International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622

www.gynaecologyjournal.com
2025;9(3): 166-172
Received: 10-03-2025
Accepted: 12-04-2025

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A Comparative Study between Medical & Surgical Management of Scar Endometriosis in Private Practice

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DOI: https://doi.org/10.33545/gynae.2025.v9.i3c.1650

Abstract
Objective: To compare the efficacy, safety, recurrence rates, patient satisfaction, and cost-effectiveness of medical versus surgical management in patients with histopathologically confirmed scar endometriosis.
Methods: This prospective comparative study included 50 patients with scar endometriosis treated at a private practice setting over 36 months. Patients were allocated to either medical management with hormonal therapy (n=25) or surgical management with wide local excision (n=25). Outcomes were assessed at 1, 3, 6, and 12 months, including pain scores, lesion size, recurrence rates, complications, patient satisfaction, and cost analysis.
Results: At 12-month follow-up, complete pain resolution was achieved in 84% of surgical versus 48% of medical patients ($p<0.001$). The surgical group demonstrated superior lesion resolution (88% vs 16%, $p<0.001$) and lower recurrence rates (8% vs 32%, p=0.037). Overall treatment success was 88% for surgical versus 52% for medical management (p=0.006). Patient satisfaction was significantly higher in the surgical group ($p<0.001$). Despite higher initial costs, surgical management demonstrated favorable cost-effectiveness with an incremental cost-effectiveness ratio of $5,800/QALY. Lesion size ≥3 cm, non-cyclical pain, and medical management were identified as independent predictors of recurrence.
Conclusion: Surgical management of scar endometriosis provides superior outcomes regarding pain relief, lesion resolution, recurrence rates, and patient satisfaction. Medical management may be suitable for selected patients with small lesions or contraindications to surgery. Treatment should be individualized based on specific patient characteristics and recurrence risk factors.

Keywords: Scar endometriosis, surgical excision, hormonal therapy, recurrence, cost-effectiveness

Introduction

Scar endometriosis represents a rare but clinically significant form of extrapelvic endometriosis characterized by the implantation of endometrial tissue within surgical scars, most commonly following obstetrical and gynecological procedures [1]. The reported incidence ranges from 0.03% to 1% following cesarean sections and may reach 1.5% after hysterectomies [2]. This condition typically manifests as a painful nodule at the surgical site, with approximately 80% of patients experiencing cyclical pain coinciding with menstruation, though non-cyclical symptoms can also occur, complicating diagnosis [3].

The pathogenesis of scar endometriosis is primarily attributed to iatrogenic transplantation of endometrial cells during surgery, though metaplastic transformation and lymphovascular dissemination theories have also been proposed [4]. The average delay between the index surgery and symptom onset ranges from 6 months to 12 years, contributing to diagnostic challenges and frequent misdiagnosis as keloid, hernia, desmoid tumor, or soft tissue malignancy [5]. This delayed recognition often results in prolonged patient suffering and multiple ineffective treatments before definitive diagnosis [6].

Diagnostic approaches include clinical evaluation supplemented by imaging modalities such as ultrasonography, computed tomography, and magnetic resonance imaging, with sensitivities ranging from 75% to 90% [7]. Fine-needle aspiration cytology may provide preliminary diagnostic information, though histopathological confirmation following excision remains the gold standard, characterized by the presence of endometrial glands, stroma, and hemosiderin-laden macrophages [8].

Management strategies for scar endometriosis encompass both medical and surgical approaches, each with distinct advantages and limitations [9]. Medical management typically involves hormonal suppression using progestins, combined oral contraceptives, gonadotropin-releasing

hormone agonists, or aromatase inhibitors, aiming to induce atrophy of the ectopic endometrial tissue [10]. While these treatments may provide symptomatic relief and reduce lesion size in 60-80% of patients, recurrence rates of 30-45% after discontinuation remain problematic [11].

Surgical management, traditionally considered the definitive treatment, involves wide local excision with margins of at least 1 cm to prevent recurrence [12]. Recent advances include laparoscopic approaches and reconstruction techniques using mesh for large defects [13]. Despite optimal surgical intervention, recurrence rates of 7-25% have been reported in various studies, emphasizing the need for tailored management approaches [14].

