

## PERSONALIZED APPROACHES TO RESTORING REPRODUCTIVE FUNCTION IN WOMEN AFTER SURGICAL TREATMENT OF OVARIAN ENDOMETRIOSIS



Agababyan Larisa Rubenovna, Shonazarova Sitora Iskandarovna  
Samarkand State Medical University, Republic of Uzbekistan, Samarkand

### ТУХУМДОНЛАР ЭНДОМЕТРИОЗИНИ ЖАРРОҲЛИК ЙЎЛИ БИЛАН ДАВОЛАШДАН КЕЙИН АЁЛЛАРДА РЕПРОДУКТИВ ФУНКЦИЯНИ ТИКЛАШГА ЁНДАШУВЛАР

Агабабян Лариса Рубеновна, Шоназарова Ситора Искандаровна  
Самарқанд Давлат тиббиёт университети, Ўзбекистон Республикаси, Самарқанд ш.

### ПЕРСОНИФИЦИРОВАННЫЕ ПОДХОДЫ К ВОССТАНОВЛЕНИЮ РЕПРОДУКТИВНОЙ ФУНКЦИИ У ЖЕНЩИН ПОСЛЕ ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ ЭНДОМЕТРИОЗА ЯИЧНИКОВ

Агабабян Лариса Рубеновна, Шоназарова Ситора Искандаровна  
Самаркандский государственный медицинский университет, Республика Узбекистан, г. Самарканд

e-mail: [sitorashonazarova3@gmail.com](mailto:sitorashonazarova3@gmail.com)

**Резюме.** Мақсад. Тухумдон эндометриози бўйича жарроҳлик даволашдан кейин репродуктив функцияни тиклашда индивидуал ёндашувларнинг самарадорлигини баҳолаш. Материал ва усуллар. Тадқиқотга 23–33 ёшдаги тухумдон эндометриози таъхиси билан лапароскопик операция ўтказилган 65 нафар аёл киритилди. Барча беморларда операциядан олдин ва 6 ой ўтгач тухумдон резервининг асосий кўрсаткичлари, жумладан антимюллер гормони (АМГ) ва антрал фолликулалар сони (АФС) баҳоланди. Операциядан кейинги даврда индивидуал реабилитация дастурлари қўлланилди. Кузатув муддати 9 ойни таъкил этди. Натижалар. Операциядан кейин АМГ кўрсаткичи 3,1 нг/мл дан 2,5 нг/мл гача, АФС эса 11,8 дан 10,1 гача камайди. Тухумдон резерви кўрсаткичларининг пасайишига қарамасдан, репродуктив салоҳият сақланиб қолди. Кузатув давомида 5 нафар беморда ҳомиладорлик қайд этилди, бу умумий беморлар сонининг 7,7 % ни таъкил этди. Хулоса. Индивидуал ёндашувга асосланган операциядан кейинги реабилитация репродуктив функцияни сақлаш ва фертил натижаларни яхшилашга ёрдам беради.

**Калим сўзлар:** тухумдон эндометриози, лапароскопия, репродуктив функция, фертилитет, АМГ, АФС, реабилитация.

**Abstract.** Purpose of the study. To evaluate the effectiveness of individualized approaches to restoring reproductive function after surgical treatment of ovarian endometriosis. Materials and methods. The study included 65 women aged 23 to 33 with ovarian endometriosis who underwent laparoscopic surgery. Before and 6 months after surgical intervention, ovarian reserve parameters were assessed, including the level of anti-Müllerian hormone (AMH) and the number of antral follicles (AFC). All patients underwent individually selected postoperative rehabilitation. The observation period was 9 months. Results. 6 months after surgery, AMH levels decreased from 3.1 to 2.5 ng/ml, and the AFC indicator decreased from 11.8 to 10.1. Despite the decrease in ovarian reserve indicators, reproductive potential was maintained. During the observation period, pregnancy occurred in 5 patients, accounting for 7.7% of the total number of examined women. Conclusion. Individualized rehabilitation following surgical treatment of ovarian endometriosis contributes to the preservation of reproductive function and the improvement of fertility.

