

Pain Relief, Gastrointestinal Function, and Recurrence After Conservative versus Radical (Segmental Resection) Surgery for Bowel Endometriosis: A Prospective Cohort Study

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Background: Surgery represents a primary treatment option in selected cases of bowel endometriosis (BE), particularly in patients with significant symptoms or those unresponsive to medical therapy, and effectively improves patients' quality of life (QoL).

Objective: This study compared postoperative clinical outcomes between conservative (shaving/disc excision) and radical (segmental resection) surgical approaches for bowel endometriosis, and provided supplementary real-world evidence.

Design: This prospective cohort study enrolled patients who underwent surgery for bowel endometriosis between February 2023 and September 2023.

Settings: A university-affiliated hospital.

Patients: A total of 33 patients were initially recruited; 2 patients were lost to follow-up, and 31 patients were finally included for analysis.

Interventions: Patients underwent bowel lesion shaving, disc excision or segmental resection and anastomosis, with surgical strategies individualized according to disease conditions.

Main Outcome: Postoperative outcomes included complication rates, improvement in clinical symptoms, recovery of gastrointestinal function, and postoperative recurrence rate.

Measures: Patients were followed up at 6, 12, 18, and 24 months post-surgery. Gastrointestinal function was evaluated using the Gastrointestinal Quality of Life Index (GIQLI).

Results: Consistent with previous evidence, both conservative and radical surgery yielded significant and comparable improvements in pelvic symptoms and QoL, with stable effects during the 2-year follow-up (all $P > 0.05$). Low complication and recurrence rates were observed in both groups.

Conclusions: Both surgical strategies achieve favorable clinical benefits for bowel endometriosis. No obvious intergroup superiority was confirmed, and surgical selection should be individualized based on lesion characteristics.

Keywords: bowel endometriosis, conservative surgery, radical surgery, clinical outcomes

Introduction

Endometriosis is defined by the presence of endometrial glands and stroma outside the uterine cavity, which elicits a chronic inflammatory response.¹ Its prevalence varies considerably, affecting approximately 10% to 15% of women of reproductive age across all ethnicities and socioeconomic groups, and it significantly impairs quality of life.² Common clinical manifestations include dysmenorrhea, chronic pelvic pain, and infertility.³ Deep endometriosis (DE) represents a distinct subtype of the disease, characterized by subperitoneal infiltration that can involve anatomical structures such as

the uterosacral ligaments, vagina, bowel, bladder, or ureter.⁴ When DE affects the colorectal (referred to as bowel endometriosis), patients frequently present with symptoms including intermittent diarrhea, constipation, tenesmus, dyschezia, painful defecation, and occasionally intestinal obstruction.⁵ Studies have demonstrated that the severity of these symptoms correlates with the depth and size of the endometriotic lesions.⁶

Surgery represents a primary treatment option in selected cases of bowel endometriosis, particularly in patients with significant symptoms or those unresponsive to medical therapy. Studies confirm that surgery plays a pivotal role in improving the quality of life (QoL) of women with bowel endometriosis who have previously been unresponsive to medical therapy.^{7,8} Surgical approaches for bowel endometriosis can be categorized as conservative or radical: conservative approaches involve nodule excision, typically via shaving or disc excision (with or without bowel opening); radical approaches, by contrast, usually consist of segmental resection—where the affected bowel segment is removed, followed by colorectal anastomosis.⁹ The selection of either approach depends on lesion-specific characteristics, including depth of intestinal invasion, size, multifocality, and patient's willingness.¹⁰ These two surgical strategies are hypothesized to differ with respect to postoperative complication rates,⁶ functional outcomes,¹¹ and long-term recurrence risks.^{12,13} A key RCT published by Roman et al¹⁴ compared conservative and radical bowel surgery for deep endometriosis. However, real-world data from Chinese cohorts remain limited. The present study further supplements this evidence based on our prospective cohort. Given these considerations, the present study aimed to compare bowel function and improvement in clinical symptoms between segmental resection and conservative surgical techniques among women diagnosed with bowel endometriosis.

Materials and Methods

We conducted a prospective observational cohort study to compare clinical outcomes between conservative rectal surgery and segmental resection in the treatment of bowel endometriosis. Eligible participants are women of childbearing age under 45 years old who have been diagnosed with deep endometriosis infiltrating the colorectal region, with lesions longer than 15 millimeters and involving at least the muscular layer, and who have shown poor response to drug treatment or are no longer willing to continue taking medication. The patients underwent colonoscopy preoperatively to assess the status of intestinal involvement and assist in the selection of surgical approach. Ultimately, the depth of invasion was confirmed by pathology. The required sample size was determined a priori using G*Power 3.1 for comparing two proportions. The analysis indicated that 28 participants (14 in each group) were needed to achieve adequate statistical power.

The surgical approach—either nodule excision (conservative) or segmental resection (radical)—was determined based on lesion depth and circumferential involvement. Specifically, shaving was performed for lesions with superficial muscular infiltration affecting < 50% of the bowel circumference; disc excision was used for lesions with submucosa or mucosa infiltration involving < 50% of the circumference; and segmental resection was reserved for lesions with submucosa or mucosa infiltration affecting ≥ 50% of the circumference. All procedures were performed by an experienced gynecological surgeon in collaboration with a specialized colorectal surgeon.

According to the study protocol, patients underwent follow-up assessments at 6, 12, 18, and 24 months post-surgery. Gastrointestinal function was evaluated using the same questionnaire as that administered preoperatively. The primary endpoints included pain intensity—specifically dysmenorrhea, chronic pelvic pain, and deep dyspareunia—measured via the Visual Analog Scale (VAS), as well as dyschezia. The Gastrointestinal Quality of Life Index (GIQLI)⁹ was used as a secondary endpoint.

The study was conducted in strict accordance with the ethical principles outlined in the Declaration of Helsinki. Prior to enrollment in the study, informed consent was obtained from all participants. Additionally, the study protocol was reviewed and approved by the Ethics Committee of the Obstetrics and Gynecology Hospital, Fudan University (Approval No.: 2023–169).

Statistical Analysis

Statistical analyses were performed using SPSS software (version 26.0). Categorical variables are presented as counts and percentages, while continuous variables are summarized as mean ± standard deviation (SD). For group comparisons,

Student's *t*-test was used for normally distributed continuous variables, and the Chi-square test for categorical variables. The Mann–Whitney *U*-test was applied to continuous data with non-normal distribution. A *P*-value < 0.05 was considered statistically significant.

Results

From February 2023 to September 2023, a total of 33 patients with bowel endometriosis were recruited at the Obstetrics and Gynecology Hospital, Fudan University, all of whom underwent surgical treatment. Of these, 19 patients received conservative surgery, and 14 underwent radical surgery. Follow-up assessments were conducted every six months over the subsequent two years, with the final follow-up completed in September 2025. In the conservative surgery group, two patients were lost to follow-up. Thus, the final analysis included 17 patients in the conservative surgery group and 14 in the radical surgery group. The study flow diagram is shown in Figure 1.

Table 1 summarizes the baseline characteristics of patients in each group. The mean age of patients at the time of surgery ranged from 36 to 37 years. No significant differences were observed in age or body mass index (BMI) between the two surgical groups ($P = 0.794$ and $P = 0.847$, respectively). The proportion of patients with a history of prior endometriosis-related surgery was comparable between the groups ($P = 0.535$). Preoperative serum CA-125 levels also did not differ significantly between the two groups ($P = 0.132$). The incidence of adenomyosis was higher in the radical surgery group than in the conservative surgery group (86% vs. 65%); however, this difference did not reach statistical significance ($P = 0.407$). The prevalence of concomitant endometriomas—whether unilateral or bilateral—was similar in both groups (all $P > 0.05$). Additionally, no significant differences were noted in the severity of dysmenorrhea, deep dyspareunia, or chronic pelvic pain between the two groups (all $P > 0.05$). None of the patients reported dysuria, and the incidence of dyschezia was also comparable between the groups ($P = 0.537$).

Table 2 presents the intraoperative findings and additional surgical procedures. In the conservative surgery group, 10 patients underwent shaving surgery, while 7 patients were treated with the Rouen technique (disc excision). In the radical surgery group, 14 patients received segmental resection. Compared with the conservative surgery group, the radical

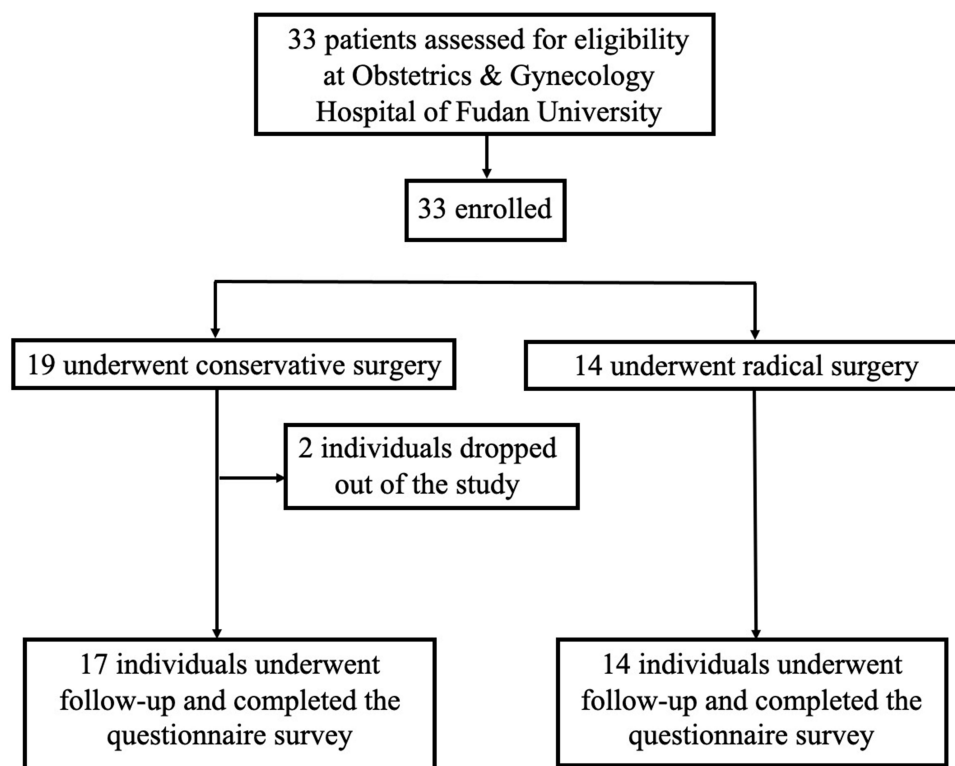


Figure 1 Flowchart for the Study of Surgical Excision in Bowel Endometriosis Patients.

Table 1 Baseline Characteristics of the Study Population (n=31)

Items	Conservative	Radical	P-value
Age, Mean $\pm$ SD	36.76 $\pm$ 6.16	36.21 $\pm$ 5.45	0.794
BMI, Mean $\pm$ SD	22.28 $\pm$ 3.46	22.52 $\pm$ 3.33	0.847
Previous surgery for endometriosis	6/17(0.35)	4/14(0.29)	0.535
CA125 level	97.27 $\pm$ 118.80	48.80 $\pm$ 26.91	0.132
Coexisting adenomyosis	11/17(0.65)	12/14(0.86)	0.407
Coexisting endometriomas	13/17(0.76)	11/14(0.79)	0.588
Unilateral	7/17(0.41)	5/14(0.36)	0.556
Bilateral	6/17(0.35)	6/14(0.43)	0.521
Dysmenorrhea	5.88 $\pm$ 2.93	6.79 $\pm$ 1.81	0.303
Deep dyspareunia	1.71 $\pm$ 1.96	1.07 $\pm$ 1.82	0.358
Dysuria	/	/	/
Dyschezia	5/17(0.29)	5/14(0.36)	0.537
Chronic pelvic pain	1.12 $\pm$ 2.47	0.43 $\pm$ 1.09	0.312

Note: Data are presented as mean $\pm$ standard deviation (SD) or number (proportion).

Abbreviations: BMI, body mass index; CA125, cancer antigen 125; /, indicates no available data.

Table 2 Intraoperative Findings and Surgical Procedures (n=31)

Items	Conservative	Radical	P-value
<i>Findings</i>			
Operative time, Mean $\pm$ SD	155.76 $\pm$ 59.83	226.86 $\pm$ 17.29	0.004*
Length of hospital stay, Mean $\pm$ SD	7.18 $\pm$ 2.67	10.50 $\pm$ 2.03	0.000*
Intraoperative blood loss, Mean $\pm$ SD	181.18 $\pm$ 151.12	203.57 $\pm$ 135.11	0.667
rAFS	68.06 $\pm$ 32.79	84.28 $\pm$ 37.97	0.219
Endometriosis ASRM stage			
III	4/17(0.24)	1/14(0.07)	0.292
IV	13/17(0.76)	13/14(0.93)	0.461
Depth of infiltration			
Muscularis	9/17(0.53)	0/14(0.00)	0.016*
Submucosa	6/17(0.35)	3/14(0.21)	0.707
Mucosa	2/17(0.12)	11/14(0.79)	0.021*
Size of the nodule (mm), Mean $\pm$ SD	26.47 $\pm$ 11.01	47.14 $\pm$ 12.04	0.000*
Douglas pouch complete obliteration	10/17(0.59)	11/14(0.79)	0.778
<i>Procedures</i>			
Excision of endometriomas	13/17(0.76)	11/14(0.79)	0.588
Total hysterectomy	4/17(0.24)	2/14(0.14)	0.472
Ureterolysis	6/17(0.35)	8/14(0.57)	0.530
Double-J stent insertion	0/17(0.00)	1/14(0.07)	0.469
Resection of bladder nodule	/	/	/
Temporary stoma	/	/	/

Notes: Data are presented as mean $\pm$ standard deviation (SD) or number (proportion). *P<0.05 indicates statistical significance; /, indicates no available data.

Abbreviations: rAFS, revised American Fertility Society score; ASRM, American Society for Reproductive Medicine.

surgery group had significantly longer operative time and hospital stay ($P = 0.004$ and $P < 0.001$, respectively). No significant difference in intraoperative blood loss was observed between the two surgical approaches ($P = 0.667$).

No significant difference in revised American Fertility Society (rAFS) scores was observed between the two groups ($P = 0.219$). Regarding the American Society for Reproductive Medicine (ASRM) endometriosis staging: in the conservative surgery group, four cases were staged III and 13 cases were staged IV; in the radical surgery group, one

case was staged III and 13 cases were staged IV. This indicated no significant difference in staging distribution between the groups (all $P > 0.05$).

For the final pathologically confirmed invasion depth: the conservative surgery group was predominantly characterized by muscular layer invasion, while the radical surgery group primarily showed mucosal layer invasion ($P = 0.016$ and $P = 0.021$, respectively). No difference was found in the distribution of submucosal invasion between the groups ($P = 0.707$). A significant difference in lesion size was observed between the groups: the mean lesion size was 47.14 mm in the radical surgery group, compared with 26.47 mm in the conservative surgery group ($P < 0.001$). Complete obliteration of the Douglas pouch was present in 10 cases of the conservative surgery group and 11 cases of the radical surgery group, indicating comparable rates between the groups ($P = 0.778$).

Intraoperatively, endometrioma excision was performed in 13 patients in the conservative surgery group and 11 patients in the radical surgery group. Concurrent total hysterectomy was conducted in 4 patients of the conservative surgery group and 2 patients of the radical surgery group. Ureterolysis was performed in 6 patients in the conservative surgery group and 8 patients in the radical surgery group, with no significant difference in the rate of this procedure between the two groups ($P = 0.530$). Regarding intraoperative double-J stent placement: a double-J stent was inserted in 1 patient in the radical surgery group, while no patients in the conservative surgery group underwent stenting.

Table 3 presents the short-term and long-term postoperative complications. No significant differences were observed between the two groups in the incidence of postoperative fever, the degree of postoperative hemoglobin reduction, or the rate of perioperative blood transfusion (all $P > 0.05$). The incidence of the following complications was zero in both groups: urinary tract infection, acute rectal bleeding, ureteral fistula, ureteral stenosis, pelvic abscess, and intestinal obstruction. Postoperatively, a rectovaginal fistula occurred in only 1 patient in the radical surgery group. Regarding persistent severe constipation after surgery: 3 patients in the conservative surgery group continued to experience this symptom, compared with 2 patients in the radical surgery group ($P = 0.610$).

Table 4 and Table 5 present postoperative symptomatic improvement, GIQLI scores, and the recurrence of pain and lesions during follow-up. Both the conservative surgery group and the radical surgery group showed significant postoperative improvement in dysmenorrhea, deep dyspareunia, and chronic pelvic pain; there was no statistically significant difference in the degree of improvement between the two groups (all $P > 0.05$). GIQLI scores were comparable between the two groups ($P = 0.137$). Regarding dyschezia: preoperatively, 5 patients in the conservative surgery group had this symptom, and 2 of these patients achieved significant improvement postoperatively. In the radical surgery group, 5 patients had preoperative dyschezia, with 3 showing significant improvement after surgery. There was no significant difference in the improvement rate of dyschezia between the two groups ($P = 0.573$).

The mean duration of postoperative follow-up did not differ significantly between the two groups ($P = 0.517$). In terms of recurrence: 2 patients in the conservative surgery group experienced recurrence of clinical symptoms. One

Table 3 Postoperative Complications (According to Clavien–Dindo Grading System for Surgical Complications)

Items	Conservative	Radical	P-value
Fever	9/17(0.53)	12/14(0.86)	0.195
Anemia (loss of ≥ 3 g/dl Hb)	0/17 (0.00)	1/14(0.07)	0.469
Blood transfusion	2/17(0.12)	1/14(0.07)	0.630
Urinary infection	/	/	/
Acute rectal bleeding	/	/	/
Ureteral fistula	/	/	/
Ureteral stenosis	/	/	/
Pelvic abscess	/	/	/
Intestinal sub-occlusion/occlusion	/	/	/
Recto-vaginal fistula	0/17(0.00)	1/14(0.07)	0.469
Severe constipation	3/17(0.18)	2/14(0.14)	0.610

Notes: Data are presented as number (proportion). /, indicates no available data.

Abbreviation: Hb, hemoglobin.

Table 4 Symptoms Improvement After Surgery

Items	Conservative	Radical	P-value
Dysmenorrhea	15/17(0.94)	14/14(1.00)	0.833
Deep dyspareunia	7/8(0.94)	4/4(1.00)	0.611
Dyschezia	2/5(0.40)	3/5(0.60)	0.573
Dysuria	/	/	/
Chronic pelvic pain	6/7(0.94)	2/2(1.00)	0.665
GIQLI	118.47±11.77	112.08±9.81	0.137

Notes: Data are presented as number (proportion) or mean ± standard deviation (SD). /, indicates no available data.

Abbreviation: GIQLI, Gastrointestinal Quality of Life Index.

Table 5 Postoperative Recurrence Rate During Follow-Up

Items	Conservative	Radical	P-value
Follow-up months, Mean ± SD	26.35 ± 2.09	26.79 ± 1.58	0.517
Clinical recurrence of pain	2/17(0.12)	0/14(0.00)	0.496
Surgical recurrence	/	/	/
Pelvic	/	/	/
Intestinal	/	/	/

Notes: Data are presented as mean ± standard deviation (SD) or number (proportion); /, indicates no available data.

patient showed no significant improvement in dysmenorrhea, deep dyspareunia, or chronic pelvic pain. Another patient in this group had a preoperative dysmenorrhea Visual Analog Scale (VAS) score of 7, which decreased to 5 postoperatively. By contrast, the radical surgery group had a 0% recurrence rate, with no recurrence of either clinical symptoms or lesions observed.

Discussion

This study focused on comparing clinical outcomes between conservative surgery and radical surgery for bowel endometriosis. Through a prospective design and 2-year follow-up, the results demonstrated the following: while radical surgery was associated with significantly longer operative duration and hospital stay compared to conservative surgery ($P = 0.004$ and $P < 0.001$, respectively), no significant differences were observed between the two groups in terms of postoperative complication incidence, long-term functional outcomes, clinical symptom improvement, or recurrence rate (all $P > 0.05$). For patients with symptomatic bowel endometriosis, significant surgical benefits were evident from 6 months postoperatively, and these benefits remained stable over the subsequent 2-year follow-up period. Based on the above findings, both conservative rectal surgery and radical rectal surgery can be recommended as effective treatment options for alleviating pain and digestive symptoms associated with bowel endometriosis.

Consistent with previous reports,^{15–18} the findings of our study revealed that patients in both the conservative surgery group and the radical surgery group achieved significant improvement in dysmenorrhea, deep dyspareunia, and chronic pelvic pain postoperatively, with a symptom relief rate of over 94%. The degree of improvement was comparable between the two groups (all $P > 0.05$) and remained stable over the 2-year follow-up period. Accumulating evidence has confirmed that laparoscopic surgery for bowel-infiltrating deep endometriosis yields durable pain relief and comprehensive improvements in daily activity and sexual well-being.¹⁹ It is important to emphasize that these favorable outcomes are not entirely attributed to the resection of rectal lesions; they are also associated with the excision of endometriomas, the management of adenomyosis, and the complete resection of pelvic lesions.²⁰ To achieve favorable outcomes, it is essential to resect lesions in other affected sites while removing intestinal lesions.

However, the improvement in dyschezia was suboptimal in both groups. Preoperatively, 5 patients in the conservative surgery group and 5 patients in the radical surgery group reported dyschezia; postoperatively, only 2 patients in the conservative surgery group achieved improvement in dyschezia, compared with 3 patients in the radical surgery group.

Our findings are consistent with previous reports, which indicate that complete resection of large deep endometriotic lesions invading the rectum does not guarantee the relief of digestive symptoms.^{21–24} This may be attributed to the fact that endometriotic lesions rarely remain confined to the digestive tract alone; instead, they often infiltrate the vagina, uterosacral ligaments, and parametrial tissues simultaneously. When visceral nerves are involved, there is a risk of nerve injury during surgery, which inevitably leads to impaired rectal function (despite the anatomical integrity of the rectum being preserved). Additionally, issues such as dysuria, vaginal dryness, and sensory loss may also occur.²⁵ Similarly, postoperative bladder dysuria may result from either visceral nerve injury caused by surgery or endometriosis itself. Furthermore, patients' digestive symptoms are influenced by multiple factors, such as dietary habits, mental stress, and other pre-existing digestive system diseases.²⁶ Consistent with other reports in the literature,¹⁵ the postoperative GIQLI scores were comparable between the conservative surgery group and the radical surgery group ($P > 0.05$). Compared with preoperative scores, the mean postoperative GIQLI score increased by nearly 30%, and this improvement persisted from 6 months to 2 years postoperatively, with no further improvement or deterioration observed during this period. Prospective longitudinal studies further demonstrated continuous improvement in lower gastrointestinal function and bowel-related quality of life following standardized laparoscopic resection for deep endometriosis.²⁷

The temporary stoma rate reported in our study was 0%, which is directly related to the proximity of the rectal and vaginal suture sites and associated with an increased risk of rectovaginal fistula.²⁸ We documented 1 case of rectovaginal fistula occurring after radical surgery; this may be associated with the patient's lower anastomotic site and concurrent vaginal resection. The rectovaginal fistula developed 1 week postoperatively and healed 1 month later following drainage and anti-inflammatory treatment. In the radical surgery group, 1 patient underwent intraoperative ureteral stent placement: this patient had a large volume of bowel endometriosis involving the right ureter, so prophylactic stent placement was performed during surgery. The ureteral stent was removed 1 month postoperatively, and computed tomography urography (CTU) showed no urinary obstruction. According to previous reports,^{15,16,29} the postoperative recurrence rate of bowel endometriosis ranges from 1.8% to 6.5% (based on imaging findings and clinical symptoms). In our study, the symptomatic recurrence rate within 2 years was 6.8% in the conservative surgery group, and no recurrence of endometriotic lesions was observed. These results indicate that surgical resection of rectal endometriotic lesions is an effective treatment, providing favorable long-term symptom relief. In this study, both patients with symptomatic recurrence were in the conservative surgery group, and no recurrence was observed in the radical surgery group; however, the difference in recurrence rates between the two groups was not statistically significant. In the literature, the main argument supporting radical surgery for the treatment of rectal endometriotic lesions is the relatively high recurrence rate following conservative surgery.¹² Among the 2 recurrent patients, both had adenomyosis and endometriosis, which may be risk factors for symptomatic recurrence. Previous reports also indicate that adenomyosis may be a potential factor affecting the improvement of postoperative symptoms in patients with DE.⁸

Surgery for bowel endometriosis can be challenging, and postoperative Clavien-Dindo Grade 3 complications³⁰ may affect up to 27% of patients.¹⁴ However, it is important to emphasize that postoperative complications have no negative impact on 1-year outcomes³¹ or postoperative pregnancy rates.^{32,33} Therefore, concerns about postoperative complications should not outweigh the expected benefits in terms of pelvic pain relief, quality of life improvement, and fertility enhancement. Beyond symptomatic relief, surgical intervention for deep endometriosis also ameliorates psychological distress and overall mental health, together with optimizing postoperative metabolic status.³⁴ Roman et al reported that after evaluating a cohort of 55 patients with a postoperative follow-up duration ranging from 4 to 6 years, the pregnancy rate was as high as 81%, with most pregnancies occurring spontaneously.³³ These results indicate that surgical treatment for bowel endometriosis can achieve clinical improvement and enable conception, and thus can be safely recommended for young women with fertility needs.

Our study has several limitations. First, the small sample size may reduce statistical power, which might overlook subtle intergroup differences and potential clinical trends in recurrence. Second, the limited follow-up period restricts long-term recurrence comparisons between the two surgical approaches. Third, this non-randomized single-center cohort presented obvious baseline imbalance in lesion size and bowel invasion depth, with no statistical adjustment for these disparities. In addition, the non-randomized design carries potential confounding factors and limits generalizability.

Nevertheless, our prospective design ensures high-quality data, and all operations were performed by the same surgeon to minimize technical variability and bias.

In conclusion, consistent with previous reports, both conservative and radical surgery alleviate pelvic symptoms and improve quality of life, with acceptable complication and recurrence rates and sustained symptom relief during follow-up. Given the small sample size, non-randomized design, baseline disparities and limited follow-up, no procedural superiority can be identified. Individualized surgical strategies are recommended based on disease severity. Future studies should focus on multicenter prospective research, prolonged follow-up, propensity-matched analysis, and comprehensive assessment of fertility and ovarian reserve. Further exploration of the abdominal cytokine microenvironment may clarify its impacts on gamete function and embryo implantation in patients with endometriosis.

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Disclosure

The authors declare no competing interests for this work.

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