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ORIGINAL RESEARCH

Analyzing the Risk Factors for Recurrence of Endometrioma and Dysmenorrhea in Patients with Endometriosis

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Background: Recurrence of endometrioma and dysmenorrhea after surgery remains a major clinical challenge. Identifying reliable risk factors is essential to optimize individualized treatment and follow-up strategies. However, large-scale data from Chinese populations are limited.

Materials and Methods: We retrospectively analyzed 1,598 reproductive-aged women with pathologically confirmed endometriosis who underwent surgery between 2009 and 2010 and were followed for up to 7 years. Clinical, surgical, and follow-up data were collected. Kaplan–Meier survival analysis and Cox proportional hazards models were used to assess recurrence and identify independent predictors.

Results: During follow-up, 348 patients (21.8%) developed endometrioma recurrence, and 187 of 846 with baseline dysmenorrhea (22.1%) experienced recurrence. The cumulative recurrence rates were 12%, 38%, 55%, and 65% for endometrioma at 1, 3, 5, and 7 years, and 28%, 52%, 68%, and 75% for dysmenorrhea at 1, 3, 5, and 7 years. Multivariable Cox regression identified bilateral ovarian cysts (HR 1.36, 95% CI 1.06–1.74, P = 0.015), older age at surgery (HR 1.04, 95% CI 1.00–1.08, P = 0.029), lack of postoperative medical therapy (HR 2.10, 95% CI 1.28–3.46, P = 0.003), and higher postoperative VAS scores (HR 1.10, 95% CI 1.05–1.15, P < 0.001) as independent risk factors for endometrioma recurrence. For dysmenorrhea recurrence, significant predictors were a history of endometriosis (HR 2.06, 95% CI 1.19–3.57, P = 0.010), higher preoperative VAS scores (HR 1.14, 95% CI 1.02–1.28, P = 0.026), and higher postoperative VAS scores (HR 1.27, 95% CI 1.18–1.39, P < 0.001).

Conclusion: Recurrence of endometrioma and dysmenorrhea is common after surgery. Bilateral cysts, older age, lack of postoperative therapy, and higher postoperative pain scores independently increase the risk of endometrioma recurrence, while both preoperative and postoperative pain severity, as well as a history of endometriosis, are strong predictors of dysmenorrhea recurrence.

Keywords: endometriosis, dysmenorrhea, recurrence, risk factors, cox regression

Introduction

Endometriosis is an estrogen-dependent chronic disease characterized by the presence of endometrial glands and stroma outside the uterine cavity.[1] It affects approximately 6–10% of reproductive-aged women worldwide,[2] with ovarian endometrioma accounting for nearly half of all cases.[3,4] Common manifestations include dysmenorrhea, chronic pelvic pain,[5] and infertility, all of which substantially impair quality of life.[6]

Surgical removal of ovarian endometriomas remains the mainstay of treatment, particularly for women with pain or infertility.[7,8] However, recurrence after surgery is frequent. Reported recurrence rates range from 19–30% for endometrioma and up to 50% for dysmenorrhea.[9,10] Repeated surgery further increases the risk of diminished ovarian reserve. In addition, postoperative recurrence may lead to persistent symptoms, repeated medical visits, and further interventions,

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thereby imposing a substantial long-term burden on patients' quality of life and reproductive potential. Although adjuvant medical therapy such as oral contraceptives, progestins, and gonadotropin-releasing hormone agonists may reduce recurrence, their long-term efficacy is limited by side effects and poor adherence.[11,12]

Several studies have examined risk factors for recurrence, including age at surgery, revised American Fertility Society (rAFS) score,[13] and history of prior surgery.[14] However, findings have been inconsistent, partly due to small sample sizes and limited follow-up.[15,16] Moreover, recurrence of ovarian endometrioma and recurrence of dysmenorrhea do not always occur simultaneously and may reflect different aspects of disease persistence or progression. Therefore, evaluating these two outcomes separately may provide a more comprehensive understanding of postoperative prognosis. Moreover, evidence from Chinese populations remains scarce, despite potential differences in clinical patterns and management practices.[17]

To address these gaps, we conducted a large-scale, long-term follow-up study of 1598 women who underwent surgery for pathologically confirmed endometriosis at a tertiary center in China. The objective was to evaluate recurrence rates of endometrioma and dysmenorrhea and to identify independent risk factors associated with recurrence. This study represents one of the largest cohort analyses of endometriosis recurrence in China and provides valuable evidence for guiding postoperative management.

