Original Article

Analysis of the effects of cystic cavity flushing with lidocaine during ultrasound-guided anhydrous ethanol sclerotherapy in the treatment of ovarian endometrioma

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Background: Ultrasound-guided anhydrous ethanol sclerotherapy (UGAES) is an effective treatment option for ovarian endometrioma-related pain and infertility. However, its use is limited by the fact that alcohol can sometimes cause unbearable abdominal pain. This study aimed to use different concentrations of lidocaine solution for cystic cavity flushing to assess its pain-relieving effect, and to investigate its effect on treatment efficacy and the degree of improvement in clinical symptoms.

Methods: This retrospective cohort study included 90 patients who underwent UGAES of ovarian endometriosis cysts from January 2022 to June 2024 at Zhejiang Hospital. The patients were allocated to the lidocaine group (comprising 61 patients) and the non-lidocaine group (comprising 29 patients) based on the use of lidocaine. The lidocaine group was further subdivided into four subgroups of 0.25%, 0.33%, 0.50%, and 1.00% depending on the concentration of lidocaine. Intraoperative pain scores (IPSs) were assessed by visual analogue scoring. At the three-month follow-up, the degree of improvement in clinical symptoms was assessed using the Clinical Symptom Scores (CSSs), and efficacy was assessed by repeat ultrasonography to calculate the cyst volume reduction ratio (VRR).

Results: A total of 90 cysts were collected from 90 patients (mean age: 29.50±6.58 years; range, 18–47 years). The patients in the lidocaine group had significantly lower IPSs than those in the non-lidocaine group [2 (IQR, 2, 3) *vs.* 4 (IQR, 3, 5), P<0.001]. At the three-month follow-up, the lidocaine group and the non-lidocaine group both had effective rates of 100%, and cure rates of 62.3% (lidocaine group) and 51.7% (non-lidocaine group), respectively, but the difference was not statistically significant (P>0.05). Nor were any statistically significant differences found between the patients' IPSs, CSSs, and cyst VRR in the lidocaine subgroup analysis (P>0.05).

Conclusions: The use of lidocaine in the intracavitary irrigation of cysts effectively reduces patients' intraoperative pain during UGAES. Different dilution concentrations of lidocaine did not have a significant effect on the therapeutic efficacy. These findings provide a new clinical strategy for pain management and may contribute to the improvement of patients' treatment experience.

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Introduction

Ovarian endometrioma (OMA) is common in women of reproductive age. It is regarded as a benign disease with malignant biological behavior, and it can seriously affect the quality of life and reproductive health of patients (1). OMA is the most common type of endometriosis, and it accounts for about 17–44% of endometriosis (2). Common clinical manifestations of the disease include dysmenorrhea, irregular menstruation, abnormal uterine bleeding, and infertility (3). Studies have also shown that OMA may increase the risk of malignancy (4,5).

At present, two methods are mainly used to treat OMA: medication and surgery (including laparoscopic and laparotomic surgery) (6); however, both methods have certain defects. For example, the medication needs to be taken for a long time, and has many side effects, and OMA may also recur if the medication is stopped. While surgery (including laparoscopic and laparotomic surgery) reduces the function of the ovarian reserve via the disruption of the normal ovarian cortex and the damage done during hemostasis, affecting female fertility (7).

Ultrasound-guided anhydrous ethanol sclerotherapy (UGAES) is becoming an increasingly popular choice, especially in patients with a low ovarian reserve. Previous studies have shown that UGAES and laparoscopic surgery have comparable results in terms of symptomatic relief and short-term recurrence (8-11). Studies have also shown that due to its minimally invasive nature, it does not cause irreversible damage to ovarian function, and does not affect the number of mature oocytes retrieved per cycle and clinical pregnancy rates during *in vitro* fertilization (12,13). Thus, UGAES is considered a promising treatment option for patients seeking to preserve ovarian function (14,15). Further, it has a number of advantages, including shorter hospitalization stays, lower costs, and fewer serious complications. It is now widely used in clinical practice and is especially favored by women of childbearing age, and those who have relapsed after treatment.

UGAES involves injecting a sclerosing agent into the cyst, which causes rapid protein denaturation of the cyst wall, resulting in the shrinkage or disappearance of the cyst (16). Anhydrous ethanol, a widely used sclerosing agent, is fast-acting and effective. However, alcohol-related adverse reactions are unavoidable. Complications related to alcohol have been reported after alcohol sclerotherapy, ranging from minor alcohol intoxication symptoms, such as flushing, nausea and vomiting, skin rash, and deep sleep, to major symptoms such as severe abdominal pain, epilepsy, and decreased blood pressure (17,18). According to reports, abdominal pain requiring analgesics is the most common adverse event and has an incidence as high as 19% (19,20). Many patients have to forgo ultrasound-guided sclerotherapy due to severe abdominal pain. Thus, there are still some potential limitations in its application (21).

Due to the irritating nature of alcohol, it can cause severe abdominal pain in patients (22). To address this issue, many researchers have employed general anesthesia. General anesthesia can be effective in relieving intraoperative pain in patients; however, this approach is often accompanied by higher costs and greater potential risks (23). Thus, we innovatively used lidocaine for intracapsular flushing based on local infiltration anesthesia. Lidocaine is a cost-effective alternative with fewer side effects. This approach ensures patient comfort while avoiding unnecessary financial burden and risk associated with general anesthesia (24,25).

In this study, based on the volume of the cyst, different concentrations of lidocaine solution were used for cystic cavity irrigation before UGAES. We sought to investigate whether intracapsular lidocaine irrigation relieves intraoperative pain in patients with OMA and whether it affects the therapeutic outcome. We present this article in accordance with the STROBE reporting checklist (available at https://qims.amegroups.com/article/view/10.21037/qims-24-2072/rc).

Methods

Study design

Ethical statement

The study was conducted in accordance with the

Declaration of Helsinki (as revised in 2013). The study was approved by the Institutional Review Board of Zhejiang Hospital (No. 2024 11G), and written informed consent was obtained from all the participants.

Research design

This study adopted a retrospective cohort design to examine the effects of cystic cavity irrigation with lidocaine on intraoperative pain relief and the long-term therapeutic outcome of UGAES. This design was chosen because it is suitable for investigating outcomes over time.

Study participants

The data of patients who underwent UGAES at the Department of Ultrasound, Zhejiang Hospital, from January 2022 to June 2024 and whose cyst contents were pathologically confirmed to be OMA were retrospectively collected. To be eligible for inclusion in the study, the patients had to meet the following inclusion criteria: (I) age ≥18 years; (II) have cysts concordant with endometrioma; (III) have symptomatic cysts associated with endometriosis (i.e., dysmenorrhea, infertility, dyspareunia, and lower abdominal, or pelvic pain); and (IV) have single and unilocular OMA with a maximum diameter of ≥4 cm confirmed by ultrasound. Patients with a history of gynecological malignancy, hormone therapy, or pregnancy before or within three months of surgery, and/or those lost to follow-up were excluded from the study. The patients experienced similar pain that was confirmed (by either symptoms, physical examination, or appropriate serologic or imaging tests) to be caused by pelvic inflammatory disease, pelvic venous stasis, malignancy, or ectopic pregnancy were also excluded.

The patients were divided into the lidocaine group (comprising 61 patients) and the non-lidocaine group (comprising 29 patients) based on the use of lidocaine. The patients in the lidocaine group were further subdivided into four subgroups of 0.25% (comprising 15 patients), 0.33% (comprising 16 patients), 0.50% (comprising 17 patients), and 1.00% (comprising 13 patients) based on the lidocaine concentration (*Figure 1*).

Data collection and follow-up period

All the patients were followed up for three months after UGAES. The recorded study variables were demographic and clinical data and information, including cyst volume, intraoperative pain scores (IPSs) (26), and Clinical Symptom Scores (CSSs) (27,28). The data were collected before and three months after UGAES. Patients lost to follow-up were excluded from the analysis.

Equipment and materials

The GE-LOGIQ E11 ultrasound scanner (General Electric Healthcare Co., