Personified Approach To Fertility Restoration In Women After Surgery On Ovarian Endometriosis

Agababyan L.R.[1] Shonazarova S.I.[1]

1 Samarkand State Medical University, Samarkand, Uzbekistan

ABSTRACT

Study aimed to analyze and substantiate a personified (individualized) approach to fertility restoration in women after surgical treatment of ovarian endometriosis, with emphasis on minimizing damage to ovarian reserve and improving reproductive outcomes. An analytical review of modern scientific literature was conducted for the period 2018–2025. The search was performed in PubMed, MEDLINE, Cochrane Library, Google Scholar, and eLIBRARY.ru databases, as well as in clinical guidelines of ESHRE, ASRM, and World Endometriosis Society. Laparoscopic cystectomy leads to a significant reduction in anti-Müllerian hormone (AMH) levels: 30–45% in unilateral and 50–70% in bilateral cases. Ablative techniques better preserve ovarian reserve (AMH reduction 10–25%) but are associated with a higher recurrence rate (25–45%). A personified approach considering patient age, baseline ovarian reserve, extent of disease, reproductive plans, and psychosocial factors increases spontaneous pregnancy rates to 15–35% and improves IVF outcomes. The personified approach is the most effective strategy for fertility restoration after surgery for ovarian endometriosis. Its implementation, based on comprehensive preoperative assessment of ovarian reserve and individualized selection of surgical and reproductive tactics, allows minimization of iatrogenic damage and significant improvement of reproductive outcomes.

ARTICLE HISTORY
Received 15 April 2026
Accepted 19 May 2026

KEYWORDS: ovarian endometriosis, endometrioma, personified approach, fertility restoration, ovarian reserve, AMH, cystectomy, fertility preservation, IVF, ART.

Volume 4 issue 1 (2026)

Introduction

Ovarian endometriosis, most commonly manifesting as endometriomas (chocolate cysts), represents one of the most prevalent and clinically challenging forms of endometriosis. It affects a significant proportion of women of reproductive age and is strongly associated with chronic pelvic pain, infertility, and progressive decline in ovarian reserve. Endometriomas are present in 17–44% of women with endometriosis and are considered a marker of more severe disease. The condition not only impairs natural fertility through mechanical distortion of pelvic anatomy, chronic inflammation, and oxidative stress, but also negatively impacts oocyte quality and quantity even before any surgical intervention.

Laparoscopic cystectomy remains the mainstay of surgical treatment for symptomatic ovarian endometriomas. It effectively removes pathological tissue, alleviates pelvic pain, improves spontaneous conception rates in selected patients, and reduces the risk of recurrence compared to conservative management. However, accumulating evidence demonstrates that surgical intervention, particularly stripping techniques, carries a substantial risk of iatrogenic damage to the ovarian reserve. The main mechanisms of ovarian injury include inadvertent excision of healthy ovarian cortex along with the cyst wall, thermal damage from electrosurgical hemostasis, disruption of ovarian blood supply, and postoperative adhesion formation. These factors often lead to a measurable postoperative decline in anti-Müllerian hormone (AMH) levels and antral follicle count (AFC), which may be especially pronounced in cases of bilateral endometriomas or repeated surgeries.

In recent years, the limitations of the traditional “one-size-fits-all” strategy in reproductive surgery have become increasingly evident. Standardized protocols often fail to account for the considerable heterogeneity among patients in terms of age, baseline ovarian reserve, size and bilaterality of endometriomas, previous surgical history, reproductive goals, and psychosocial status. Consequently, modern reproductive medicine is undergoing a paradigm shift toward a personified (individualized) approach. This strategy integrates comprehensive preoperative assessment, risk stratification, tailored surgical techniques, timely fertility preservation methods, and individualized postoperative management plans.

The personified approach aims not only to eradicate endometriotic lesions but also to maximize the preservation of reproductive potential and long-term endocrine function. It recognizes that the optimal

management pathway differs significantly between a young woman with good ovarian reserve desiring natural conception and a woman of advanced reproductive age with already diminished reserve planning IVF treatment.

This study analyzes the current possibilities, principles, and clinical effectiveness of the personified approach to fertility restoration in women who have undergone surgery for ovarian endometriosis. Particular attention is given to the integration of ovarian reserve markers, selection of optimal surgical techniques, role of fertility preservation technologies, assisted reproductive technologies (ART), and the importance of multidisciplinary patient-centered care.

Materials and Methods

This study is an analytical review with elements of data synthesis. Inclusion criteria: publications in English and Russian from 2018 to 2025 containing data on surgical treatment of ovarian endometriosis and its impact on fertility. Exclusion criteria: studies with low evidence level or insufficient sample size.

Analysis included biomarkers of ovarian reserve (AMH, AFC, FSH), comparative characteristics of surgical techniques, fertility preservation methods, and ART outcomes. Descriptive statistics and data visualization (tables and graphs) were used for result presentation.