**Keywords:** ovarian endometriosis, laparoscopy, reproductive function, fertility, AMH, AFC, rehabilitation.

**Introduction.** Endometriosis remains one of the most significant gynecological disorders affecting women of reproductive age and is diagnosed in approximately 10–15% of this population worldwide [5]. Ovarian endometriosis (endometrioma) represents one of the most common manifestations of the disease and is closely associated with chronic pelvic pain, menstrual dysfunction, diminished ovarian reserve, and infertility [1,2]. According to contemporary studies, infertility occurs in approximately 30–

50% of women with endometriosis, making preservation of reproductive potential one of the main goals of treatment [3,5].

The pathophysiological relationship between endometriosis and infertility is complex and involves chronic inflammation, oxidative stress, impaired folliculogenesis, altered ovarian microenvironment, pelvic adhesions, and implantation disorders [5,6]. In addition, ovarian endometriomas may negatively affect ovarian reserve even before surgical intervention

due to progressive fibrosis and inflammatory damage to healthy ovarian tissue [14].

Laparoscopic surgery remains the gold standard for the treatment of ovarian endometriosis, especially in women presenting with pain syndrome, infertility, or large endometriotic cysts [5,8]. Surgical excision improves pelvic anatomy and reduces disease burden; however, it may also lead to inadvertent removal of healthy ovarian cortex, thereby affecting future reproductive potential [12,14].

Recent systematic reviews and meta-analyses have demonstrated a significant postoperative decline in anti-Müllerian hormone (AMH) levels following endometrioma cystectomy, particularly in cases of bilateral lesions and repeated surgical interventions [9,14]. Although the antral follicle count (AFC) appears less sensitive to postoperative changes, both AMH and AFC are currently regarded as the most informative markers of ovarian reserve and reproductive prognosis [4,9].

The updated ESHRE guideline highlights the importance of individualized management, fertility preservation strategies, and the use of ovarian tissue-sparing surgical techniques [5]. Contemporary approaches to endometriosis treatment focus not only on eliminating disease manifestations but also on maximizing reproductive outcomes and maintaining long-term ovarian function [11].

Despite considerable advances in surgical technologies and postoperative management, the optimal strategy for restoration of reproductive function after ovarian endometriosis surgery remains controversial [13]. Clinical outcomes vary substantially depending on patient age, ovarian reserve status, disease severity, and postoperative rehabilitation protocols [4,10]. Furthermore, available data regarding postoperative fertility outcomes remain heterogeneous due to differences in patient age, disease severity, ovarian reserve status, and rehabilitation approaches [15].

Therefore, further investigation of individualized postoperative rehabilitation programs and their impact on ovarian reserve and fertility outcomes remains highly relevant.

**Aim of the Study.** To evaluate the effectiveness of individualized approaches to reproductive function restoration in women after laparoscopic surgery for ovarian endometriosis by assessing changes in ovarian reserve parameters and fertility outcomes during postoperative follow-up.

**Materials and methods.** The present prospective study included 65 women aged 23–33 years with ovarian endometriosis who underwent laparoscopic surgical treatment between 2024 and 2026. The diagnosis was established on the basis of clinical manifestations, gynecological examination, transvaginal ultrasonography, and intraoperative verification of endometriotic lesions. All patients were of reproductive age and were interested in preserving or restoring

their fertility. Surgical treatment was performed using standard laparoscopic techniques with maximal preservation of healthy ovarian tissue.

Before surgery, all participants underwent comprehensive clinical evaluation including assessment of reproductive and gynecological history, menstrual function characteristics, infertility duration, previous treatment methods, hormonal status, and ultrasound examination of the pelvic organs. Particular attention was paid to ovarian reserve assessment using serum anti-Müllerian hormone (AMH) levels and antral follicle count (AFC), which were determined before surgery and repeated six months after the intervention. The observation protocol was based on a standardized clinical assessment form that included demographic data, reproductive history, laboratory and instrumental findings, surgical characteristics, and postoperative outcomes.

