

Insights Into the Clinical Features, Diagnosis, Treatment, and Prognosis of Post-Surgical Abdominal Wall Endometriosis: A Retrospective Study

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Purpose: This study aimed to categorize abdominal wall endometriosis (AWE) according to lesion depth, analyze its clinical features, treatment, outcomes, and prognosis, and share clinical treatment experience.

Patients and methods: A retrospective analysis was performed on 187 AWE patients who underwent surgery at the First Affiliated Hospital, Zhejiang University School of Medicine between January 2013 and April 2024. Patients were classified into three types: type I (skin and subcutaneous fat layer), type II (fascia or muscle layer), and type III (peritoneal layer). Clinical features, perioperative outcomes, and recurrence rates were analyzed.

Results: Among the 187 AWE patients, 28 (14.97%) were classified as type I, 104 (55.61%) as type II, and 55 (29.42%) as type III. The main complaint was an abdominal wall mass or/and pain (98.39%, 184/187). Both preoperative imaging and intraoperative exploration revealed a significant trend of increasing lesion diameter across types I, II, and III ($P < 0.01$). As the depth of endometriosis invasion increased, the proportion of lesions with a maximum diameter of ≥ 3 cm increased ($P < 0.01$). Additionally, there was a significant increase in the frequency of intraoperative mesh placement and drainage placement, as well as longer operative time ($P < 0.01$). Lesions were mainly located at corner sites of cesarean section incisions: 85.0% occurred in transverse incisions and 87.76% in longitudinal incisions. The three-year cumulative recurrence rate was 6.2%, with no identified risk factors for recurrence.

Conclusion: The presence of an abdominal mass or pain in or around a surgical scar should raise suspicion of AWE. Type III AWE is associated with the most severe clinical manifestations, larger lesion diameter, longer operative time, and a higher incidence of intraoperative mesh and drainage placement. Complete surgical excision is the treatment of choice, and the overall recurrence rate is low.

Keywords: abdominal wall endometriosis, extra-pelvic endometriosis, cesarean scar endometriosis

Introduction

Endometriosis, defined as the implantation of ectopic endometrial glands and stroma in sites other than the uterine cavity, affects approximately 5%-10% of reproductive age women.¹ The most common sites of endometriosis are in the pelvic cavity such as the ovary and pelvic peritoneum, however, a wide array of extra-pelvic involvement has been encountered.² Abdominal wall endometriosis (AWE) is a rare form of extra-pelvic endometriosis, characterized by the presence of ectopic endometrial tissue at various depths and segments of the abdominal wall, particularly within the subcutaneous adipose layers and muscles.^{3,4} AWE can result in cyclical pain and/or a palpable mass on the abdominal wall, which is often associated with a previous surgical procedure or occurs spontaneously.⁵ The incidence of AWE among women of reproductive age ranges from 0.03% to 3.5%.⁶ Abdominal scar endometriosis (ASE) represents the most prevalent form of AWE, occurring predominantly following cesarean sections, although cases have also been reported post-hysterectomy and at laparoscopic trocar port sites.^{7,8} In recent years, the incidence of AWE has increased

concomitantly with the global rise in cesarean section rates, suggesting that the true prevalence of this condition may be underestimated.²

AWE is primarily characterized by periodic bleeding of ectopic endometrial tissue due to estrogen and progesterone, resulting in tissue fibrosis and the formation of ectopic nodules.⁹ Despite its rarity, AWE often presents cyclical menstrual-related abdominal pain, even constant pain in severe cases, thereby significantly impacting health and quality of life. Furthermore, the infrequency of this condition frequently results in misdiagnosis, which can delay treatment and lead to unnecessary procedures, exacerbating both the physical and psychological distress of patients.¹⁰ Additionally, there have been sporadic reports of malignant transformation associated with AWE. Consequently, strategies aimed at preventing and reducing the occurrence of AWE, as well as preventing its recurrence, are imperative.