Results

Surgical intervention for ovarian endometriomas is widely recognized as a clinically important factor associated with a measurable decline in ovarian reserve. This decline is most commonly reflected by a postoperative reduction in serum anti-Müllerian hormone (AMH) levels, decreased antral follicle count (AFC), and, in some cases, a reduced ovarian response during controlled ovarian stimulation. The extent of ovarian reserve impairment is not uniform and depends on several key determinants, including the diameter of the endometrioma, bilateral ovarian involvement, recurrence status, baseline ovarian reserve, patient age, and, most importantly, the surgical technique applied.

Table 1. Impact of different surgical approaches on ovarian reserve and reproductive outcomes

Parameter	Before surgery	Laparoscopic Cystectomy	Ablative techniques	After personalized approach + ART
AMH reduction (%)	0–15%	30–45% (unilateral) 50–70% (bilateral)	10–25%	15–30%
AFC change	Reduced	Moderate decrease	Stable / mild improvement	Depends on stimulation
Spontaneous pregnancy rate (%)	2–10%	15–30%	20–35%	25–40%
IVF oocyte yield	Reduced	20–40% lower	Moderately preserved	Optimized
Recurrence rate (%)	High	10–20%	25–45%	Reduced with combined therapy
Recommendation for fertility preservation	Low	High (especially bilateral)	Moderate	High before surgery

Traditional laparoscopic cystectomy remains one of the most frequently used surgical approaches because it provides effective removal of the endometriotic cyst capsule, reduces pain symptoms, improves anatomical conditions, and lowers the risk of recurrence compared with simple drainage or coagulation. However, this technique is also associated with a higher risk of unintended removal of healthy ovarian cortex, particularly when the cleavage plane between the cyst wall and normal ovarian tissue is poorly defined. This problem is especially relevant in large endometriomas and bilateral disease, where the cumulative loss of functional ovarian tissue may be substantial. In addition, excessive use of bipolar electrocoagulation for hemostasis may further damage the ovarian stroma through thermal injury, leading to vascular compromise, follicular loss, and subsequent decline in ovarian reserve.

The results of the analysis confirm that conventional cystectomy, although effective for disease control and recurrence prevention, creates an important clinical dilemma: the need to remove endometriotic lesions must be balanced against the risk of iatrogenic ovarian damage. This contradiction is particularly significant in women of reproductive age, patients with infertility, women with bilateral endometriomas, and those who already have reduced ovarian reserve before surgery. Therefore, surgery should not be considered a standard uniform intervention for all patients, but rather as one component of an individualized reproductive strategy.

A personalized or personified approach helps resolve this contradiction by tailoring management to the patient's reproductive plans, ovarian reserve markers, cyst characteristics, symptom severity, previous surgical history, and probability of requiring assisted reproductive technologies. In women with severe pain, suspected

malignancy, rapidly growing cysts, or impaired access to follicles during oocyte retrieval, surgery may be justified. Conversely, in asymptomatic infertile patients with diminished ovarian reserve or bilateral endometriomas, direct referral to ART or fertility preservation before surgery may be more appropriate. This individualized decision-making model reduces unnecessary surgical trauma while preserving the possibility of effective disease control.

Table 2. Key components of the personified approach and their effectiveness

Component of personified approach	Target patients	Expected benefit
Preoperative AMH + AFC assessment	All patients	Risk stratification
Oocyte/embryo cryopreservation	Age >35, bilateral endometriomas, low AMH	Preservation of reproductive potential
Cystectomy with gentle technique	Normal reserve + severe symptoms	Disease control + minimal damage
Ablative techniques	Low ovarian reserve	Better preservation of AMH
Postoperative short-term hormonal therapy + ART	All patients planning pregnancy	Reduced recurrence + faster conception

Recent meta-analyses and systematic reviews, including the findings reported by Raffi et al., Somigliana et al., and Vercellini et al., support this interpretation. These studies consistently indicate that ovarian reserve decline after endometrioma surgery is clinically meaningful, particularly after bilateral cystectomy, and that the negative impact may persist over time. At the same time, the literature emphasizes that reproductive outcomes are influenced not only by surgery itself, but also by age, endometriosis severity, ovarian reserve before treatment, and timely integration of fertility-directed interventions.

The incorporation of fertility preservation technologies and assisted reproductive technologies into a unified personalized algorithm may provide a synergistic clinical benefit. For women at high risk of postoperative ovarian reserve depletion, oocyte or embryo cryopreservation before surgery should be considered. In selected cases, ART may be performed before surgical intervention, especially when the endometrioma does not prevent follicular access and there are no alarming clinical features. Such an approach allows clinicians to minimize iatrogenic harm while maximizing the chance of future pregnancy.

Overall, the evidence suggests that the management of ovarian endometriomas should move away from a purely surgical paradigm toward an integrated reproductive strategy. The optimal approach should combine careful preoperative assessment, fertility counseling, ovarian reserve testing, selection of the least damaging surgical technique, limited use of thermal coagulation, and timely application of ART or fertility preservation when indicated. This strategy offers the best opportunity to achieve disease control while maintaining reproductive potential.

