma compared with cystectomy.⁷

How APC supports your approach

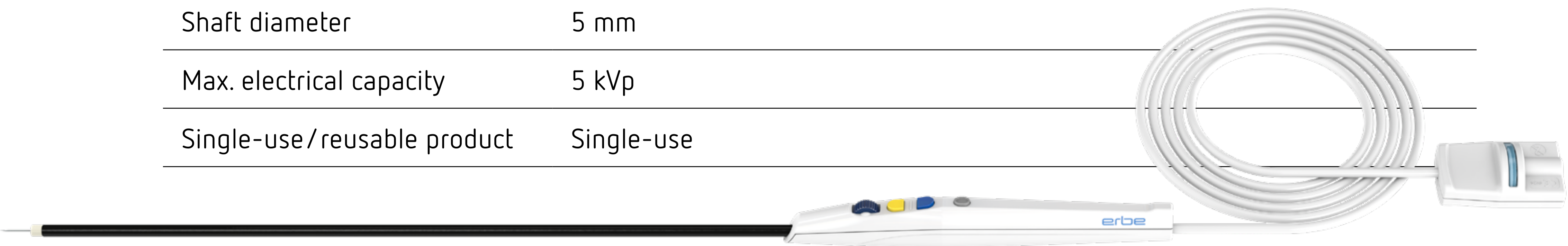
APC enables rapid superficial coagulation for uniform hemostasis and ablation across larger surfaces. It delivers a homogeneous tissue effect with limited coagulation depth, ensuring consistent performance.

Highlights of the APCapplicator:

- **Ergonomic design:** All functions are integrated into a single handpiece and can be activated easily with your fingertips.
- **Improved visibility:** Low smoke plume development during argon-assisted electrosurgery enhances the view of the operating field.
- **Contact-free operation:** Prevents adhesion of the instrument tip to coagulated tissue.
- **Versatile cutting:** Enables precise electrosurgical cutting even without argon gas.

Technical data APCapplicator

Compatibility	APC 3 in combination with a VIO® 3 or VIO® 3n electrosurgical unit
Length of instrument	350 mm
Shaft diameter	5 mm
Max. electrical capacity	5 kVp
Single-use/reusable product	Single-use



Scientific information

[4] Muzii, Ludovico et al. "Histologic analysis of endometriomas: what the surgeon needs to know" *Fertility and Sterility* vol. 87.2 (2007): doi.org/10.1016/j.fertnstert.2006.06.055

Objective

Histopathologic analysis of the endometrioma cyst wall after laparoscopic excision.

Methodology

The prospective series included **59 consecutive premenopausal women** undergoing laparoscopic excision of ovarian endometriomas at a tertiary university hospital. A total of **70 endometriomas** (monolateral or bilateral; diameter ≥ 3 cm) were exercised using the **stripping technique**.

Key findings

The inner cyst wall was lined by endometriotic tissue over a **median of 60%** (range 10-98%) of the surface. The **mean cyst wall thickness** was **1.4 mm**. Endometriotic tissue penetrated the cyst wall to a **mean maximal depth of 0.6 mm** (range 0.1–2.0 mm) in **99% of cases**, endometriotic tissue penetration did not exceed 1.5 mm, and in 87%, it was ≤ 1.0 mm.

Conclusion

The study demonstrates the extent and depth of endometriotic tissue spread in the endometrioma cyst. Any treatment must consider the full spread of endometriotic tissue in the cyst wall, while preserving underlying healthy ovarian tissue.

[5] Stefanovic, Stefan et al. "Microscopic, Macroscopic and Thermal Impact of Argon Plasma, Diode Laser, and Electrocoagulation on Ovarian Tissue" *In Vivo* vol. 37 (2) 531-538 (2023): doi.org/10.21873/invivo.13111

Objective

Comparison of the microscopic and macroscopic thermal damage on bovine ovarian tissue induced by different surgical methods.

Methodology

60 fresh cadaveric bovine ovaries were used as a surrogate for human ovarian tissue due to their comparable size, morphology, and reproductive physiology.

Ovaries were divided into five equal groups (12 per group) and exposed to one of the following modalities: monopolar electrocoagulation, bipolar electrocoagulation, YPG diode laser, Erbe APC 3, flexible probe (preciseAPC® effect 5, or forcedAPC® effect 3). Each ovary received a **1-second and a 5-second application** at separate sites. Tissue temperature was measured 1 cm lateral to the application point at 4- and 8-seconds post-application.

Histopathologic evaluation quantified **depth and lateral extent of tissue damage**.

Key findings

- After 5 seconds, **bipolar electrocoagulation caused overheating ($>40^{\circ}\text{C}$) in 41.7% of samples**.
- Adjacent tissue heating was **least pronounced with preciseAPC® and monopolar electrocoagulation**. With preciseAPC® mode after 5 sec activation a mean of $27.2 \pm 3.3^{\circ}\text{C}$ was reached.
- **preciseAPC® produced the shallowest defects of all modalities**, with a mean depth of only 0.05 mm after 5 seconds.

Conclusion

Among the tested modalities, APC using **preciseAPC® mode demonstrated the most favorable safety profile**, with minimal thermal spread and limited tissue penetration. Therefore, from a safety perspective **preciseAPC® is an excellent choice to preserve healthy ovarian tissue**. To ablate the full endometriotic tissue lining, settings have to be adapted to reach the desired tissue depth in future studies on human endometrioma tissue using a rigid APCapplicator.