Materials and Methods

Study Population

This study retrospectively screened women of childbearing age who underwent surgery for endometriosis at the Obstetrics and Gynecology Hospital of Fudan University in Shanghai from January 2009 to December 2010. A total of 1740 patients were identified, and the diagnosis of endometriosis was confirmed by two independent pathologists.

Inclusion criteria were pathologically confirmed endometriosis and completion of at least one postoperative follow-up. Exclusion criteria included incomplete clinical data, concomitant malignancies, or loss to follow-up within 12 months. Of the 1740 patients, 1598 (91.8%) were successfully followed and included in the final analysis. During follow-up, 348 patients (21.8%) developed recurrence of endometrioma, and 187 of 846 patients (22.1%) with baseline dysmenorrhea experienced recurrence of dysmenorrhea. Follow-up was conducted via outpatient visits and standardized telephone interviews every three months during the first postoperative year and every six months thereafter. Routine transvaginal ultrasonography was performed to confirm endometrioma recurrence, and pain symptoms were systematically assessed at each visit (Figure 1).

The study was approved by the Ethics Committee of Obstetrics & Gynecology Hospital of Fudan University (No.: 2025–283). Written informed consent was obtained from all patients at the time of surgery.

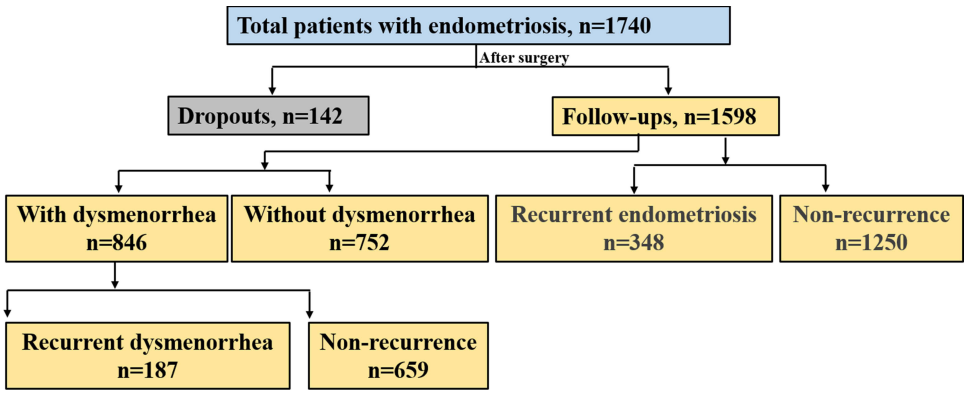

Figure 1 Study flowchart of patient selection and follow-up. A total of 1,598 patients with surgically confirmed endometriosis were enrolled. Among them, 348 developed recurrence of endometrioma during follow-up, and 846 patients had baseline dysmenorrhea, of whom 187 experienced recurrence.

Measurements

Patients were followed for a median of 58.0 months (IQR, 44.0–72.0 months). Data collected from medical records included demographic characteristics, clinical symptoms, pelvic examination findings, surgical details, postoperative medical therapy, and clinical scores, including the revised American Fertility Society (rAFS) score, Endometriosis Fertility Index (EFI), and Least Function (LF) score.

Outcomes: Endometrioma recurrence was defined as the detection of an ovarian cyst ≥3 cm with typical ultrasonographic features on at least two consecutive menstrual cycles, irrespective of pain symptoms. The recurrence interval was defined as the time from surgery to the first confirmed recurrence.[15,16] The recurrence of dysmenorrhea was defined as the case when the patient with dysmenorrhea reported at least 3 months of alleviation of pain immediately after surgery yet the pain recurred later with the severity score equal to or higher than that before the surgery. Pain intensity was assessed using a 10-point visual analog scale (VAS), with higher scores indicating more severe pain. Both preoperative and postoperative VAS were analyzed as continuous variables in Cox models. These two recurrence outcomes were predefined separately because imaging-confirmed endometrioma recurrence and pain recurrence represent different clinical dimensions of postoperative disease persistence.

Scoring systems: AFS classification was used to stage lesions. EFI score (0–10) was used to assess fertility potential. LF score was calculated as the sum of the lowest function score of each adnexal structure (fallopian tube, fimbria, ovary).

Statistical Analysis

Statistical analyses were performed using SPSS version 16.0 (SPSS Inc., New York, NY, USA). Continuous variables were expressed as median (interquartile range [IQR]) and categorical variables as number (percentage). Comparisons of continuous variables between groups were performed using the Mann–Whitney *U*-test, and categorical variables were compared using the χ^2-test or Fisher's exact test, as appropriate.

Time-to-event outcomes (endometrioma and dysmenorrhea recurrence) were analyzed using Kaplan–Meier curves with Log rank tests. Multivariable Cox proportional hazards models were applied to estimate hazard ratios (HRs) with 95% confidence intervals (CIs). Clinically relevant variables and those with $P < 0.10$ in univariable analyses were considered for inclusion. The proportional hazards assumption was verified using Schoenfeld residuals. Postoperative medical therapy was coded as a binary variable (none vs. any therapy). Preoperative and postoperative VAS scores were analyzed as continuous variables, reflecting baseline pain severity and residual pain, respectively. ΔVAS (preoperative − postoperative) was additionally explored in sensitivity analyses but not included in the primary models. A two-sided $P < 0.05$ was considered statistically significant.

Results

Baseline Characteristics

The baseline characteristics of the 1598 patients included in the analysis are summarized in Table 1. The median age at surgery was 32 years (IQR, 28–37), and the median BMI was 22.6 kg/m^2 (IQR, 21.5–24.0). A total of 846 patients (52.9%) reported preoperative dysmenorrhea.

Recurrence of Endometrioma

During a median follow-up of 58.0 months (IQR, 44.0–72.0 months), 348 patients (21.8%) developed recurrence of endometrioma. As shown in Table 2, patients with recurrence had significantly higher preoperative VAS scores, higher rAFS scores, greater intraoperative bleeding, longer operative time, and longer hospital stay compared with those without recurrence (all $P < 0.05$). Conversely, lower LF and EFI scores were observed in the recurrent group.

Bilateral ovarian involvement was more common among recurrent cases, and postoperative medical therapy was less frequently used ($P = 0.011$). Kaplan–Meier analysis showed that the cumulative recurrence rates of endometrioma at 1, 3, 5, and 7 years after surgery were 12%, 38%, 55%, and 65%, respectively (Figure 2A). The cumulative hazard function demonstrated a steeper increase after 72 months, indicating an acceleration in recurrence risk (Figure 2B).

Table 1 Baseline Characteristics of the 1,598 Patients with Endometriosis

Variable	All Patients (N = 1,598)
Age at surgery, years	32 (28–37)
BMI, kg/m^2	22.5 (21.2–24.0)
Age at menarche, years	14 (13–15)
Parity, n (%)	
0	930 (58.2)
1	520 (32.5)
≥2	148 (9.3)
Preoperative dysmenorrhea, n (%)	846 (52.9)
History of endometriosis, n (%)	71 (4.4)
History of infertility, n (%)	365 (22.8)
Preoperative VAS (0–10)	1 (0–3)
Largest ovarian cyst diameter, cm	4.2 (3.0–5.7)
Laterality of ovarian endometrioma, n (%)	
Left	533 (33.4)
Right	490 (30.7)
Bilateral	573 (35.9)
Menstrual cycle phase at surgery, n (%)	
Proliferative	719 (45.0)
Secretory	879 (55.0)
rAFS score	45 (28–60)
EFI score (0–10)	6 (5–7)
LF score	6 (5–7)

Notes: Data are presented as median (interquartile range, IQR) for continuous variables and as number (percentage) for categorical variables.

Table 2 Comparisons of Patients with and without Recurrence of Endometrioma

Variable	Nonrecurrent (n = 1,250)	Recurrent (n = 348)	P value
Age at surgery, years	32 (28–37)	31 (27–36)	0.028
BMI, kg/m^2	22.6 (21.2–24.0)	22.3 (20.9–23.7)	0.051
Age at menarche, years	14 (13–15)	14 (13–15)	0.099
Parity, n (%)			0.058
0	725 (58.0)	205 (58.9)	
≥1	525 (42.0)	143 (41.1)	
Preoperative infertility, n (%)	271 (21.7)	94 (27.0)	0.023
History of endometriosis, n (%)	11 (0.9)	60 (17.2)	<0.001
Preoperative dysmenorrhea, n (%)	628 (50.2)	218 (62.6)	<0.001
Preoperative VAS score (0–10)	1 (0–3)	2 (0–4)	<0.001
Largest ovarian cyst diameter, cm	4.1 (3.0–5.7)	4.3 (3.0–6.0)	0.015
Laterality of ovarian endometrioma, n (%)			<0.001
Left	455 (36.4)	78 (22.4)	
Right	401 (32.1)	89 (25.6)	
Bilateral	394 (31.5)	179 (51.4)	
Cyst size, n *(%)*			0.566
<5 cm	191 (15.3)	50 (14.4)	
5–10 cm	1015 (81.3)	282 (81.0)	
≥10 cm	43 (3.4)	16 (4.6)	
rAFS score	36 (20–52)	69 (28–100)	<0.001
LF score	6 (5–7)	5 (4–6)	<0.001
EFI score	6 (5–7)	5 (4–7)	<0.001
Intraoperative bleeding, mL	50 (30–100)	50 (50–100)	0.021

(*Continued*)

Table 2 (Continued).

Variable	Nonrecurrent (n = 1,250)	Recurrent (n = 348)	P value
Operative time, min	65 (50–90)	75 (55–100)	<0.001
Intraoperative adhesion, n (%)	853 (68.2)	260 (74.7)	0.011
Operation mode, n (%)			0.031
Laparoscopy	1155 (92.4)	331 (95.1)	
Laparotomy	95 (7.6)	16 (4.6)	
Days of hospitalization	6 (5–7)	7 (5–7)	0.001
Preoperative medical therapy, n (%)	36 (2.9)	146 (42.0)	<0.001
Postoperative medical therapy, n (%)	705 (56.4)	155 (44.5)	<0.001
Drug use time after operation, months	3 (0–3)	0 (0–3)	<0.001

Notes: Data are presented as median (IQR) for continuous variables and as number (percentage) for categorical variables. P values were calculated using the Mann–Whitney *U*-test for continuous variables and the χ^2-test or Fisher's exact test for categorical variables.

Recurrence of Dysmenorrhea

Among the 846 patients with preoperative dysmenorrhea, 187 (22.1%) experienced recurrence after surgery (Figure 1). As shown in Table 3, patients with recurrence had significantly higher preoperative VAS scores and rAFS scores, longer hospital stay, and were more likely to have a history of endometriosis (all P < 0.05). Postoperative medical therapy was less common among recurrent cases (P = 0.011).

The recurrence rates of dysmenorrhea at 1, 3, 5, and 7 years after surgery were 28%, 52%, 68%, and 75%, respectively (Figure 3A). The cumulative hazard of dysmenorrhea recurrence increased approximately linearly over time (Figure 3B).

Multivariable Analyses

Variables with P < 0.10 in univariable comparisons were entered into Cox proportional hazards models (Tables 4 and 5).

For endometrioma recurrence (Table 4), bilateral cysts (HR 1.36, 95% CI 1.06–1.74, P = 0.015), older age at surgery (HR 1.04, 95% CI 1.00–1.08, P = 0.029), lack of postoperative medical therapy (HR 2.10, 95% CI 1.28–3.46, P = 0.003), and higher postoperative VAS scores (HR 1.10, 95% CI 1.05–1.15, P < 0.001) were independent predictors of recurrence.

For dysmenorrhea recurrence (Table 5), a history of endometriosis (HR 2.06, 95% CI 1.19–3.57, P = 0.010), higher preoperative VAS scores (HR 1.14, 95% CI 1.02–1.28, P = 0.026), and higher postoperative VAS scores (HR 1.27, 95%

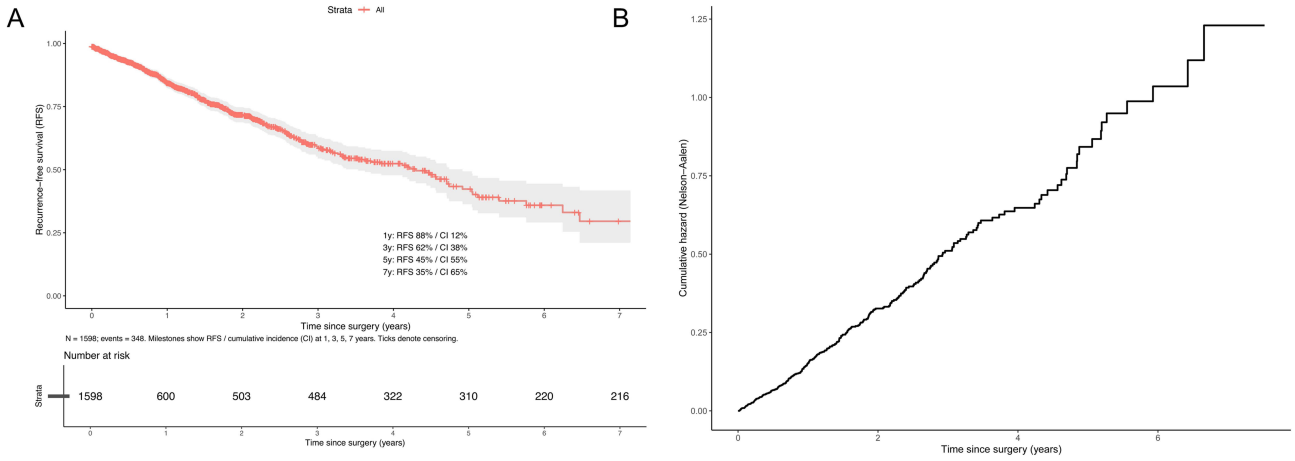

Figure 2 Kaplan–Meier curves of endometrioma recurrence. (**A**) The cumulative recurrence rates of endometrioma were 12%, 38%, 55%, and 65% at 1, 3, 5, and 7 years after surgery, respectively. (**B**) The estimated cumulative hazard function for endometrioma recurrence increased gradually over time, with a more pronounced rise after approximately 72 months postoperatively.

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Table 3 Baseline Characteristics of Patients with and without Recurrence of Dysmenorrhea

Variable	Nonrecurrent (n = 659)	Recurrent (n = 187)	P value
Age at surgery, years	32 (28–37)	31 (27–36)	0.210
BMI, kg/m^2	22.7 (21.5–24.0)	22.5 (21.2–23.8)	0.267
Age at menarche, years	14 (13–15)	14 (13–15)	0.574
Parity, n (%)			0.182
0	402 (61.0)	121 (64.7)	
≥1	257 (39.0)	66 (35.3)	
Preoperative infertility, n (%)	157 (23.8)	45 (24.1)	0.508
History of endometriosis, n (%)	17 (2.6)	19 (10.2)	<0.001
Preoperative dysmenorrhea, n (%)	27 (4.1)	10 (5.3)	0.289
Preoperative VAS score	3.4 (3.0–3.6)	4.1 (3.7–4.4)	<0.001
Largest ovarian cyst diameter, cm	3.8 (3.5–4.5)	4.0 (3.7–4.5)	0.097
Laterality of ovarian endometrioma, n (%)			0.066
Left	202 (30.7)	53 (28.3)	
Right	201 (30.5)	43 (23.0)	
Bilateral	255 (38.7)	90 (48.1)	
Cyst size, n (%)			0.705
<5 cm	81 (12.3)	26 (13.9)	
5–10 cm	549 (83.3)	151 (80.7)	
≥10 cm	29 (4.4)	10 (5.3)	
rAFS score	45 (28–52)	55 (50–60)	<0.001
LF score	5.5 (5.3–5.6)	5.6 (5.3–5.8)	0.653
EFI score	5.8 (5.6–5.9)	5.5 (5.3–5.8)	0.129
Intraoperative bleeding, mL	50 (30–100)	55 (40–110)	0.606
Operative time, min	65 (50–90)	70 (55–95)	0.289
Intraoperative adhesion, n (%)	549 (83.3)	151 (80.7)	0.705
Operation mode, n (%)			0.522
Laparoscopy	179 (27.2)	51 (27.3)	
Laparotomy	480 (72.8)	136 (72.7)	
Days of hospitalization	6 (5–7)	7 (6–7)	0.045
Preoperative medical therapy, n (%)	37 (5.6)	31 (16.6)	<0.001
Postoperative medical therapy, n (%)	399 (60.5)	95 (50.8)	0.011
Duration of postoperative therapy, months	3 (0–3)	2 (0–3)	0.468

Notes: Data are presented as median (IQR) for continuous variables and as number (percentage) for categorical variables. P values were calculated using the Mann–Whitney *U*-test for continuous variables and the χ^2-test or Fisher's exact test for categorical variables.

CI 1.18–1.39, P < 0.001) were independent risk factors, suggesting that both baseline pain severity and persistent postoperative pain are associated with recurrence and may serve as clinical markers of persistent disease activity.

Discussion

Despite advances in surgical approaches such as laparoscopy and laparotomy, recurrence of endometriosis-related symptoms remains a major clinical challenge.[18,19] Identifying risk factors for recurrence is crucial to guide individualized management and long-term follow-up strategies.[15,20] Previous studies outside of China have reported heterogeneous recurrence rates, ranging from 8–30% within 3 years after surgery, with risk factors including disease stage, age at surgery and prior surgical history.[21,22] However, most of these studies were limited by relatively small sample sizes and shorter follow-up durations.

Our study, based on a large cohort of 1,598 patients with a median follow-up of nearly 5 years, provides one of the most comprehensive datasets in China.[16,23,24] We observed cumulative recurrence rates of endometrioma at 1, 3, 5, and 7 years of 12%, 38%, 55%, and 65%, respectively, which are comparable to those reported in previous studies. Similarly,

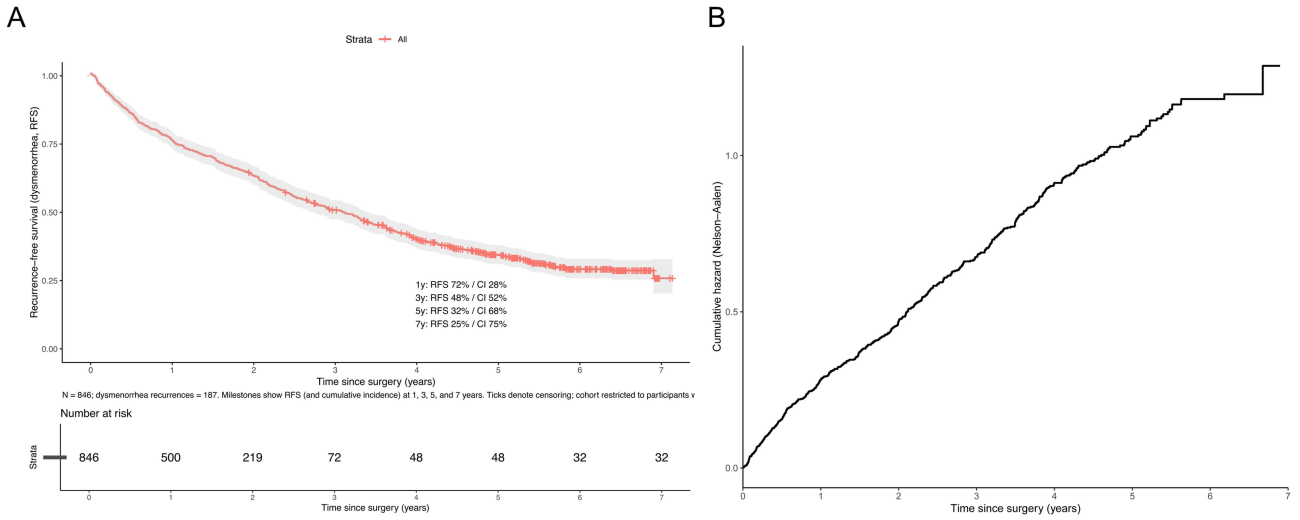

Figure 3 Kaplan–Meier curves of dysmenorrhea recurrence. (**A**) The cumulative recurrence rates of dysmenorrhea were 28%, 52%, 68%, and 75% at 1, 3, 5, and 7 years after surgery, respectively. (**B**) The cumulative hazard function for dysmenorrhea recurrence increased almost linearly over time, suggesting a relatively constant hazard rate throughout the follow-up.

recurrence rates of dysmenorrhea reached 28%, 52%, 68%, and 75% at 1, 3, 5, and 7 years, respectively. These findings highlight the need for continued long-term follow-up to better understand recurrence patterns in different populations.

In multivariable analysis, bilateral ovarian involvement, older age at surgery, lack of postoperative medical therapy, and higher postoperative VAS scores were independent predictors of endometrioma recurrence. The association between age and recurrence has been reported previously; women aged >30 years were found to have an increased risk compared with younger women.[19] Our findings are consistent, suggesting that age at surgery may influence recurrence risk. It should be noted that while univariable analysis suggested younger patients tended to recur more frequently, multivariable Cox regression identified older age as an independent predictor. This discrepancy highlights the importance of adjusting for confounding factors and warrants

Table 4 Multivariable Cox Regression for Risk of Endometrioma Recurrence (Primary Model)

Variable	Hazard Ratio (95% CI)	P value
Bilateral cyst (yes vs unilateral)	1.357 (1.060–1.737)	0.015
Age at surgery (per year)	1.040 (1.004–1.077)	0.029
Postoperative medical therapy (No vs Any)	2.103 (1.279–3.457)	0.003
Postoperative VAS (per 1-point increase)	1.100 (1.053–1.151)	< 0.001

Notes: Hazard ratios (HRs) with 95% confidence intervals (CIs) are shown. Variables included in the model were selected based on clinical relevance and univariable analysis (P < 0.10).

Table 5 Multivariable Cox Regression for Risk of Dysmenorrhea Recurrence (Primary Model)

Variable	Hazard Ratio (95% CI)	P value
Endometriosis history (Yes vs No)	2.06 (1.19–3.57)	0.010
Preoperative VAS (per 1-point increase)	1.14 (1.02–1.28)	0.026
Postoperative VAS (per 1-point increase)	1.27 (1.18–1.39)	< 0.001

Notes: Hazard ratios (HRs) with 95% CIs are shown. Variables included in the model were selected based on clinical relevance and univariable analysis (P < 0.10).

cautious interpretation. This reversal in direction may reflect the influence of confounding factors correlated with age, such as reproductive history, disease severity, or postoperative management, which were accounted for in the multivariable model.

The role of postoperative medical therapy remains debated. Several randomized controlled trials have demonstrated that long-term use of oral contraceptives or progestins after surgery significantly reduces recurrence,[25,26] while other studies found no clear benefit.[2] In our cohort, lack of postoperative therapy doubled the risk of recurrence, supporting the integration of adjuvant pharmacotherapy into long-term management strategies.

Notably, postoperative pain scores (VAS) were positively associated with recurrence risk. This finding suggests that persistent or worsening pain after surgery may indicate residual disease or ongoing pathological activity, which predisposes patients to recurrence. Clinically, this highlights the importance of adequate postoperative pain control not only for improving quality of life but also as a potential marker for recurrence surveillance. Sensitivity analysis of ΔVAS (preoperative – postoperative change) showed no independent association with recurrence, further indicating that absolute postoperative pain levels, rather than pain improvement alone, may better reflect recurrence risk.

For dysmenorrhea recurrence, independent predictors included a history of endometriosis, higher preoperative VAS scores, and higher postoperative VAS scores. These findings suggest that both baseline pain severity and persistent postoperative pain are strong prognostic indicators. Previous reports also support the role of severe preoperative pain in predicting recurrence risk.[19,27] Taken together, our data emphasize that pain trajectories before and after surgery deserve greater attention in clinical follow-up.

This study has several strengths, including its large sample size, long-term follow-up, and comprehensive evaluation of both clinical and surgical variables. To our knowledge, this is the first large-scale study in China to analyze recurrence of both endometrioma and dysmenorrhea with up to 7 years of follow-up.

Nevertheless, several limitations should be noted. First, the retrospective design introduces potential selection bias and limits causal inference. Second, heterogeneity in postoperative medical regimens (types, duration, adherence) could not be fully standardized. Third, pain assessment relied on VAS scores, which are subjective and may vary with cultural or personal perception. Moreover, postoperative VAS was assessed at fixed follow-up intervals, which may not capture dynamic changes in pain perception over time. Finally, this study was conducted at a single tertiary center, and findings may not be generalizable to broader populations.

In summary, our findings highlight the importance of identifying high-risk patients—those with bilateral ovarian involvement, older age at surgery, prior endometriosis history, and persistent pain after surgery—for closer surveillance and individualized treatment. Long-term follow-up and appropriate postoperative medical therapy should be considered essential components of management to reduce recurrence and improve patient outcomes.

Conclusion

In summary, recurrence of endometrioma and dysmenorrhea after surgery remains high in Chinese women. Independent risk factors include bilateral ovarian involvement, older age at surgery, lack of postoperative medical therapy, and both higher preoperative and postoperative pain scores. These findings emphasize the need for long-term follow-up, optimized surgical strategies, and sustained adjuvant pharmacological therapy to reduce recurrence and improve patients' quality of life.

Data Sharing Statement

The data used to support the findings of this study are included within the article.

Ethics Statement

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee of Obstetrics & Gynecology Hospital of Fudan University (No.: 2025-283) and informed consent was provided by all participants.

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Disclosure

The authors have no conflicts of interest to declare in this work.

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