Following surgery, patients received individualized rehabilitation and follow-up according to their reproductive plans, clinical characteristics, and ovarian reserve status. Reproductive outcomes were monitored throughout the observation period. The primary study endpoints included changes in AMH and AFC values after surgery as well as the occurrence of pregnancy during follow-up. The duration of observation was nine months. During this period, five spontaneous pregnancies were recorded among the study participants.

Statistical analysis was performed using standard biomedical statistical methods. Quantitative variables were presented as mean values, whereas categorical variables were expressed as absolute numbers and percentages. Comparative analysis of ovarian reserve indicators before surgery and six months after treatment was carried out to evaluate the impact of surgical intervention and individualized postoperative management on reproductive function restoration in women with ovarian endometriosis.

**Results.** A total of 65 women aged 23–33 years with laparoscopically confirmed ovarian endometriosis were included in the study. The mean follow-up period was 9 months. Evaluation of reproductive outcomes demonstrated that individualized postoperative management contributed to preservation of ovarian reserve and maintenance of reproductive potential despite the expected decline in ovarian reserve markers following surgical treatment.

Analysis of ovarian reserve indicators revealed a decrease in both serum anti-Müllerian hormone (AMH) levels and antral follicle count (AFC) six months after surgery. The mean AMH concentration decreased from 3.1 ng/mL before surgery to 2.5 ng/mL after surgery, corresponding to a 19.4% reduction. Similarly, the mean AFC declined from 11.8 to 10.1 follicles, representing a 14.4% decrease. Despite these changes, postoperative values remained within

ranges compatible with preserved reproductive function in the majority of patients (Table 1).

As shown in Table 1, both ovarian reserve indicators demonstrated a moderate decline after laparoscopic treatment. However, the magnitude of reduction was not associated with complete loss of reproductive potential, indicating successful preservation of ovarian tissue during surgery.

The dynamics of ovarian reserve markers are illustrated in Figure 1. As demonstrated in Figure 1, both AMH and AFC exhibited a similar downward trend after surgical intervention. This finding is consistent with current evidence suggesting partial reduction of ovarian reserve following endometrioma excision. Assessment of fertility outcomes during the 9-month follow-up period revealed that pregnancy occurred in 5 of 65 women, corresponding to an overall

pregnancy rate of 7.7%. Analysis according to age groups demonstrated differences in pregnancy distribution (Table 2).

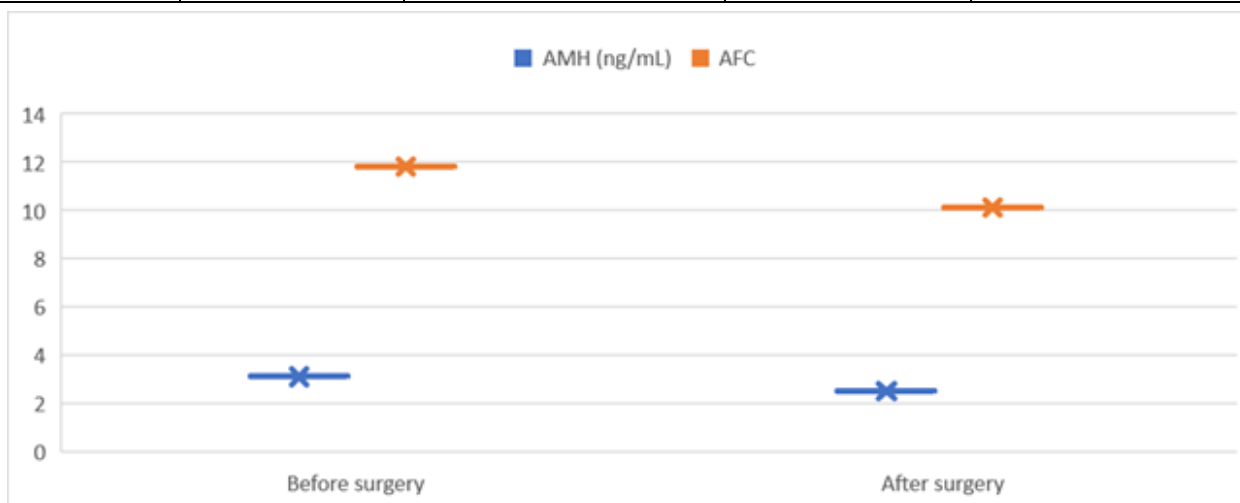
As presented in Table 2, the majority of pregnancies were observed in women aged 28–33 years (60.0%), whereas 40.0% occurred among women aged 23–27 years. Although the absolute number of pregnancies was limited, successful conception in both age groups indicates preservation of reproductive function following surgery.

For a more comprehensive evaluation of treatment outcomes, ovarian reserve preservation and reproductive success were assessed together (Table 3).

As shown in Table 3, ovarian reserve markers decreased after surgery; however, reproductive function was preserved in a substantial proportion of patients.

**Table 1.** Changes in ovarian reserve parameters before and after surgery

Parameter	Before surgery	6 months after surgery	Absolute change	Relative change (%)
AMH (ng/mL)	3.1	2.5	-0.6	-19.4
AFC	11.8	10.1	-1.7	-14.4



**Fig. 1.** Changes in AMH and AFC values before surgery and 6 months after surgery

**Table 2.** Distribution of pregnancies according to age

Age group (years)	Number of patients	Pregnancies, n	Pregnancy rate (%)
23–27	36	1-2	40.0*
28–33	29	3	60.0*
Total	65	5	7.7**

\*Percentage among all pregnancies.

\*\*Percentage among all study participants.

**Table 3.** Integrated assessment of postoperative reproductive outcomes

Outcome indicator	Value
Number of participants	65
Follow-up duration	9 months
Mean AMH before surgery (ng/mL)	3.1
Mean AMH after surgery (ng/mL)	2.5
Mean AFC before surgery	11.8
Mean AFC after surgery	10.1
Total pregnancies	5
Pregnancy rate (%)	7.7
AMH reduction (%)	19.4
AFC reduction (%)	14.4

The occurrence of pregnancies during follow-up supports the effectiveness of individualized postoperative management and fertility-oriented rehabilitation strategies.

Overall, the obtained results indicate that laparoscopic treatment of ovarian endometriosis combined with individualized postoperative follow-up allows preservation of ovarian function despite a moderate decline in ovarian reserve parameters. The observed reproductive outcomes confirm the clinical value of personalized approaches aimed at optimizing fertility after surgery.

**Discussion.** The present study evaluated reproductive outcomes and changes in ovarian reserve following laparoscopic surgery for ovarian endometriosis within an individualized postoperative management program. The findings demonstrated a moderate decline in ovarian reserve markers during the first six months after surgery, while preservation of fertility potential was observed throughout the follow-up period. Pregnancy was achieved in 7.7% of patients during the nine-month observation period, indicating that reproductive function can be maintained despite measurable postoperative changes in ovarian reserve.

The reduction in AMH and AFC observed in the current study most likely reflects the inevitable impact of surgical manipulation on ovarian tissue. During cyst excision, preservation of healthy ovarian cortex remains technically challenging because the boundary between endometriotic and normal tissue is not always clearly distinguishable. As a result, partial loss of primordial follicles may occur even when meticulous surgical techniques are applied. Nevertheless, the magnitude of decline recorded in our cohort was moderate and did not appear to compromise reproductive capacity substantially.

An important observation of the present study is that the decrease in ovarian reserve markers was not accompanied by complete loss of fertility potential. This finding suggests that postoperative reproductive prognosis cannot be determined solely on the basis of AMH or AFC values. Ovarian reserve markers reflect quantitative characteristics of the follicular pool, whereas successful conception depends on a broader range of factors including oocyte quality, tubal function, endometrial receptivity, hormonal balance, and the absence of disease recurrence. Therefore, interpretation of ovarian reserve indicators should always be performed within the context of an individualized reproductive assessment.

