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When and How Is Surgery Required for Large Endometrioma prior to in vitro Fertilization: A Survey of Practices

Jonas Jean Mathieu Vibert[a] Milena Alec[b] Antonio Simone Laganà[c] Giuseppe Benagiano[d, e] Nicola Pluchino[a]

[a]Department of Obstetrics and Gynecology, Lausanne University Hospital, Lausanne, Switzerland; [b]Department of Obstetrics and Gynecology, Geneva University Hospitals and University of Geneva, Geneva, Switzerland; [c]Unit of Obstetrics and Gynecology, Department of Health Promotion, Mother and Child Care, Internal Medicine and Medical Specialties (PROMISE), "Paolo Giaccone" Hospital, University of Palermo, Palermo, Italy; [d]Faculty of Medicine and Dentistry, "Sapienza" University of Rome, Rome, Italy; [e]Geneva Foundation for Medical Education and Research, Geneva, Switzerland

Keywords
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Abstract

Objectives: The aim of the study was to evaluate current practices among gynecologists in managing large endometriomas before in vitro fertilization (IVF). ***Design:*** A cross-sectional online survey was conducted. ***Participants/Materials:*** The survey was distributed to an estimated 410 gynecologists, with 111 specialists completing the survey (response rate: 27.8%). Among respondents, 73% practiced in academic settings, and 61% had more than 15 years of clinical experience. ***Setting:*** Gynecologists involved in IVF treatments or endometrioma surgery were recruited via email through professional societies across multiple countries. ***Methods:*** An online survey consisting of 18 questions covering clinical experience, surgical thresholds, techniques, hormonal protocols, and timing of ovarian stimulation post-surgery was distributed through professional societies. Responses were collected anonymously and analyzed using SPSS version 29.0.2.0. ***Results:*** Laparoscopic cystectomy was the most common procedure (48.2%). The median threshold size for surgery was 50 mm (interquartile range [IQR] 40–60). Despite the same median threshold, surgeons performing laparoscopic surgery as their main clinical activity had a significantly different distribution of thresholds (IQR 40–60 vs. 47–89, $p = 0.006$), with a tendency to recommend surgery for smaller endometriomas. Techniques like CO_2 laser ablation and plasma energy were less commonly used. Notably, 40.5% of participants indicated they would change their practice if a CO_2 laser or plasma energy device were available in their surgical armamentarium. Most participants (67.9%) adjusted their strategy based on preoperative anti-Müllerian hormone levels. The average timing for IVF stimulation post-surgery was 6 weeks (IQR 4–8) with no difference across different experiences. ***Limitations:*** The survey-based design may introduce response bias and reflect only the opinions of those who chose to participate. Additionally, the study may not capture regional or institutional differences comprehensively. ***Conclusion:*** Managing large endometriomas before IVF involves balancing surgical benefits with

karger@karger.com
www.karger.com/goi

Correspondence to:
Jonas Jean Mathieu Vibert, jonas.vibert@chuv.ch

risks to ovarian reserve. The survey highlights significant variability in practices, with a median surgical threshold size of 50 mm. Laparoscopic cystectomy, while common, is associated with ovarian tissue loss, whereas emerging techniques like CO_2 laser ablation show promise in preserving ovarian reserve. The need for up-to-date evidence-based guidelines is essential to standardize practices and optimize outcomes for IVF patients.

Introduction

The management of endometriomas in patients scheduled for in vitro fertilization (IVF) has been investigated for almost 2 decades but, in spite of the amount of published information, the issue remains the subject of considerable debate [1, 2]. While small endometriomas are no longer considered an absolute indication for surgery, the optimal approach to managing large endometriomas in this specific clinical scenario continues to be controversial. Large endometriomas present unique challenges as they are often painful and can interfere with follicle accessibility during oocyte retrieval [3–7]. Additionally, surgery to remove these cysts can reduce ovarian reserve and responsiveness to gonadotropins, thus reducing oocyte yield [8–11], and the threshold size for intervention, as well as the techniques and timing of ovarian stimulation following surgery, are not uniformly agreed upon.