In this study, we aimed to evaluate the differences in clinical features, and surgical conditions, and explore the risk factors for recurrence among different types of patients with AWE.

Methods

This study was approved by the Ethics Committee of the First Affiliated Hospital, Zhejiang University School of Medicine (IIT20241610A). A cohort of 187 patients who underwent surgical procedures and were histopathologically confirmed AWE at the First Affiliated Hospital of Zhejiang University School of Medicine between January 2013 and April 2024 were retrospectively analyzed. The study focused on cases of scar endometriosis, explicitly excluding spontaneous lesions such as those occurring in the groin and umbilicus. Patients with incomplete medical records were excluded from the analysis. A comprehensive review of the patients' medical records was conducted to gather clinical data, patient characteristics, and follow-up information. Owing to the retrospective design of the study, informed consent was waived.

Surgical resection of scar endometriosis lesions was performed via an open incision, strategically placed at or near the original surgical scar. The lesion and surrounding normal tissues were separated 0.5–1.0cm along the edge of the lesion, and the AWE mass was completely resected. In instances where the tissue defect was too extensive for direct suturing or where tissue tension would have compromised optimal abdominal wall remodeling, mesh implantation was considered. Subcutaneous drainage was employed for patients who underwent mesh implantation or had large lesions. Postoperative fever was identified as a body temperature $\geq 38.5^{\circ}\text{C}$, except for two consecutive measurements taken more than 4 hours apart on the day of surgery.

Patients were classified into three categories based on the depth of infiltration of the endometriotic mass. Type I lesions penetrate the skin and subcutaneous adipose tissue; type II lesions extend into the fascia or muscular layer; and type III lesions reach the peritoneal layer or extend into the abdominal cavity. For patients with multiple lesions, the largest or most deeply infiltrating nodule was selected for statistical analysis.

After Institutional Review Board approval, the medical records of patients with AWE confirmed by surgical pathology were reviewed. The clinical data collected included age, body mass index (BMI), gravidity, parity, history of previous surgeries, number of cesarean sections, type of incision, latency period, disease course, symptoms, mass size and location, diagnosis, intraoperative findings, and recurrence. The latency period was defined as the time from the last surgical procedure to the onset of symptoms, whereas the course of disease was defined as the duration from symptom onset to surgical intervention.

The preoperative imaging assessment included an abdominal ultrasound, abdominal CT, or pelvic MRI, based on the particular circumstances.

Follow-up was performed by a combination of outpatient visits and telephone consultations for at least six months. Treatment success was defined by the resolution of pain symptoms or the absence of a palpable mass, whereas treatment failure was identified by the persistence or worsening of pain symptoms. Postoperative recurrence was defined as recurrence of abdominal wall pain worsening to the preoperative level or a mass pain found on postoperative physical examination and ultrasound assessment three months after surgery.

Continuous data with a normal distribution are presented as the mean $\pm$ standard deviation (SD) and were analyzed using the Student's *t*-test and analysis of variance. Post-hoc comparisons were performed with post-hoc Bonferroni tests. Data with a skewed distribution are reported as the median (range). The categorical data are presented as numbers and

percentages and were analyzed with the Chi-square and Fisher's exact test. The univariate and multivariate Cox proportional hazards models were employed to assess factors influencing the recurrence. The hazard ratio (HR) and 95% confidence interval (CI) were calculated to quantify the risk of recurrence. All the data analyses were performed using SPSS software (Version 20.0 IBM, Chicago, IL, USA). A $P < 0.05$ was considered statistically significant.

Results

Patients with substantial missing clinical data ($n = 6$) and those lost to follow-up after surgery ($n = 10$) were excluded from the study. Additionally, seven patients without a surgical history, who were suspected of spontaneous AWE, were also excluded. Ultimately, 187 AWE patients who underwent laparotomy confirmed by pathology were systematically reviewed.

Baseline Characteristics and Preoperative Findings

Among these 187 patients, 28 (14.97%) were classified as type I, 104 (55.61%) as type II, and 55 (29.42%) as type III. The baseline characteristics and preoperative findings of the patients are presented in Table 1. There were no statistically significant differences identified among the three groups.