The achievement of pregnancy in both age groups included in the study supports the concept that fertility preservation remains possible after surgical treatment of ovarian endometriosis. Although the number of pregnancies was limited, successful conception during the relatively short follow-up period may indicate the potential benefit of structured postoperative monitoring and fertility-oriented manage-

ment. In clinical practice, the period immediately following surgery is frequently considered a window of opportunity during which restoration of normal pelvic anatomy and reduction of inflammatory activity may facilitate conception.

Another clinically relevant finding is the apparent discrepancy between the decline in biological markers and the preservation of reproductive outcomes. Such observations emphasize that postoperative management should focus not only on laboratory indicators but also on individualized fertility planning. Women with preserved ovarian reserve may benefit from expectant management, whereas patients with reduced reserve or prolonged infertility may require earlier referral for assisted reproductive technologies. Consequently, treatment decisions should be based on comprehensive reproductive evaluation rather than isolated hormonal measurements.

The results of this study highlight the importance of individualized postoperative rehabilitation strategies. A personalized approach allows clinicians to consider patient age, reproductive intentions, ovarian reserve status, and previous infertility history when selecting follow-up tactics. Such an approach may optimize the use of available reproductive resources and improve long-term fertility outcomes.

Several limitations should be acknowledged when interpreting the findings. First, the study included a relatively small number of participants from a single clinical center. Second, the duration of follow-up was limited to nine months, which may underestimate cumulative pregnancy rates. Third, additional factors potentially influencing fertility outcomes, including male-factor infertility, disease stage, and postoperative recurrence, were not analyzed separately. Future multicenter studies involving larger cohorts and longer observation periods are necessary to clarify predictors of successful reproductive outcomes after ovarian endometriosis surgery.

Despite these limitations, the study provides clinically relevant evidence regarding fertility preservation after laparoscopic treatment of ovarian endometriosis. The findings support the concept that moderate postoperative reductions in ovarian reserve markers should not automatically be interpreted as indicators of poor reproductive prognosis. Individualized postoperative management remains a key component of comprehensive care aimed at restoring reproductive function and improving fertility outcomes in women with ovarian endometriosis.

**Conclusion.** The findings of the present study demonstrate that laparoscopic surgery for ovarian endometriosis is associated with a moderate reduction in ovarian reserve markers, reflected by decreases in serum AMH levels and antral follicle count during the postoperative period. However, these changes did not preclude preservation of reproductive potential in the studied population.

The achievement of pregnancy in 7.7% of patients during the 9-month follow-up period indicates that fertility can be maintained after surgical treatment when appropriate postoperative management is implemented. The observed reproductive outcomes suggest that ovarian reserve markers alone are insufficient for predicting fertility prospects and should be interpreted within a comprehensive clinical context.

An individualized approach to postoperative rehabilitation and reproductive planning allows optimization of fertility-oriented management in women with ovarian endometriosis. Such strategies may contribute to preservation of ovarian function, improvement of reproductive outcomes, and enhancement of long-term reproductive health.

Further prospective studies involving larger patient populations and extended follow-up periods are required to identify the most effective approaches for reproductive function restoration after ovarian endometriosis surgery.