In 2010, Gelbaya et al. [12] carried out a European Society of Human Reproduction and Embryology (ESHRE)-sponsored survey of the current strategies for the management of endometrioma (>3 cm) prior to IVF. It was found that surgical management was the most common treatment modality (82.2%), and that the preferred surgical approach was drainage and excision of the cyst wall (78.5%). The findings were in line with the recommendations of the ESHRE guidelines of the time.

Then, in 2022, ESHRE issued new guidelines, again highlighting the potential benefits, as well as the limits, of surgery for endometriomas before assisted reproductive technology (ART) to improve follicle accessibility; however, there was no specific mention of an exact size threshold for surgical intervention [4].

In 2017, the National College of French Gynecologists and Obstetricians (CNGOF) discouraged surgery before IVF for endometriomas smaller than 6 cm, on the grounds that their presence does not affect embryo quality, or IVF outcomes. At the same time, the College observed that endometriomas may reduce the number of retrieved oocytes and necessitate higher doses of gonadotropins, while making no specific recommendation for endometriomas larger than 6 cm [5].

Cystectomy is associated with a significant reduction in anti-Müllerian hormone (AMH) levels, which has important implications for IVF patients, as AMH levels are directly correlated with ovarian response and the number of oocytes retrieved [9, 10]. For this reason, various surgical techniques have been developed to manage large endometriomas with the goal of minimizing surgical trauma and preserving ovarian reserve [13–15].

At present, ESHRE guidelines recommend cystectomy or CO_2 laser vaporization for the surgical management of endometrioma. The guidelines also underline the importance of minimizing ovarian damage, with a focus on pain relief and improving follicle accessibility, and suggest that clinical judgment and patient preference should guide decision-making [4]. In compliance with these guidelines, today, it is quite common for fertility and endometriosis specialists to discuss the management of patients with large endometriomas before IVF.

To date, multiple practices have been described to address the issue of preliminary surgery, none of which have reached an international consensus. This variability reflects a knowledge gap.

In 2020, Maheshwari et al. [16] invited endometriosis and fertility experts across the UK to participate in an online questionnaire proposing a multicenter randomized-controlled clinical trial to compare surgery versus no surgery for endometrioma prior to IVF. The majority of the 126 clinicians who completed the survey (70%) were willing to participate in such a trial.

Even if carried out, this randomized-controlled clinical trial will leave open the question of what the current practices are among gynecologists involved in the management of endometriosis and IVF. To provide a response to this question, we conducted an international survey to explore current practices among involved gynecologists. Understanding these practices will help in designing educational strategies and guiding future research in this area.

Materials and Methods

We developed an ad hoc online survey protocol, consisting of 18 multiple-choice questions to evaluate the current management of large endometriomas for patients already scheduled for IVF (see Table 1). The survey was sent to specialists, namely to members of the Société de Médecine de la Reproduction (SMR) in France, the European Endometriosis League (EEL), the Endoscopy

Group of the Obstetrics and Gynecology Society of Switzerland, and the Società Italiana di Fertilità e Sterilità-Medicina della Riproduzione (SIFES-MR). The survey asked gynecologists the following questions: years of the Ob/Gyn clinical experience, type of prevalent medical practice (IVF and/or laparoscopic surgery for endometriomas), present country/region of practice, affiliation to private or academic institutions.

The survey aimed at exploring prevailing practices regarding the evaluation of

- AMH (prior and after surgery),
- modification of the management strategy according to AMH levels,
- use of hormonal treatment,
- threshold size (diameter in mm) of endometrioma for which they usually recommend surgery prior to IVF,
- management of >10 cm endometriomas prior to IVF, and
- type of surgery used and time span between surgery and the first ovarian stimulation for IVF.

Participants were also asked to consider whether updated guidelines from scientific societies are needed to improve the management of this specific clinical scenario. A summary of the questions is presented in Table 1.

The survey was sent by email during the months of January and February 2024. It was anonymized, and data were collected using SurveyMonkey. The survey was of an open format and entirely voluntary, with no incentives – monetary or otherwise – offered to participants. Every participant who accessed the link completed the survey entirely. Since the study involved no human subjects and was only a survey of practices, the IRB Board (CER-VD) determined that the data collection was outside the scope of the Swiss Human Research Act (HRA) and did not require authorization.

All statistical analyses were performed using SPSS version 29. Continuous variables were summarized using median and interquartile range (IQR), while categorical variables were reported as frequencies and percentages. Normality of the data was assessed with the Shapiro-Wilk test. Group comparisons of non-normally distributed variables were performed by Mann-Whitney U tests. A multivariable linear regression model was used to examine the association between the size of the endometrioma surgically treated and participant characteristics as independent variables. Coefficients (β\beta) were reported with their 95% confidence intervals (CIs) and p values. Multivariable logistic regression was used to evaluate the association between AMH perioperative measuring and type of practice, adjusting for potential confounders. Odds ratios (ORs) and 95% CIs were reported. A significance level of $p < 0.05$ was considered statistically significant.

Results

Characteristics of Participants

Of the 111 specialists who completed the survey, 73% practiced in an academic setting and 61% had more than 15 years of experience. Close to two-thirds of the respondents indicated that they usually focus on one procedure only, with 14.4% performing IVF only and 47.7% performing surgery only. On the other hand, 31.5% of the respondents performed both procedures (see Table 2). The survey was distributed via email through professional societies, reaching an estimated 410 relevant specialists. Based on this estimate, the response rate is approximately 27.8%. Among those who accessed the survey, all completed it in full, resulting in a 100% completion rate for analyzed responses.

Threshold Size

The threshold size (diameter in mm) of endometrioma, for which responders felt that surgery was indicated prior to IVF, ranges from 20 to 101 mm, with a median of 50 mm (IQR 40–60). Although the median size of endometriomas at which surgery was recommended was similar (50 mm), surgeons performing laparoscopic surgery tended to intervene on smaller lesions, as indicated by narrower IQRs (40–60 vs. 47–89) and a significant effect size (β = −15.72 [95% CI = −27.95 to −3.49], p = 0.006) (see Fig. 1). The median threshold size was similar between private and university-affiliated hospitals (52 mm [IQR 40–60] vs. 50 mm [IQR 40–60]; p value = 0.479). Practitioners performing ultrasound-guided cyst drainage had a higher threshold size than those using other techniques, with a median of 55 mm (IQR 33–85), but this result was not statistically significant (p value = 0.069). None of the other predictors demonstrated statistically significant effects. The results of the multiple linear regression analysis, adjusted for all confounders related to participant characteristics and type of practice, confirmed an association between the threshold size and whether the practitioner regularly performs endometrioma surgery via laparoscopy (β = −2.09, 95% CI [1.06–3.93], p value = 0.047).

Type of Surgery

Laparoscopic cystectomy remains the most common procedure, accounting for 48.2% of all interventions. Additional methods included laparoscopic combination

Table 1. Questionnaire sent to the participants

Question	Response options
1. In which country do you work?	List of countries
2. Could you please describe the type of your prevalent medical practice?	• University-Affiliated Hospital • Public Hospital, Not University-Affiliated • Private
3. How many years of Ob/Gyn clinical experience do you have (including your Ob/Gyn training)?	• <5 years • 5–9 years • 10–14 years • 15–19 years • 20–24 years • >25 years
4. Do you usually perform IVF?	yes/no
5. Do you usually perform endometrioma surgery by laparoscopy?	yes/no
6. Do you usually perform both IVF and laparoscopy for endometrioma?	yes/no
7. Please indicate the threshold size (mean diameter in mm) of endometrioma for which you usually advise surgery prior to IVF	Number
8. Which type of surgery do you usually perform (or advise) in this clinical scenario (prior to IVF)?	List of surgical procedures
9. Would you change your approach if CO_2 laser or plasma energy device is available in your surgical arsenal?	yes/no
10. How do you manage a >10 cm endometrioma prior to IVF?	List of surgical procedures
11. Do you prescribe any hormonal treatment before the surgical procedure?	yes/no
12. Do you prescribe any hormonal treatment after any surgical procedure?	yes/no
13. Do you measure AMH before performing surgery?	yes/no
14. Do you modify the management strategy according to AMH levels (e.g., more conservative methods or no surgery for very low AMH level)?	yes/no
15. Do you usually measure AMH following surgery?	yes/no
16. How many weeks after endometrioma management does ovarian stimulation for IVF begin?	Number
17. Do you believe that updated guidelines from scientific societies are necessary to enhance the management of this specific clinical scenario?	yes/no
18. Please share any other comments you have below	Free text

of cystectomy and ablation using CO_2 laser or plasma energy device (12.5%), laparoscopic alcohol sclerotherapy (3.6%); and ultrasound-guided cyst drainage (2.7%) (see Fig. 2). Since surgery may involve multiple steps (e.g., drainage followed by ablation, or cystectomy) in separate interventions, a specific question dealt with this eventuality. Surgeons and IVF experts showed slight variations in the frequency of performing these procedures. For example, IVF experts tended to perform fewer cystectomies (39.1% vs. 48.9%, p value 0.046) and instead opted for other techniques, such as ultrasound-guided cyst drainage (10.9%). Overall, laparoscopic cystectomy remained the predominant choice for treating endometriomas. It is noteworthy that 40.5% of participants would change their practice if a CO_2 laser or plasma energy device were available in their surgical armamentarium.

Management of Endometriomas >10 cm

Concerning the management prior to IVF of endometriomas larger than 10 cm, the results show notable variability. Most specialists (41.4%) perform a laparoscopic cystectomy, 9.9% a laparoscopy and alcohol

Table 2. Respondents' demographic and practice characteristics

Variable	Categories	*n* (%)/median (IQR)
Type of medical practice	University hospital	81 (73%)
	Private	15 (13.5%)
	Public	15 (13.5%)
Years of Ob/Gyn experience	<5 years	3 (2.7%)
	5–9 years	15 (13.5%)
	10–14 years	25 (22.5%)
	15–19 years	14 (12.6%)
	20–24 years	21 (18.9%)
	>25 years	33 (29.7%)
Clinical activities	IVF only	16 (14.4%)
	Surgery only	53 (47.7%)
	Both (IVF + surgery)	35 (31.5%)
	None	7 (6.3%)
Type of surgery	Laparoscopic cystectomy	53 (47.7%)
	Laparoscopic cystectomy and ablation (CO_2 or energy device)	14 (12.6%)
	Two steps surgery	8 (7.2%)
	Ultrasound-guided cyst drainage (± alcohol sclerotherapy)	8 (7.2%)
	Laparoscopy and CO_2 laser ablation	6 (5.4%)
	Other	22 (19.8%)
Measurement of AMH	Before surgery	89 (80.2%)
	After surgery	68 (61.3%)
Use of hormonal treatment	Before surgery	54 (48.6%)
	After surgery	96 (86.5%)
Time to ovarian stimulation, weeks	Weeks after endometrioma management	6 (4–8)

sclerotherapy of the cyst and 8.1% prefer not to intervene, mentioning that IVF can be performed without prior size-reducing surgery.

Perioperative Hormonal Treatment

The majority of participants (53.2%) typically refrain from administering hormonal treatment before endometrioma surgery. Among those who do prescribe hormonal treatment before surgery, progestins are the predominantly used (65.4%). Following surgery, 86.5% of the participants would initiate a hormonal treatment, with progestins being the most commonly prescribed (48.4%), followed by combined estrogen-progestin contraceptives (22.6%). Additionally, a significant number of respondents (29%) use other forms of hormonal treatment, including GnRH agonists, with only 0.9% using GnRH antagonists.

Perioperative Measurement of AMH Levels

The majority of the participants (67.9%) modified their strategy based on AMH levels. Measuring AMH before surgery is significantly associated with a higher likelihood of performing both IVF and laparoscopy, with respondents who measure AMH being about 5 times more likely to perform both procedures (OR = 5.09, 95% CI: 1.1–23.2, p value <0.05).

Timing of Ovarian Stimulation

The median timing of ovarian stimulation for IVF following endometrioma management is estimated at 6 weeks (IQR 4–8).

Need of Updated Guidelines

The majority of gynecologists surveyed (88.3%) express that updated guidelines from scientific societies are necessary to improve the management of endometriomas before IVF. Our analysis revealed that gynecologists with more years of Ob/Gyn clinical experience were significantly more likely to express the need for updated guidelines (OR = 2.00, 95% CI [1.16–3.44], p = 0.012). Finally, we did not find significant associations between the belief in the necessity of updated guidelines and specific clinical practices, such as the use of advanced surgical tools, hormonal treatment protocols, and AMH testing.

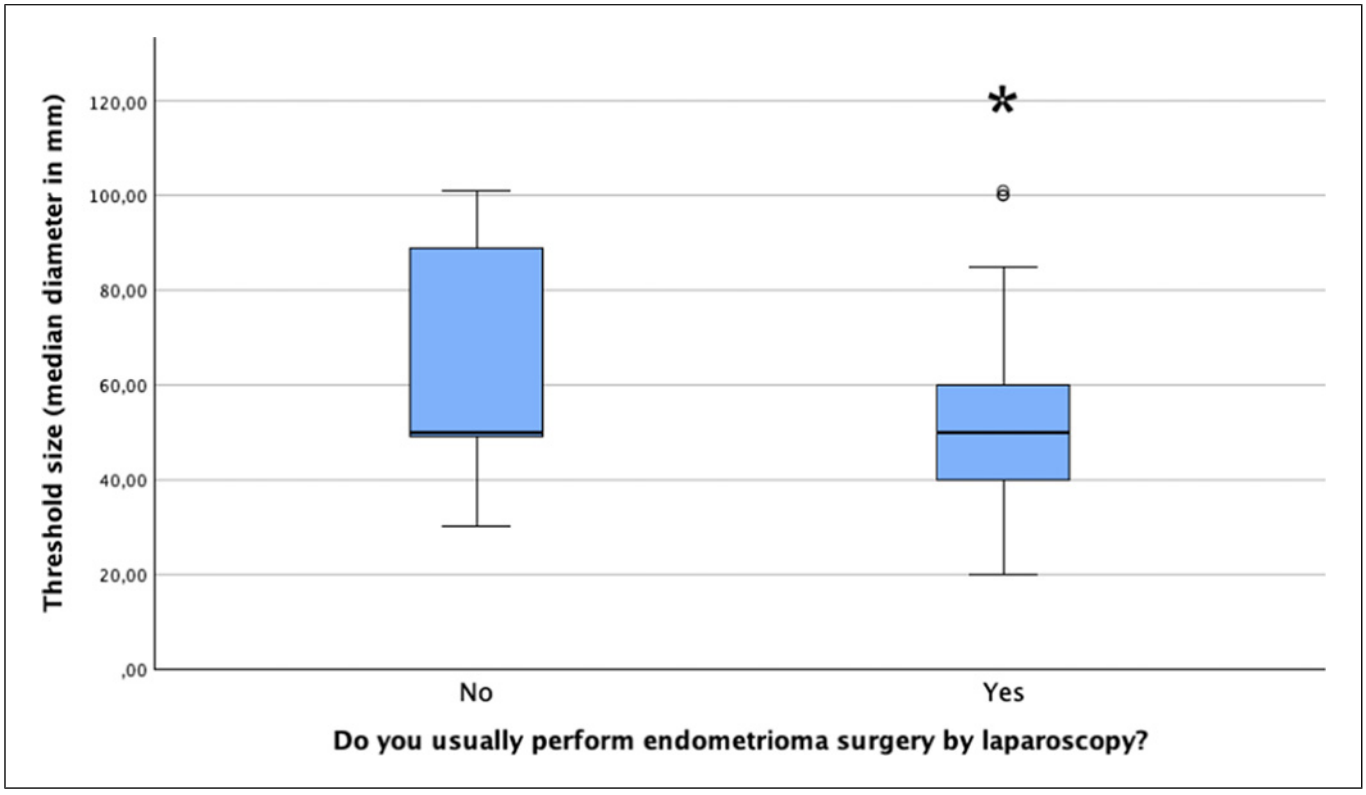

Fig. 1. Threshold size: median diameter (in mm) of endometrioma, for which surgery is advised based on clinical experience in performing laparoscopic surgery. Statistical significance was observed ($p < 0.05$).

Discussion

The management of large endometriomas before IVF involves a complex decision-making process that balances the benefits of surgery against the potential risks for ovarian reserve. The survey results provide an insightful overview of current practices among gynecologists and reproductive specialists with a substantial level of expertise, considering that 60% of them had over 15 years of experience.