Table 1 Clinical Characteristics and Preoperative Findings

Characteristics	Overall (n = 187)	Type I (n = 28)	Type II (n = 104)	Type III (n = 55)	P value
Age (years)	33.43 ± 5.44	33.71 ± 6.64	32.88 ± 4.71	34.31 ± 6.02	0.288
BMI (kg/m ²)	22.17 ± 3.11	22.65 ± 3.58	22.01 ± 3.22	22.24 ± 2.66	0.647
Parity	1.4 ± 0.53	1.39 ± 0.50	1.39 ± 0.55	1.40 ± 0.53	0.997
Type of previous operation					1.000
Cesarean section	185 (98.9)	28 (100)	103 (99)	54 (98)	0.651
Laparoscopy	2 (1.1)	0	1 (1)	1 (2)	
Number of Cesarean sections					
One	134 (72.43)	21 (75)	76 (73.79)	37 (68.52)	0.181
Two	50 (27.03)	7 (25)	27 (26.21)	16 (29.63)	
Three	1 (0.54)	0		1 (1.85)	
Type of abdominal wall incision					0.185
Longitudinal incision	44 (23.53)	11 (39.29)	20 (19.23)	13 (23.64)	
Transverse incision	141 (75.40)	17 (60.71)	83 (79.81)	41 (74.54)	
Laparoscopic incision	2 (1.07)	0	1 (0.96)	1 (1.82)	0.536
Previous surgery for AWE	6 (3.21)	0	2 (1.92)	4 (7.27)	
Latency period (years)	3.73 ± 3.10	3.41 ± 2.44	3.62 ± 3.13	4.11 ± 3.36	0.442
Course (years)	2.46 ± 3.03	2.77 ± 3.88	2.60 ± 3.11	2.03 ± 2.30	
Initial symptom					
Abdominal wall mass (palpable mass)	45 (24.06)	10 (35.72)	25 (24.04)	10 (18.18)	0.101
Abdominal wall pain	48 (25.67)	2 (7.14)	28 (26.92)	18 (32.73)	
Palpable mass and pain	91 (48.66)	16 (57.14)	48 (46.15)	27 (49.09)	
Asymptomatic	3 (1.61)	0	3 (2.89)	0	0.969
Symptom associated with menstruation					
Yes	147 (78.61)	22 (78.57)	81 (77.88)	44 (80.0)	
No	40 (21.39)	6 (21.43)	23 (22.12)	11 (20.0)	0.800
Dysmenorrhea	59 (31.55)	10 (35.71)	31 (29.81)	18 (32.73)	
History of endometriosis	10 (5.35)	2 (7.14)	5 (4.81)	3 (5.45)	0.901
History of adenomyosis	10 (5.35)	2 (7.14)	4 (3.85)	4 (7.27)	
Preoperative CA125 (IU/mL)*					
>35	45 (33.09)	5 (23.81)	20 (28.57)	20 (44.44)	0.136
<35	91 (66.91)	16 (76.19)	50 (71.43)	25 (55.56)	

(Continued)

Table 1 (Continued).

Characteristics	Overall (n = 187)	Type I (n = 28)	Type II (n = 104)	Type III (n = 55)	P value
Preoperative CA199 (IU/mL)*					0.287
>37	15 (11.03)	1 (4.76)	11 (15.71)	3 (6.67)	
<37	121 (88.97)	20 (95.24)	59 (84.29)	42 (93.33)	
Preoperative hormonal therapy					0.074
Yes	6 (3.21)	1 (3.57)	1 (0.96)	4 (7.27)	
No	181 (96.79)	27 (96.43)	103 (99.04)	51 (92.73)	

Notes:*Only 136 patients were tested preoperatively; Type I, n = 21; Type II, n = 70; Type III, n = 45. The values are presented as mean $\pm$ standard deviation, and n (%).

Abbreviation: AWE, abdominal wall endometriosis.

The main complaint was a tender mass located in or near the surgical scar, which tended to enlarge and become more symptomatic during menstruation. The presence of an abdominal wall mass and/or pain was reported by 98.39% (n=184) of the patients. Periodic symptoms were observed in 78.61% (n=147) of the patients. At the time of presentation, three patients were undergoing treatment with pain medications. In our patient cohort, 185 patients (98.93%) involved at least one cesarean section, whereas 2 patients (1.07%) were secondary to laparoscopic hysterectomy without cesarean section. Six patients (3.21%) who had previously undergone AWE operation at other hospitals but came to our hospital for second operation due to the recurrence of AWE. Secondary implantation following cesarean section was the most prevalent manifestation of AWE, particularly in patients with transverse incisions.

The preoperative diagnosis was accurate in 94.65% (n=177) of the patients initially; however, 10 patients were misdiagnosed preoperatively with fibroma, malignant tumor metastasis, incisional hernia or an inguinal mass. A definitive diagnosis was achieved through histological analysis of the nodules.

All patients underwent preoperative imaging, including abdominal wall ultrasound, CT, or MRI, to assess lesion dimensions. The maximum imaging diameters were 1.59 ± 0.55 cm for type I, 2.31 ± 1.04 cm for type II, and 2.85 ± 1.19 cm for type III, with statistically significant difference ($P < 0.01$).

Intraoperative Findings

All patients underwent surgical procedures, of them 171 patients operated on in the Department of Obstetrics and Gynecology and 16 in the Department of Surgery. The intraoperative findings are summarized in Table 2. Consistent with preoperative imaging, revealed the maximum lesion diameter, we observed an increasing trend in the intraoperative resection diameter of lesions among types I, II, and III ($P < 0.01$). A pairwise comparison among the three types

Table 2 Intraoperative Findings

	Type I (n = 28)	Type II (n = 104)	Type III (n = 55)	P value
Maximum diameter of the mass in the image (cm)	$1.59 \pm 0.55^{\Delta*}$	$2.31 \pm 1.04^{\Delta}$	$2.85 \pm 1.19^{\Delta}$	0.000
Size of the intraoperative mass (cm)	$2.10 \pm 0.97^{\Delta}$	$2.63 \pm 0.97^{\Delta}$	$3.64 \pm 1.52^{\Delta}$	0.000
Size of the intraoperative mass				0.000
<3 cm	21 (75) [*]	55 (52.88) [*]	12 (21.82) ^Δ	
≥3 cm	7 (25)	49 (47.12)	43 (78.18)	
Number of intraoperative lesions				0.989
1	25 (89.29)	92 (88.46)	49 (89.09)	
≥2	3 (10.71)	12 (11.54)	6 (10.91)	
Placement of mesh	0 [*]	3 (2.88) [*]	11 (20) ^Δ	0.000
Drainage	0 [*]	5 (4.81) [*]	13 (23.64) ^Δ	0.000
Intraoperative bleeding (mL)	10.68 ± 6.38	20.29 ± 33.82	22.18 ± 20.79	0.184
Operation time(min)	$45.64 \pm 29.77^{\Delta}$	$52.86 \pm 29.05^{\Delta}$	$76.67 \pm 45.06^{\Delta}$	0.000

Notes: The values are presented as mean $\pm$ standard deviation, and n (%). Post hoc analysis: ^Δ Compared with Type II, $P < 0.01$; ^{*} Compared with Type III, $P < 0.01$;

indicated that type III patients had higher rates concerning a maximum diameter of ≥ 3 cm, mesh and drainage placement, and longer operative times ($P < 0.01$).

In total, 211 abdominal wall lesions were examined and excised. Among these lesions, 160 were located at the transverse incision of the previous cesarean section and were distributed as follows: 24 in the middle segment, 64 in the left corner, and 72 in the right corner. In addition, 49 lesions were located within the longitudinal incision of the previous cesarean section, comprising 6 in the middle segment, 18 in the upper corner, and 25 in the lower corner. Additionally, two lesions were identified at the site of the previous laparoscopic puncture site. Notably, the majority of lesions were located at corner sites following the cesarean section incision, with 136/160 (85.0%) in the transverse incision and 43/49 (87.76%) in the longitudinal incision.