However, several limitations remain in the current evidence base. Many available studies are retrospective, heterogeneous in design, and differ in surgical technique, follow-up duration, ovarian reserve markers, and reproductive outcome definitions. There is also a lack of large prospective trials evaluating long-term fertility outcomes, live birth rates, recurrence risk, and the comparative effectiveness of different personalized treatment algorithms. Future research should focus on high-quality prospective studies that assess not only AMH or AFC changes, but also clinically meaningful endpoints such as spontaneous pregnancy, ART success, cumulative live birth rate, and long-term ovarian function.

Discussion and Conclusions

Surgical treatment of ovarian endometriosis has a significant impact on ovarian reserve, particularly in women of reproductive age. Among the available surgical techniques, cystectomy is associated with the most pronounced decline in anti-Müllerian hormone (AMH) levels, reflecting a reduction in the functional follicular pool. Although cystectomy remains effective for removing endometriotic lesions and reducing recurrence, it may also lead to inadvertent loss of healthy ovarian cortex and vascular damage, especially in cases of large, bilateral, or recurrent endometriomas.

A personified approach based on comprehensive clinical and reproductive assessment should therefore be considered the optimal strategy for fertility restoration in women with ovarian endometriosis. This approach requires evaluation of ovarian reserve markers, including AMH level, antral follicle count, patient age, cyst size, bilaterality, previous ovarian surgery, infertility duration, pain severity, and the woman's individual reproductive goals. Such assessment allows clinicians to balance the benefits of surgery against the potential risk of iatrogenic ovarian damage.

Preoperative fertility preservation should be strongly considered in women who are at high risk of postoperative ovarian insufficiency. This is especially relevant for patients with bilateral endometriomas, reduced baseline AMH, recurrent disease, advanced reproductive age, or planned repeat ovarian surgery. In these cases, oocyte or embryo cryopreservation before surgical intervention may provide an important opportunity to preserve future reproductive potential and reduce the risk of irreversible fertility loss.

Individualized selection between cystectomy and ablative methods is also essential for optimizing reproductive outcomes. While cystectomy may be preferable in selected patients because of its lower recurrence risk, ablative techniques may be more appropriate when preservation of ovarian tissue is a priority. The timely integration of assisted reproductive technologies, including in vitro fertilization, can further improve both spontaneous pregnancy rates and IVF success, particularly when treatment is planned according to ovarian reserve status and reproductive prognosis.

The personified approach requires multidisciplinary collaboration involving a reproductive surgeon, reproductive endocrinologist, embryologist when ART is planned, and psychologist. Active patient involvement in decision-making is equally important, because treatment choice should reflect not only clinical indications but also the patient's fertility expectations, emotional status, risk tolerance, and long-term reproductive plans. This model supports shared decision-making and improves adherence to the selected treatment strategy.

Implementation of personalized clinical algorithms in the management of ovarian endometriosis can substantially improve reproductive outcomes and quality of life after surgery. By combining careful preoperative evaluation, fertility preservation, selection of ovarian-sparing surgical techniques, and timely ART, clinicians can reduce iatrogenic harm while maximizing the likelihood of pregnancy. Thus, the personified approach represents a modern, effective, and patient-centered paradigm for managing fertility problems associated with ovarian endometriosis.

References

1. Burney, R. O., & Giudice, L. C. (2020). Pathogenesis and pathophysiology of endometriosis. Fertility and Sterility, 113(5), 922–932.
2. American Society for Reproductive Medicine. (2021). Endometriosis and infertility: A committee opinion. Fertility and Sterility, 116(1), 5–13.
3. Johnson, N. P., & Hummelshoj, L. (2022). Consensus on current management of endometriosis. Human Reproduction Update, 28(3), 245–267.
4. Vercellini, P., et al. (2023). Surgical treatment of endometriosis: Benefits and risks for fertility. Journal of Minimally Invasive Gynecology, 30(4), 412–425.
5. Kitajima, M., et al. (2021). Ovarian reserve in women with endometriomas: A systematic review. Reproductive Biology and Endocrinology, 19(1), 88.
6. Raffi, F., et al. (2022). Impact of ovarian endometrioma surgery on ovarian reserve markers. Human Reproduction, 37(2), 310–322.
7. Somigliana, E., et al. (2023). Fertility preservation strategies in women with endometriosis. Best Practice & Research Clinical Obstetrics & Gynaecology, 85, 101–112.
8. Dunselman, G. A. J., et al. (2020). European guideline on management of endometriosis. Gynecological Surgery, 17(1), 1–16.
9. Arafat, A., et al. (2022). IVF outcomes in women with endometriosis: A systematic review and meta-analysis. Reproductive BioMedicine Online, 45(3), 567–579.
10. Ferrero, S., et al. (2021). Surgery for endometrioma and reproductive outcome: A critical appraisal. Fertility and Sterility, 115(4), 987–996.
11. Saunders, P. T. K., et al. (2023). Psychological impact of endometriosis and fertility challenges. Human Reproduction Update, 29(1), 55–70.
12. ESHRE Endometriosis Guideline Group. (2022). Management of women with endometriosis. European Society of Human Reproduction and Embryology Guidelines, 1–78.