The decision to perform surgery on endometriomas is primarily influenced by their size and impact on the ovarian response. Endometriomas between 40 and 49 mm are known to reduce follicle and oocyte counts, with larger cysts over 50 mm having a more pronounced effect [3, 15, 17]. However, practitioners must weigh these benefits against the surgical risks, particularly the potential reduction in ovarian reserve [13, 14]. The survey indicates a median threshold size for surgical intervention of 50 mm, with surgeons recommending surgery at a significantly smaller size compared to IVF specialists. This finding suggests that training background and clinical focus significantly influence decision-making, underscoring the need for a multidisciplinary approach to ensure comprehensive patient care. Interestingly, practice setting (academic vs. private) did not impact these decisions, further supporting the role of individual expertise and training.

In our survey, laparoscopic cystectomy emerged as the predominant procedure (utilized by 48.2% of responders), despite its well-documented risks of significant loss of ovarian tissue and decreased ovarian reserve [9, 10]. Techniques such as CO_2 laser ablation and plasma energy offer promising alternatives as they minimize ovarian damage due to their limited thermal spread [18, 19], while maintaining comparable recurrence rates [11, 20, 21]. The survey revealed considerable interest in adopting these advanced methods, with 40.5% of participants indicating they would use such technologies if available. However, less commonly performed procedures, such as laparoscopic sclerotherapy, require further evaluation due to potential risks, including ovarian fibrosis [22]. Additionally, simply draining the cyst can be a temporary solution but leads to recurrence [23].

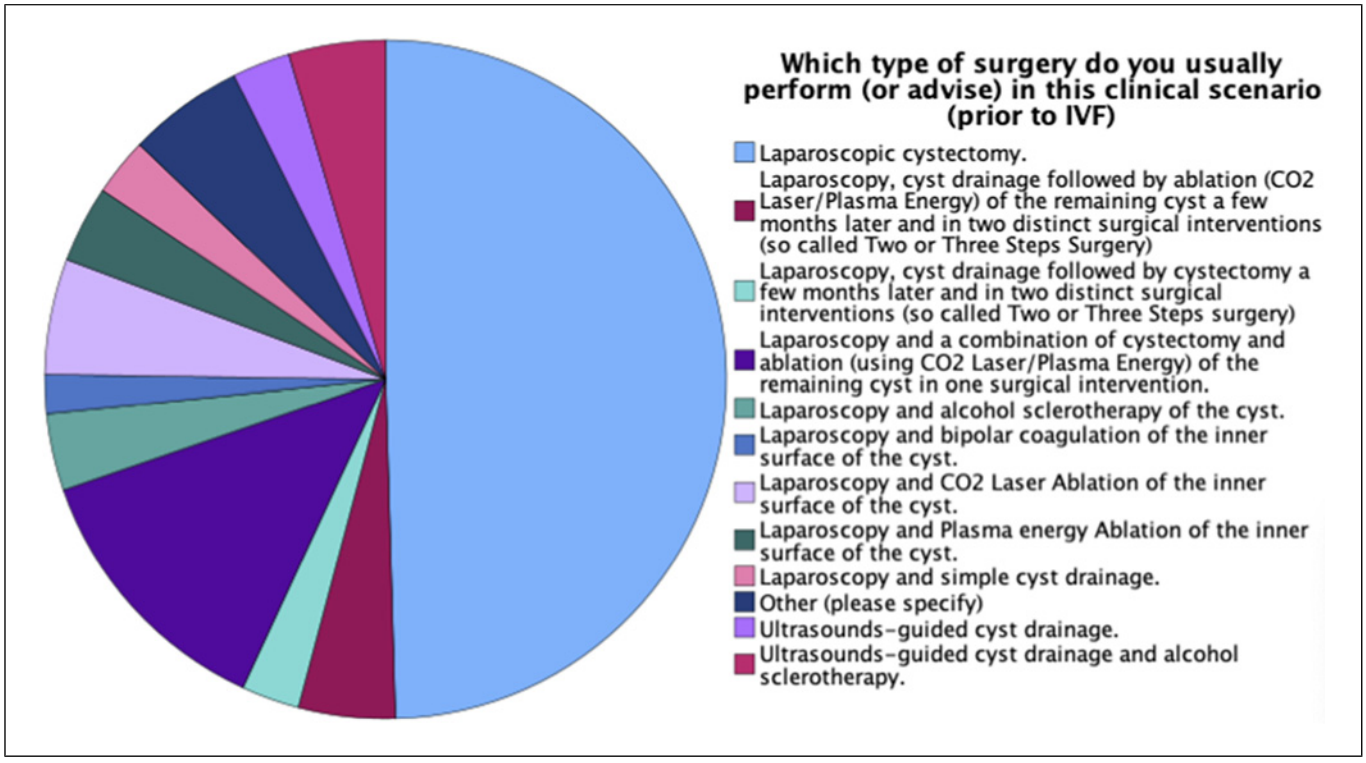

Fig. 2. Type of surgery: distribution of surgical techniques used for managing large endometriomas prior to in vitro fertilization (IVF).

Preoperative hormonal treatment is prescribed by 45.9% of participants and consists primarily of progestins, probably based on recent data suggesting that hormonal therapy may reduce the need for surgery before IVF [24, 25]. Post-surgery, hormonal treatments are more frequently prescribed (86.5%), with progestins being the most common choice.

The timing of ovarian stimulation for IVF post-surgery showed wide variability, with an average duration of 6 weeks (IQR 4–8). This variability underscores the need for individualized treatment plans based on the patient's response and recovery. However, longer intervals between surgery and IVF are not associated with a specific procedure (i.e., cystectomy) but much more based on personal experience in the absence of solid evidence of principles of ovarian recovery following surgery.

A large majority of respondents (88.3%) stressed the need for updated guidelines from scientific societies to improve the management of endometriomas before IVF, with more experienced practitioners particularly emphasizing this necessity. This reflects recognition of knowledge gaps and variability in current practices, as well as a demand for clear, evidence-based recommendations to improve patient outcomes.

Conclusion

The management of large endometriomas before IVF involves balancing the benefits of surgery with the potential risks to the ovarian reserve. This survey highlights significant variability in current practices, influenced by practitioner expertise and training rather than institutional settings. While laparoscopic cystectomy remains the most commonly employed procedure, available evidence indicates that it is associated with considerable ovarian tissue loss. However, advanced techniques, such as CO_2 laser ablation and plasma energy devices, offer promising alternatives. This is particularly relevant in the case of IVF where ovarian response predicts treatment success.

The survey results reveal a high degree of heterogeneity in management approaches and underscore the significant influence of practitioners' experience on decision-making. This variability, coupled with the need for individualized patient care, highlights the necessity for updated, evidence-based guidelines. Practitioners strongly support the development of new guidelines to standardize and improve management practices. Implementing these guidelines will be crucial

in enhancing fertility preservation and optimizing clinical outcomes for women with large endometriomas undergoing IVF.

Limitations of the Study

This study has several limitations that should be acknowledged. First, as a survey-based study, it relies on self-reported practices, which may introduce response bias and may not always reflect actual clinical behavior. Second, the response rate was 27.8%, which, while within acceptable ranges for survey studies, may limit the generalizability of the findings as non-respondents might have different practices or perspectives. Third, the study was primarily descriptive in nature, aiming to provide an overview of current practices rather than establishing causal relationships or clinical outcomes. Finally, regional and institutional variability may not have been fully captured, as the majority of respondents practiced in academic settings.

Statement of Ethics

Since the study involved no human subjects and was only a survey of practices, the IRB board (CER-VD) determined that the data collection was outside the scope of the Swiss Human Research Act (HRA) and did not require authorization.

Conflict of Interest Statement

The authors declare no conflicts of interest related to this work.

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Author Contributions

N.P. conceived and designed the study. J.J.M.V. and N.P. analyzed the data. J.J.M.V. drafted the manuscript. M.A., A.S.L., G.B., and N.P. critically revised the manuscript. All authors approved the final version of the report.

Data Availability Statement

The data that support the findings of this study are fully anonymized to ensure the privacy of research participants. These data are not publicly available but can be accessed upon reasonable request from the corresponding author, Jonas Jean Mathieu Vibert (jonas.vibert@chuv.ch), in compliance with ethical guidelines and institutional policies. Access will be granted solely for research purposes related to the study topic and contingent upon appropriate agreements to ensure data security and confidentiality.

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