Postoperative Outcomes

The postoperative conditions of the three groups are detailed in Table 3. No statistically significant differences were observed in terms of postoperative fever, poor incision healing, incisional hernia, or postoperative hormonal therapy across the three types of AWE patients.

Recurrence

Six patients (3.21%) experienced recurrence after AWE resection in other hospitals. The remaining 181 patients were admitted for the first time. The median follow-up period for the 187 AWE patients was 43 months. All patients exhibited improvement in clinical symptoms immediately after the surgery. Recurrence following surgical treatment occurred in 10 patients, with a median recurrence interval of 11 months. The cumulative recurrence rate at three years was 6.2%. Among the patients, four patients with recurrence underwent a second surgical procedure with safe margin, while the remaining patients were treated conservatively. The clinical characteristics of the patients in the recurrence and non-recurrence groups are shown in Table 4. Notably, variables such as age, BMI, the type of abdominal wall incision, size of the intraoperative mass, number of lesions, depth of infiltration, and postoperative hormonal therapy did not differ significantly between the two groups.

Table 3 Postoperative Circumstances

	Type I (n = 28)	Type II (n = 104)	Type III (n = 55)	P value
Postoperative fever	0	5 (4.81)	3 (5.45)	0.571
Poor incision healing	0	3 (2.88)	4 (7.27)	0.290
Incisional hernia	0	1 (0.96)	1 (1.82)	1.000
Postoperative hormonal therapy	0	6 (5.77)	7 (12.73)	0.076

Note: The values are presented as n (%).

Table 4 Postoperative Recurrence

Characteristics	Recurrence Group (n = 10)	Unrecurrence Group (n = 177)	P value
Age			0.170
<35 yr	9 (90)	117 (66.10)	
≥ 35 yr	1 (10)	60 (33.90)	
BMI (kg/m ²)	21.94 $\pm$ 3.22	22.18 $\pm$ 3.11	0.817
Type of abdominal wall incision			0.512
Longitudinal incision	1 (10)	43 (24.29)	
Transverse incision	9 (90)	132 (74.58)	
Laparoscopic incision	0	2 (1.13)	

(Continued)

Table 4 (Continued).

Characteristics	Recurrence Group (n = 10)	Unrecurrence Group (n = 177)	P value
Size of the intraoperative mass			0.194
<3 cm	7 (70)	81 (45.76)	
≥3 cm	3 (30)	96 (54.24)	
The type of AWE			0.287
I	3 (30)	25 (14.12)	
II	4 (40)	100 (56.50)	
III	3 (30)	52 (29.38)	
Numbers of multiple lesions			1.000
I	9 (90)	157 (88.70)	
≥2	1 (10)	20 (11.30)	
Postoperative hormonal therapy			0.494
Yes	1 (10)	11 (6.21)	
No	9 (90)	166 (93.79)	

Notes: The values are presented as the mean ± standard deviation, and n (%).

Abbreviation: AWE, abdominal wall endometriosis.

Univariate and multivariate Cox proportional-hazards regression model analyses were performed to identify the risk factors for postoperative recurrent AWE (Table 5). The analyses did not reveal any statistically significant risk factors for AWE recurrence.

Discussion

The pathogenesis of endometriosis is multifactorial, encompassing immunologic, hormonal, inflammatory and genetic components.¹¹ All of these theories can also be applied to any type of extra-pelvic endometriosis. For AWE, the predominant theory remains that endometrial tissue is iatrogenically implanted directly into the abdominal wound during surgical procedures, which is known as the implantation theory.^{5,6} With appropriate nutrient supply and hormonal stimulation, these endometrial cells can survive and proliferate, ultimately resulting in AWE.^{3,12} Studies have identified previous cesarean surgeries as an independent risk factor for AWE, with transverse incisions posing a higher risk than the longitudinal incisions, particularly at the adipose and fascia layers.^{3,13} These findings align with the results of the present study, in which approximately 98.9% of cases reported a history of cesarean section, with 75.4% involving a transverse incision and 23.5% involving a longitudinal incision. Given the relatively low incidence of scar endometriosis despite the high number of cesarean sections, multiple factors clearly contribute to the pathogenesis of this condition. Genetic

Table 5 Univariate and Multivariate Cox Regression Analyses for Identifying the Risk Factors for Recurrent AWE

Variables	Univariate Cox Regression	P value	Multivariate Cox Regression	P value
	HR (95% CI)		HR (95% CI)	
Age (< 35 or ≥ 35 yr)	0.218 (0.028–1.724)	0.149	0.242 (0.030–1.980)	0.186
BMI (kg/m ²)	1.428 (0.369–5.525)	0.605	1.715 (0.437–6.738)	0.44
Size of the intraoperative mass (<3cm or ≥3cm)	0.389 (0.101–1.504)	0.171	0.410 (0.087–1.932)	0.259
The type of AWE (I or II or III)	0.716 (0.278–1.842)	0.488	0.743 (0.259–2.133)	0.581
Numbers of lesions (1 or ≥ 2)	0.858 (0.109–6.770)	0.884	0.838 (0.102–6.878)	0.87
Postoperative hormonal therapy	2.176 (0.274–17.268)	0.462	5.376 (0.498–57.887)	0.166

Abbreviations: HR, hazard ratio; CI, confidence interval; AWE, abdominal wall endometriosis.

susceptibility and genetic components may interact in the presentation of such cases.¹¹ Hematogenic or lymphatic dissemination and/or metaplastic transformation can explain distant ectopic endometrial implants, including spontaneous AWE with no prior surgical history.^{14,15} In our study, seven patients without a history of surgery who were considered spontaneous AWE were excluded. Some investigators propose a combination of these theories.

Currently, prior abdominal surgery is recognized as the most significant risk factor for AWE, with over 80% of cases associated with surgical scars, most commonly resulting from cesarean section.^{13,15} AWE has been documented in scar tissue during laparotomy, at laparoscopic trocar port sites, and during hernia repair.^{4,8,15} In our series, 185 cases of secondary AWE were identified following cesarean sections, and 2 cases were observed after laparoscopic surgery. Cesarean section appears to be the primary risk factor for AWE. Several studies have confirmed that an increasing BMI may be a risk factor for the development of AWE.⁶ Overweight and obese patients present increased technical difficulty during surgery, leading to suboptimal hysterotomy closure and inadequate subcutaneous irrigation, thereby increasing the risk of AWE.⁴ However, the mean BMI of the patients in our study was 22.17 kg/m²,² which was within the normal range.

The pathognomonic triad of AWE comprises periodic abdominal pain, palpable abdominal mass, and a history of abdominal procedures such as cesarean section.^{4,12} The cyclical nature of the complaint is a significant predictor of the disease, that 78.61% of patients in our study presented with cyclic symptoms. The presence of a mass and/or pain was the most prevalent symptom, occurring in 98.39% of the patients. The mechanism involves ectopic endometrial implantation through an abdominal incision, resulting in periodic bleeding and abdominal pain during the menstrual cycle, which is influenced by changes in sex hormones.⁹ Other common symptoms include cyclical bleeding from superficial lesions, particularly in cases of umbilical endometriosis. When the chief complaint does not involve periodic symptoms or specific characteristics of the abdominal mass, clinical diagnosis becomes challenging. Consequently, some patients are referred to the Department of General Surgery due to atypical abdominal wall masses or pain,² especially in the umbilicus or groin regions. In certain studies, the accuracy of preoperative diagnosis ranges from 20% to 50%.⁵ A potential explanation for diagnostic challenges is the involvement of general surgeons who may lack familiarity with the disease.⁵ Therefore, auxiliary testing is necessary to increase the accuracy of diagnosis and to avoid both delayed and incorrect diagnoses in patients presenting with atypical symptoms.

AWE is often misdiagnosed as incisional hernias, abscesses, granulomas, lipomas, desmoid tumors, or cancerous lesions because of its rarity and presentation as having a cystic, solid, or mixed mass-like appearance.^{2,13} However, the integration of clinical and imaging data can significantly refine the differential diagnosis. Abdominal wall ultrasonography is the preferred imaging modality for diagnosing AWE, as it is low-cost, noninvasive, highly sensitive and widely accessible.^{5,6,16} In clinical cases where there is no obvious palpable nodule but pain at a previous incision site, ultrasound can facilitate the early detection of subfascial AWE. Typical ultrasound images include predominantly hypoechoic nodules with poorly defined borders and a hyperechoic rim.¹⁷ The combination of ultrasonography with clinical symptoms, physical examination, and surgical history enhances the accuracy of preoperative diagnosis. In a retrospective series of studies, ultrasound accurately diagnosed approximately 97% of patients with palpable abdominal mass and clinical suspicion of AWE.¹⁸ In our study, the accuracy of preoperative diagnosis was as high as 94.65%, which was achieved through a comprehensive evaluation of classic history, clinical presentation, and imaging data. In cases where intraoperative identification of a lesion proves challenging, intraoperative abdominal ultrasound serves as a valuable tool for precise localization. Pelvic MRI is necessary when ultrasound results are inconclusive, as it can provide superior delineation of the lesion's location and depth to guide preoperative planning.⁴ Fine-needle aspiration (FNA) can provide preoperative diagnosis and is particularly beneficial when the diagnosis is in doubt. However, it is imperative to exclude the presence of an incisional hernia prior to its application. In our study, a patient's preoperative CT scan revealed a deep abdominal wall mass that was suspected to be neoplastic. FNA performed before surgery confirmed the diagnosis of endometriosis.

Currently, surgical excision remains the first-line treatment for symptomatic AWE, with boasting cure rates exceeding 95%,^{12,13} with postoperative pathological analysis serving as the definitive standard for confirming the diagnosis. To ensure complete excision of the lesion and surrounding fibrotic tissue, thereby minimizing the risk of recurrence, a wide surgical resection with a margin of at least 1 cm was employed.⁶ The choice of surgical method should be determined

according to the size, location and level of the involved abdominal wall. At present, the primary surgical interventions for AWE include both the laparoscopic and the traditional abdominal approaches.¹² In our investigation, all participants underwent the traditional abdominal approach. In some cases, complete excision of the lesion necessitated the removal of adjacent fascia and muscle tissue.¹⁹ To address large defects following abdominal wall resection, mesh repair is essential to restore fascia stability and prevent incisional hernia, as was implemented in fourteen patients in our study cohort. The findings of this study indicate that with increased depth of endometriotic infiltration, there is a corresponding increase in the proportion of lesions with a maximum diameter of ≥ 3 cm. Additionally, the frequency of intraoperative mesh placement was greater. Notably, type III patients presented a significantly greater likelihood of requiring mesh implantation.

Emerging minimally invasive techniques, such as high-intensity focused ultrasound (HIFU) ablation, percutaneous cryoablation and radiofrequency ablation (RFA), are recognized as promising novel therapies for AWE.^{20–24} These techniques maintain the integrity of the abdominal wall and prevent new scarring. Currently, the evaluation of the efficacy of these techniques for AWE has been limited to retrospective studies, highlighting the need for prospective randomized studies with extended follow-up periods to thoroughly assess their effectiveness and safety. Medical treatment has not been shown to be effective for AWE, often providing only temporary symptom relief followed by relapse upon discontinuation of the medication.²¹ Furthermore, such treatments do not reduce the lesion size and may cause side effects.²⁰ Multiple studies have reported that postoperative medication has no significant effect on recurrence rates.^{9,25} In our study, only 12 patients received postoperative hormonal therapy. No statistically significant association with recurrence risk was observed in this subgroup. Due to the small sample size and nonrandomized treatment allocation, hormonal therapy remains controversial.