[6] Ferrari, Stefano M. et al. "Histologic findings from ablation of ovarian endometriomas using argon plasma coagulation (APC-ENDO): a pilot study" *European Journal of Obstetrics & Gynecology and Reproductive Biology* vol. 312 (2025): doi. org/10.1016/j.ejogrb.2025.114532

Objective

In a pilot study the histologic effects of APC (APC 2 system, APCapplicator) used for ex vivo ablation of human ovarian endometriomas were tested.

Methodology

Eleven patients with symptomatic ovarian endometriomas ≥ 3 cm were enrolled and underwent laparoscopic cystectomy (n=2) or laparoscopic adnexectomy (n=9).

After specimen removal, a **2 × 2 cm area of the cyst's inner surface was ablated ex vivo** using the APC 2 system, with coagulation settings of **40–60 W**, a probe distance of **~5 mm**, and an exposure time of **1–2 seconds per site**.

The **primary endpoint** was histologic measurement of coagulation (necrosis) depth within the endometrioma pseudocapsule.

Secondary endpoints included assessment of thermal damage to adjacent ovarian parenchyma and confirmation of complete ablation of endometriotic tissue.

Key findings

- Histologic analysis showed a **mean coagulation depth of 0.8 mm** (95% confidence interval 0.42–1.17 mm).
- The **maximum observed depth was 1.5 mm**, remaining within the thickness of the fibrotic pseudocapsule.
- **No residual endometrial epithelium or stroma** was detected in any coagulated area, indicating complete ablation of endometriotic tissue.
- **No thermal damage extended into the surrounding ovarian parenchyma**, demonstrating strict confinement of necrosis to the pseudocapsule.

Conclusion

Argon plasma coagulation using the APC2 system produces **controlled, shallow coagulation** confined to the endometrioma pseudocapsule, achieving complete ablation of endometriotic tissue while sparing adjacent ovarian parenchyma. These findings support APC as a promising, tissue-preserving alternative to cystectomy. Additional clinical evidence from San Raffaele Hospital indicates that precise APC effect 9.0 creates a tissue effect that is:

- Deep enough to remove endometriotic tissue from the cysts
- Superficial enough to preserve the ovarian tissue

Clinical studies evaluating long term clinical effects on fertility, recurrence, and pregnancy rate will be conducted.

[7] E. Saridogan et al., "Recommendations for the surgical treatment of endometriosis-part 1: ovarian endometrioma," *Gynecol Surg*, vol. 14, no. 1, p. 27, 2017, doi: 10.1186/s10397-017-1029-x

Objective

To provide expert-based, practical recommendations on the technical performance of different surgical approaches for ovarian endometriomas in women of reproductive age.

Methodology

A multidisciplinary working group from ESGE, ESHRE, and WES reviewed available evidence and combined it with extensive clinical expertise to develop consensus recommendations for ovarian endometrioma surgery.

Given the limited high-quality comparative evidence, guidance is largely based on expert opinion and best clinical practice rather than formal meta-analysis.

Key findings

Cystectomy (stripping technique): Recommended as an effective method for complete removal of endometriotic tissue but is associated with unavoidable loss of ovarian tissue and potential reduction in ovarian reserve.

Ablation techniques (laser or argon plasma): Carbon dioxide (CO₂) laser and argon plasma are recommended for treatment of endometriotic tissue confined to the superficial cyst lining. These techniques may better preserve ovarian parenchyma compared with cystectomy when performed correctly.

Electrocoagulation: Widely used but associated with deeper and less predictable thermal spread. Short application times, low power settings, frequent cooling, and cautious use are strongly emphasized.

Conclusion

This consensus document provides detailed, technically focused recommendations for the surgical management of ovarian endometriomas, complementing existing evidence-based guidelines. It underscores the need to balance complete eradication of endometriotic tissue with maximal preservation of ovarian function, for which for example APC may be a feasible approach.

References

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- 2 Giudice LC. Clinical practice. Endometriosis. N Engl J Med. 2010 Jun 24;362(25):2389–98. doi:10.1056/NEJMcp1000274. Understanding diagnostic delay for endometriosis: a scoping review | medRxiv
- 3 Panvino F, Paparella R, Pisani F, Tarani F, Ferraguti G, Fiore M, Ardizzone I, Tarani L. Endometriosis in Adolescence: A Narrative Review of the Psychological and Clinical Implications. Diagnostics [Internet]. 2025 Feb 24 [cited 2025 Sep 29];15(5):548. Available from: <https://www.mdpi.com/2075-4418/15/5/548>
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- 4 Muzii, Ludovico et al. "Histologic analysis of endometriomas: what the surgeon needs to know" Fertility and Sterility vol. 87.2 (2007): doi.org/10.1016/j.fertnstert.2006.06.055
- 5 Stafanovic, Stefan et al. "Microscopic, Macroscopic and Thermal Impact of Argon Plasma, Diode Laser, and Electrocoagulation on Ovarian Tissue" In Vivo vol. 37 (2) 531-538 (2023): doi.org/10.21873/in vivo.13111
- 6 Ferrari, Stefano M. et al. "Histologic findings from ablation of ovarian endometriomas using argon plasma coagulation (APC-ENDO): a pilot study" European Journal of Obstetrics & Gynecology and Reproductive Biology vol. 312 (2025): doi.org/10.1016/j.ejogrb.2025.114532
- 7 E. Saridogan et al., "Recommendations for the surgical treatment of endometriosis-part 1: ovarian endometrioma," Gynecol Surg, vol. 14, no. 1, p. 27, 2017, doi: 10.1186/s10397-017-1029-x