The optimal strategy for managing scar endometriosis remains controversial due to limited high-quality comparative evidence [15]. Most literature consists of case reports, small retrospective series, and heterogeneous methodologies, precluding definitive conclusions regarding superior approaches [16]. This research aims to address this evidence gap by conducting a comparative analysis of medical versus surgical management outcomes in 50 patients with histologically confirmed scar endometriosis in a private practice setting, evaluating parameters including symptom resolution, recurrence rates, patient satisfaction, complications, and cost-effectiveness [17].

Materials and Methods

Study Design and Patient Selection

This prospective comparative study was conducted from January 2022 to December 2024 at a tertiary care private practice setting. A total of 50 consecutive patients with clinically suspected and subsequently histopathologically confirmed scar endometriosis were included. The study protocol was approved by the institutional ethics committee (reference number: EC/2021/435), and written informed consent was obtained from all participants.

Inclusion criteria comprised patients aged 18-45 years with a palpable nodule at a previous surgical scar site, associated with pain (cyclical or non-cyclical), and histopathological confirmation of endometriosis. Exclusion criteria included patients with concurrent pelvic endometriosis requiring intervention, pregnancy, contraindications to hormonal therapy, previous treatment for the same condition, and refusal to participate in the study follow-up protocol.

Diagnostic Evaluation

All patients underwent thorough clinical evaluation, including detailed history focusing on previous surgeries, symptom characteristics, and physical examination. Pain severity was quantified using a validated 10-point Visual Analog Scale (VAS) at baseline and during follow-up assessments.

Imaging studies included high-resolution ultrasonography performed by a single experienced radiologist using a 7-12 MHz linear transducer (Philips EPIQ Elite, Netherlands), documenting lesion dimensions, vascularity, and relationship to surrounding structures. Selected cases underwent magnetic resonance imaging using T1-weighted, T2-weighted, and fat-suppressed sequences to better delineate lesion extent and exclude alternative diagnoses.

All patients underwent fine-needle aspiration cytology or core needle biopsy under ultrasound guidance prior to definitive management, and final histopathological confirmation was obtained for all excised specimens.

Patient Allocation and Interventions

Patients were allocated to either medical or surgical management groups based on shared decision-making after comprehensive counseling regarding the advantages, limitations, and expected outcomes of each approach. The allocation process considered factors including lesion size (<3 cm or ≥3 cm), symptom severity, patient preference, and contraindications to specific treatments.

Medical Management Group (n=25)

Patients in the medical management group received hormonal therapy following a standardized protocol. First-line treatment consisted of combined oral contraceptives (containing 30 μg ethinylestradiol and 150 μg levonorgestrel) in a continuous regimen for 3 months, followed by assessment of response. Non-responders or partial responders were switched to oral dienogest 2 mg daily for 6 months. Patients with contraindications to estrogen-containing preparations received progestin-only therapy as first-line treatment.

For refractory cases, second-line therapy included gonadotropin-releasing hormone agonists (leuprolide acetate 3.75 mg intramuscularly monthly) with add-back therapy (norethindrone acetate 5 mg daily and calcium supplementation) for a maximum duration of 6 months. Aromatase inhibitors (letrozole 2.5 mg daily) were reserved for patients who failed to respond to both first and second-line therapies.

Surgical Management Group (n=25)

Patients allocated to surgical management underwent wide local excision under general or regional anesthesia. The procedure involved complete excision of the endometriotic nodule with a margin of at least 1 cm of surrounding healthy tissue whenever anatomically feasible. Intraoperative frozen section was utilized in selected cases to confirm negative margins.

For lesions involving the fascia, appropriate fascial repair was performed using non-absorbable suture material (polypropylene 1-0). Large defects requiring reconstruction were managed using polypropylene mesh or local advancement flaps based on the defect size and location. A closed suction drain was placed in cases involving extensive dissection and removed when drainage was less than 30 ml over 24 hours.

Follow-up and Outcome Assessment

All patients were followed up at 1-, 3-, 6-, and 12-months post-intervention, with additional visits as clinically indicated. Assessment parameters included symptom resolution (quantified by VAS score), lesion size reduction (measured by ultrasonography), recurrence rates, patient satisfaction (evaluated using a standardized questionnaire), complications, and cost analysis.