The recurrence rate of AWE after surgery was 4.3%,¹³ while a recent study reported a recurrence rate of 9.85%.⁹ In our series, the recurrence rate was 5.3% (10/187), with a 3-years cumulative recurrence rate of 6.2%. Both univariate and multivariate analyses of risk factors for recurrent AWE did not identify any statistically significant factors. We believe that local recurrence may be associated with inadequate surgical resection. Based on our experience, surgical treatment demands complete removal of the nodule and the surrounding fibrotic tissue, as this fibrotic tissue may harbor endometrial cells and potentially serve as a nidus for recurrence.⁴ A recent study revealed that when the depth of lesion invasion is deep, integrated resection may reduce the recurrence rate to some extent.⁹ Consequently, thorough surgical resection is crucial for achieving favorable prognostic outcomes.

The prevalence of AWE is notably higher among women with a history of cesarean section, with reported incidence rates ranging from 0.03% to 1% following such procedures.¹³ Given the strong association between AWE and cesarean section, a reduction in cesarean section rates could decrease the incidence of AWE. However, cesarean section rates are increasing globally, with projections indicating an increase in the global average from the current 21.1% to 28.5% by 2030.²⁶ In China, the cesarean section rate was 45.7% in 2012 and decreased slightly to 41.3% in 2016.²⁷ A previous cesarean delivery increased the risk of being delivered by cesarean section again. Unless there are specific obstetric indications necessitating a cesarean section, vaginal delivery is recommended as the primary option. Furthermore, during cesarean section procedures, meticulous attention to detail is crucial. This includes techniques such as lifting the uterus outside the pelvis for repair, avoiding the use of sponges to clean the uterine cavity, repeatedly irrigating the incision, employing a wound protector, changing gloves and instruments prior to abdominal closure, and utilizing an endobag for specimen removal during laparoscopy to prevent iatrogenic implantation.^{4,5,13}

This study has several limitations. First, its retrospective design may introduce information bias. Notably, 16 patients were excluded due to missing data or loss to follow-up. Although this number is small, it may contribute to selection bias and slightly affect the accuracy of the reported long-term recurrence rate. Second, as AWE is a rare condition, our cohort included patients with heterogeneous follow-up durations, which may have led to an underestimation of the true recurrence rate. Additionally, the low absolute number of recurrence events limited the statistical power for comparative analyses of risk factors. Finally, the involvement of multiple surgeons from different departments introduces potential variability in surgical technique, which could have influenced key outcomes such as recurrence, operative time, and the decision for mesh placement.

Conclusions

Despite its rarity, abdominal wall endometriosis should be considered in women who report a mass or pain at or near the incision site. According to the previous history of abdominal surgery, clinical manifestations and ultrasound imaging, most cases can be diagnosed prior to surgical intervention. Our observations indicate that patients with larger lesions present greater infiltration depths, frequently affecting the fascia and peritoneum, and are classified as type II and III AWE. Notably, type III lesions are associated with increased surgical complexity, a higher likelihood of requiring mesh and drainage tube placement and extended operative duration. Wide surgical excision including the surrounding fibrotic tissue is the main treatment of choice even for recurrent lesions and the overall postoperative recurrence rate is low.

Abbreviations

AWE, Abdominal wall endometriosis; ASE, Abdominal scar endometriosis; BMI, Body mass index; CT, Computed tomography; MRI, Magnetic resonance imaging; SD, Standard deviation; HR, Hazard ratio; CI, Confidence interval; FNA, Fine-needle aspiration; HIFU, High-intensity focused ultrasound; RFA, Radiofrequency ablation.

Data Sharing Statement

The datasets used during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Informed Consent

This study was in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of the First Affiliated Hospital, Zhejiang University School of Medicine (IIT20241610A). All patient data were anonymized and handled with strict confidentiality.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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