#### Literature:

1. Адамян Л.В., Андреева Е.Н., Арсланян К.Н. Современные аспекты диагностики и лечения эндометриоза // *Акушерство и гинекология*. 2022. №4. С. 5–12.
2. Ризаев Ж. А., Агабабян И. Р. Место статинов в лечении хронического пародонтита у больных атеросклерозом коронарных артерий // *Экспериментальная и клиническая гастроэнтерология*. – 2026. – №. 12. – С. 62-67.
3. Ризаев Ж. А., Агабабян И. Р. Давлатова Азиза, Ахмедова Азиза Тайировна, Расулова Феруза Голибовна // *Состояние полости рта у первобеременных*. – 2023. – Т. 4. – №. 4.
4. Ризаев Ж. А. и др. Острый миелоидный лейкоз в пакистанской больнице с ограниченными ресурсами // *Главный редактор*. – 2024. – Т. 12. – №. 3. – С. 248.
5. Ризаев Ж. А. и др. Значение коморбидных состояний в развитии хронической сердечной недостаточности у больных пожилого и старческого возраста // *Достижения науки и образования*. – 2022. – №. 1 (81). – С. 75-79.
6. Carbonell M., Dolz M., Casals G. Fertility preservation in endometriosis: review of current evidence // *Gynecological Endocrinology*. 2024. Vol. 40. No. 2. P. 101–108.
7. Chon S.J., Lee Y.J., Kim S.H. Oocyte cryopreservation for women with endometriosis // *Clinical and Experimental Reproductive Medicine*. 2024. Vol. 51. No. 4. P. 245–254.
8. Elizur S.E., Chiantera V., Soriano D. Fertility preservation for women with ovarian endometriosis // *Reproductive BioMedicine Online*. 2023. Vol. 46. No. 3. P. 521–529.
9. Grigoriadis G., Pantos K., Simopoulou M. Evidence on serum anti-Müllerian hormone levels and reproductive outcomes after endometrioma surgery // *Journal of Clinical Medicine*. 2025. Vol. 14. No. 11. Article 3772.
10. Kalaitzopoulos D.R., Nirgianakis K., Mueller M.D. Fertility preservation in women with endometriosis // *Journal of International Medical Research*. 2026. Vol. 54. No. 2.
11. La Marca A., Sunkara S.K. Fertility preservation in women with endometriosis // *Human Reproduction Open*. 2025. Vol. 2025. No. 2. Article hoaf012.
12. Li Y., Wang H., Zhang X. Impact of endometriotic cystectomy on ovarian reserve and reproductive outcomes // *Frontiers in Endocrinology*. 2025. Vol. 16. Article 1687765.
13. Pecorella G., Candiani M., Vercellini P. Endometriosis and reproductive-sparing surgery // *Journal of Clinical Medicine*. 2026. Vol. 15. No. 1. Article 380.
14. Younis J.S., Shapso N., Fleming R. The impact of ovarian endometrioma and endometriotic cystectomy on ovarian reserve: an appraisal of systematic reviews // *Frontiers in Endocrinology*. 2024. Vol. 15. Article 1397279.
15. Yu E.H., Chan C.H.Y., Ma H.K. Commentary on the new 2022 European Society of Human Reproduction and Embryology guideline for endometriosis // *Clinical and Experimental Reproductive Medicine*. 2022. Vol. 49. No. 4. P. 233–235.

#### **ПЕРСОНИФИЦИРОВАННЫЕ ПОДХОДЫ К ВОССТАНОВЛЕНИЮ РЕПРОДУКТИВНОЙ ФУНКЦИИ У ЖЕНЩИН ПОСЛЕ ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ ЭНДОМЕТРИОЗА ЯИЧНИКОВ**

*Агабабян Л.Р., Шоназарова С.И.*

**Резюме.** Цель исследования. Оценить эффективность индивидуализированных подходов к восстановлению репродуктивной функции после хирургического лечения эндометриоза яичников. Материалы и методы. В исследование включены 65 женщин в возрасте от 23 до 33 лет с эндометриозом яичников, которым была выполнена лапароскопическая операция. До хирургического вмешательства и через 6 месяцев после него оценивали показатели овариального резерва, включая уровень антимюллерова гормона (АМГ) и количество антральных фолликулов (АFC). Всем пациенткам проводилась индивидуально подобранная послеоперационная реабилитация. Период наблюдения составил 9 месяцев. Результаты. Через 6 месяцев после операции уровень АМГ снизился с 3,1 до 2,5 нг/мл, а показатель АFC уменьшился с 11,8 до 10,1. Несмотря на снижение показателей овариального резерва, репродуктивный потенциал был сохранён. В течение периода наблюдения беременность наступила у 5 пациенток, что составило 7,7 % от общего числа обследованных женщин. Заключение. Индивидуализированная реабилитация после хирургического лечения эндометриоза яичников способствует сохранению репродуктивной функции и улучшению фертильности.

**Ключевые слова:** эндометриоз яичников, лапароскопия, репродуктивная функция, фертильность, АМГ, АFC, реабилитация.