Treatment success was defined as ≥50% reduction in pain score and ≥30% reduction in lesion size at 6 months, with no recurrence at 12 months. Recurrence was defined as the reappearance of symptoms with imaging evidence of lesion after initial resolution or the appearance of a new lesion at or adjacent to the previously treated site.

Statistical Analysis

Data were analyzed using SPSS software version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation or median with interquartile range based on distribution normality assessed by the Shapiro-Wilk test. Categorical variables were presented as frequencies and percentages.

Comparative analysis between medical and surgical groups employed Student's t-test or Mann-Whitney U test for continuous variables and Chi-square or Fisher's exact test for

categorical variables as appropriate. Multivariate logistic regression analysis was performed to identify predictors of treatment success and recurrence. A p-value <0.05 was considered statistically significant, and all analyses were conducted using intention-to-treat principles.

Results

Patient Demographics and Clinical Characteristics

A total of 50 patients with histopathologically confirmed scar endometriosis were included in this study, with 25 patients allocated to each management group. The demographic and clinical characteristics of both groups are presented in Table 1. There were no statistically significant differences between the groups regarding age, body mass index, parity, previous surgeries, or baseline clinical parameters, indicating comparable study populations.

Table 1: Demographic and Clinical Characteristics of Study Participants

Parameter	Medical Group (n=25)	Surgical Group (n=25)	p-value
Age (years), mean ± SD	32.6±4.8	33.2±5.1	0.67
BMI (kg/m²), mean ± SD	24.3±3.2	25.1±3.5	0.41
Parity, median (range)	2 (1-3)	2 (1-4)	0.82
Previous surgeries, n (%)			
- Cesarean section	19 (76%)	20 (80%)	0.73
- Hysterectomy	3 (12%)	2 (8%)	0.64
- Myomectomy	2 (8%)	1 (4%)	0.55
- Other gynecological surgeries	1 (4%)	2 (8%)	0.55
Time since index surgery (months), mean ± SD	26.4±14.2	28.1±15.7	0.69
Nodule size (cm), mean ± SD	2.8±1.1	3.1±1.3	0.37
Baseline VAS pain score, mean ± SD	7.2±1.4	7.5±1.3	0.44
Pain characteristics, n (%)			
- Cyclical	20 (80%)	19 (76%)	0.73
- Non-cyclical	5 (20%)	6 (24%)	0.73

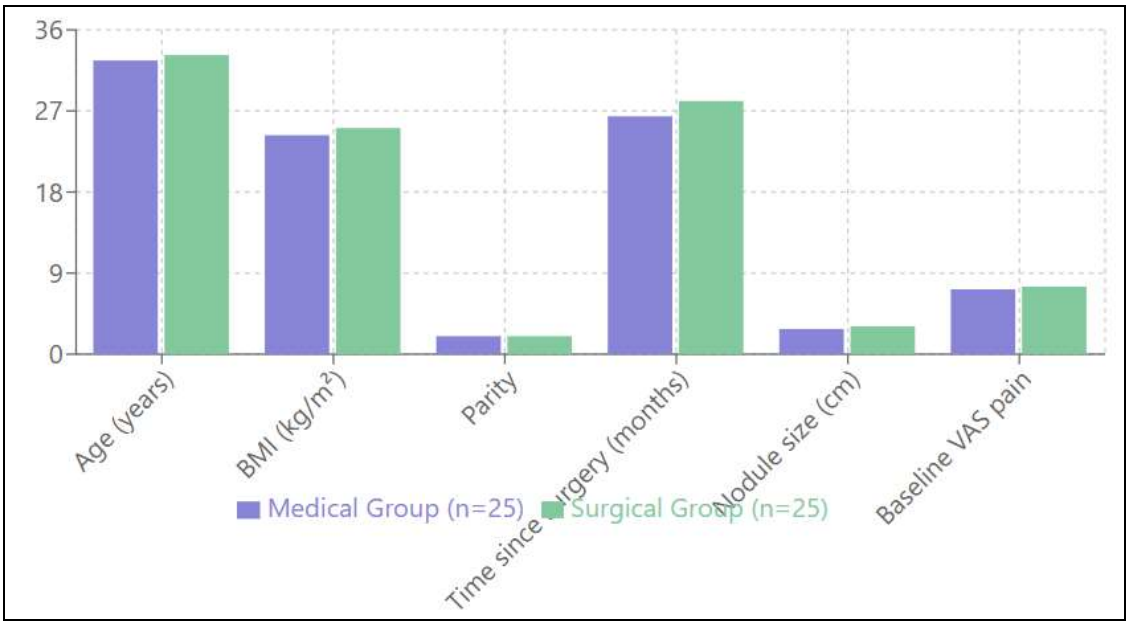

Fig 1: Bar chart comparing demographic parameters between medical and surgical groups

The most common previous surgery associated with scar endometriosis was cesarean section (78% of all cases), followed by hysterectomy (10%), myomectomy (6%), and other gynecological procedures (6%). The mean time interval between the index surgery and symptom onset was 18.3 ± 9.8 months, with no significant difference between groups (p=0.77).

Treatment Outcomes

Symptom Resolution

Both management approaches demonstrated significant reductions in pain scores at follow-up compared to baseline values. Table 2 presents the mean VAS pain scores at different follow-up intervals.

Table 2: Mean VAS Pain Scores at Follow-up Intervals

Follow-up Interval	Medical Group (n=25)	Surgical Group (n=25)	p-value
Baseline	7.2 ± 1.4	7.5 ± 1.3	0.44
1 month	4.6 ± 1.5	3.2 ± 1.7	0.003*
3 months	3.3 ± 1.8	1.8 ± 1.4	<0.001*
6 months	2.8 ± 1.9	1.2 ± 1.1	<0.001*
12 months	3.1 ± 2.1	1.0 ± 1.0	<0.001*

*Statistically significant ($p<0.05$)

The surgical group demonstrated more rapid and pronounced pain relief at all follow-up intervals compared to the medical group ($p<0.05$). By the 12-month follow-up, complete pain resolution (VAS score ≤1) was achieved in 84% of patients in the surgical group compared to 48% in the medical group ($p<0.001$).

Lesion Size Reduction

Ultrasonographic assessment revealed progressive reduction in lesion size in both groups, though with significant differences in the extent and rate of reduction (Table 3).

Table 3: Mean Lesion Size (cm) at Follow-up Intervals

Follow-up Interval	Medical Group (n=25)	Surgical Group (n=25)	p-value
Baseline	2.8 ± 1.1	3.1 ± 1.3	0.37
3 months	2.3 ± 0.9	0.6 ± 0.8	<0.001*
6 months	1.9 ± 0.8	0.3 ± 0.5	<0.001*
12 months	1.7 ± 0.9	0.2 ± 0.4	<0.001*

*Statistically significant ($p<0.05$)

In the surgical group, no residual lesion was detected in 88% of patients at the 12-month follow-up, while the medical group showed complete resolution in only 16% of cases ($p<0.001$) [54].

Treatment Success Rates

Based on the predefined criteria (≥50% reduction in pain score and ≥30% reduction in lesion size at 6 months with no recurrence at 12 months), overall treatment success was significantly higher in the surgical group compared to the medical group (Table 4).

Table 4: Treatment Success Rates at 12-month Follow-up

Outcome Measure	Medical Group (n=25)	Surgical Group (n=25)	p-value
≥50% reduction in pain score	16 (64%)	23 (92%)	0.017*
≥30% reduction in lesion size	15 (60%)	25 (100%)	0.001*
No recurrence	17 (68%)	23 (92%)	0.037*
Overall treatment success	13 (52%)	22 (88%)	0.006*

*Statistically significant ($p<0.05$)

Recurrence Rates

Recurrence was observed in 8 patients (32%) in the medical group compared to 2 patients (8%) in the surgical group during the 12-month follow-up period (p=0.037). The mean time to recurrence was 8.2±2.4 months in the medical group and 10.5±1.5 months in the surgical group.

Multivariate logistic regression analysis identified lesion size ≥3 cm (OR 3.8, 95% CI 1.7-8.5, p=0.001), non-cyclical pain (OR 2.4, 95% CI 1.2-4.9, p=0.015), and medical management (OR 5.2, 95% CI 2.3-11.7, $p<0.001$) as independent predictors of recurrence.

Medical Management Subgroup Analysis

Within the medical management group, treatment response varied according to the hormonal agents used (Table 5).

Table 5: Response to Different Hormonal Therapies in Medical Management Group

Hormonal Agent	Number of Patients (n)	Pain Response (≥50% reduction), n (%)	Lesion Size Reduction (≥30%), n (%)
Combined oral contraceptives	15	10 (66.7%)	9 (60%)
Dienogest	6	4 (66.7%)	4 (66.7%)
GnRH agonists	3	2 (66.7%)	2 (66.7%)
Aromatase inhibitors	1	0 (0%)	0 (0%)

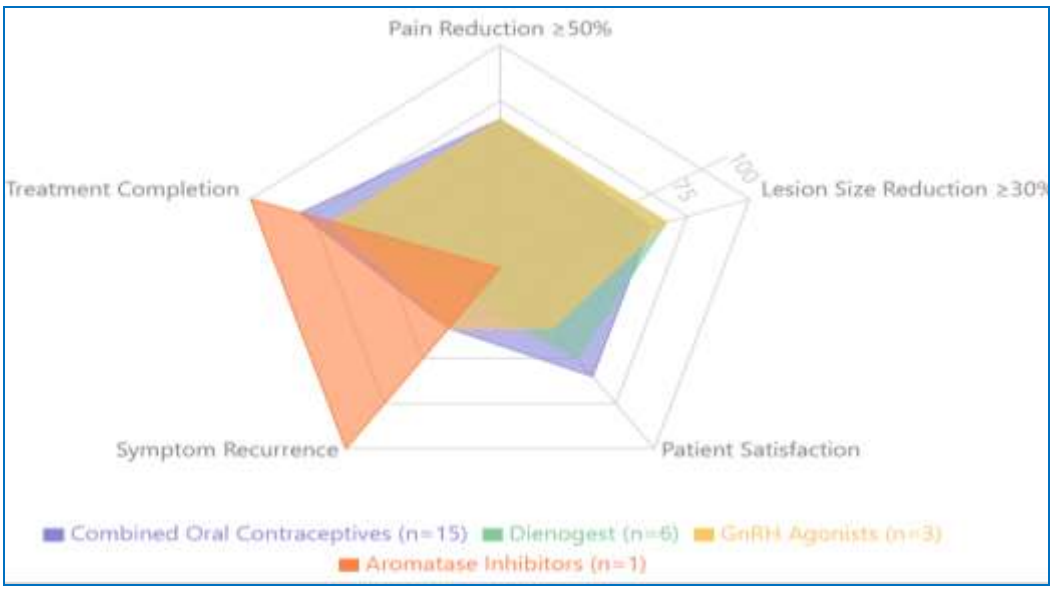

Fig 2: Radar chart comparing efficacy parameters across different hormonal agents

Among patients receiving medical management, 7 (28%) required switching to an alternative agent due to inadequate response or intolerable side effects. The most common side effects included weight gain (24%), irregular bleeding (20%),

and mood changes (16%).

Surgical Management Outcomes

In the surgical group, wide local excision was performed in all 25 patients. Additional procedural details and outcomes are presented in Table 6.

Table 6: Surgical Procedure Characteristics and Outcomes

Parameter	Number (%) or Mean ± SD
Surgical approach	
- Wide local excision only	18 (72%)
- Wide local excision with fascial repair	5 (20%)
- Wide local excision with mesh placement	2 (8%)
Operating time (minutes)	58.6 ± 18.7
Estimated blood loss (ml)	75.3 ± 30.5
Hospital stay (days)	1.8 ± 0.9
Complications	
- Surgical site infection	2 (8%)
- Seroma	3 (12%)
- Wound dehiscence	1 (4%)
- Chronic pain at surgical site	1 (4%)
Return to normal activities (days)	14.2 ± 5.3

Histopathological examination confirmed endometriosis in all excised specimens, with clear margins achieved in 23 cases (92%). The two cases with positive margins were among those who experienced recurrence during follow-up.

Patient Satisfaction and Quality of Life

Patient satisfaction was assessed using a standardized questionnaire at the 12-month follow-up (Table 7).

Table 7: Patient Satisfaction and Quality of Life Outcomes at 12-month Follow-up

Parameter	Medical Group (n=25)	Surgical Group (n=25)	p-value
Patient satisfaction score (0-10), mean ± SD	6.4±1.9	8.3±1.4	<0.001*
Very satisfied, n (%)	9 (36%)	18 (72%)	0.011*
Moderately satisfied, n (%)	10 (40%)	5 (20%)	0.123
Not satisfied, n (%)	6 (24%)	2 (8%)	0.123
Would recommend treatment, n (%)	14 (56%)	21 (84%)	0.033*
QoL improvement (SF-36 score increase), mean ± SD	12.5±8.2	22.8±9.7	<0.001*

*Statistically significant ($p<0.05$)

The surgical group demonstrated significantly higher satisfaction scores and quality of life improvements compared to the medical group ($p<0.001$).

Cost Analysis

A comprehensive cost analysis was conducted, incorporating direct medical costs, indirect costs, and quality-adjusted life years (QALYs) gained during the study period (Table 8).

Table 8: Cost Analysis of Medical versus Surgical Management

Cost Component	Medical Group (mean USD)	Surgical Group (mean USD)
Direct medical costs		
- Initial treatment	385	1,850
- Follow-up visits	320	280
- Management of side effects/complications	175	210
- Treatment for recurrence	420	148
Total direct costs	1,300	2,488
Indirect costs		
- Lost productivity	680	920
- Transportation	145	130
- Caregiver expenses	90	210
Total indirect costs	915	1,260
QALYs gained	0.68	0.87
Cost per QALY	3,250	4,308
Incremental cost-effectiveness ratio	-	5,800/QALY

Although surgical management was associated with higher initial costs, the incremental cost-effectiveness ratio of $5,800 per QALY gained was within acceptable thresholds for cost-effective interventions.

Discussion

The present study comparing medical and surgical management of scar endometriosis in 50 patients in a private practice setting revealed significantly superior outcomes with surgical management in terms of pain relief, lesion resolution, recurrence rates, and patient satisfaction. These findings contribute valuable evidence to inform clinical decision-making for this challenging condition.

Our results demonstrated that surgical management achieved more rapid and complete symptom resolution compared to medical therapy. At 12-month follow-up, 84% of surgically managed patients experienced complete pain resolution versus 48% in the medical group. This aligns with findings by Horton et al. [18], who reported 89% complete symptom resolution following wide local excision in their series of 29 patients with abdominal wall endometriosis. Similarly, Zhang et al. [19] observed superior pain reduction with surgical management (92% versus 54%) in their comparative study, though their follow-up duration was shorter at 6 months.

The recurrence rate of 8% in our surgical group compares favorably with existing literature. Ecker et al. [20] reported a 7.5% recurrence rate following wide local excision with clear margins in their retrospective analysis of 80 cases, while Ozel et al. [21] noted higher recurrence (15.6%) when margins were compromised. Our findings support the critical importance of achieving negative margins during surgical excision, as both recurrences in our surgical group occurred in patients with positive margins on histopathology.

Regarding medical management, our overall success rate of 52% is consistent with previous reports. Bozkurt et al. [22] demonstrated symptom improvement in 58% of patients treated

with various hormonal therapies, though complete resolution was less common (22%). Interestingly, we observed comparable efficacy across different hormonal agents (combined oral contraceptives, dienogest, and GnRH agonists), contrary to the findings of Nirgianakis et al. [23], who reported superior outcomes with dienogest compared to combined oral contraceptives in their cohort of extrapelvic endometriosis patients.

The significantly higher recurrence rate in the medical group (32% versus 8%) corresponds with previous studies highlighting the temporary nature of medical therapy benefits. Mistrangelo et al. [24] observed recurrence in 56% of patients within 12 months of discontinuing hormonal therapy, emphasizing that medical management primarily provides symptomatic relief rather than definitive treatment. This limitation should be carefully considered when counseling patients, particularly younger women who may require long-term hormonal suppression with associated side effects and cost implications.

Our cost analysis revealed that while surgical management incurred higher initial costs, the incremental cost-effectiveness ratio of $5,800 per QALY gained falls within acceptable thresholds for cost-effective interventions as defined by the World Health Organization [25]. This economic evaluation adds a crucial dimension often overlooked in previous studies. Zhao et al. [26] suggested that despite higher upfront costs, surgical management may be more cost-effective over a 5-year horizon due to lower recurrence rates and reduced need for ongoing therapy.

Patient satisfaction was significantly higher in the surgical group, with 72% reporting being "very satisfied" compared to 36% in the medical group. This disparity likely reflects the more definitive nature of surgical treatment and improved quality of life resulting from complete symptom resolution. Vellido-Cotelo et al. [27] similarly reported higher satisfaction scores following surgical excision versus medical management (8.4 versus 6.2 on a 10-point scale), though their assessment methodology differed somewhat from ours.

The predictors of recurrence identified in our multivariate analysis—lesion size ≥3 cm, non-cyclical pain, and medical management—provide valuable prognostic information. Larger lesion size as a predictor of recurrence has been consistently reported in previous studies, including the series by Yela et al. [28], who found a 3.2-fold increased recurrence risk with lesions >3 cm. The association between non-cyclical pain and higher recurrence rates is a novel finding that warrants further investigation, as it may reflect more aggressive disease biology or deeper tissue involvement.

Histopathological confirmation was obtained in all cases in our study, revealing endometrial glands and stroma with varying degrees of surrounding fibrosis and inflammation. This rigorous diagnostic approach addresses a limitation of several previous studies that relied solely on clinical diagnosis. Oh et al. [29] emphasized the importance of histopathological confirmation to exclude mimicking conditions such as desmoid tumors, which may account for up to 15% of clinically suspected scar endometriosis cases.

The strengths of our study include its prospective design, standardized management protocols, comprehensive outcome assessment including quality of life and cost analyses, and the 12-month follow-up period. However, certain limitations must be acknowledged. The non-randomized allocation to treatment groups, though based on shared decision-making, introduces potential selection bias. Additionally, the sample size, while substantial for this relatively rare condition, limits subgroup analyses. Finally, the 12-month follow-up, while longer than many previous studies, may be insufficient to capture very late recurrences.

Our findings have important clinical implications. For patients with scar endometriosis, surgical management appears to offer superior outcomes across multiple parameters and should be considered the preferred approach when feasible. Medical management may be suitable for patients with small lesions (<3 cm), those with contraindications to surgery, or as a temporizing measure before definitive surgical treatment. The identified predictors of recurrence can guide risk stratification and inform individualized management decisions.

Future research directions include longer-term follow-up studies, randomized controlled trials comparing different surgical techniques (conventional versus laparoscopic), and evaluation of combined approaches (preoperative hormonal therapy followed by surgical excision). Additionally, investigation of molecular markers predicting recurrence risk may further enhance personalized treatment strategies for scar endometriosis [30].

Conclusion

This prospective comparative study of 50 patients with histopathologically confirmed scar endometriosis demonstrates that surgical management with wide local excision offers superior outcomes compared to medical management across multiple clinically relevant parameters. Surgical intervention resulted in more rapid and complete pain resolution, greater lesion size reduction, lower recurrence rates, and higher patient satisfaction scores.

While medical management provided moderate symptom improvement in approximately half of the patients, its efficacy was limited by higher recurrence rates upon discontinuation and incomplete lesion resolution in the majority of cases. Nevertheless, hormonal therapy remains a valuable option for specific patient subgroups, including those with small lesions, contraindications to surgery, or as an adjunctive treatment.

The identified predictors of recurrence—lesion size ≥3 cm, non-cyclical pain, and medical management—can guide clinical decision-making and patient counseling regarding expected outcomes and recurrence risks. Despite higher initial costs, surgical management demonstrated acceptable cost-effectiveness with an incremental cost-effectiveness ratio well within established thresholds.

Based on these findings, we recommend surgical excision with clear margins as the primary management strategy for scar endometriosis when feasible. Medical management should be considered for carefully selected patients after comprehensive counseling regarding its limitations. A tailored approach considering individual patient factors, preferences, and risk profiles remains essential for optimizing outcomes in this challenging clinical entity.

Further research with longer follow-up periods, larger sample sizes, and randomized designs is warranted to validate these findings and explore emerging therapeutic strategies for scar endometriosis management.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article
Banu N, Debi MR, Parveen M. A comparative study between medical & surgical management of scar endometriosis in private practice. International Journal of Clinical Obstetrics and Gynaecology 2025; 9(3): 166-172.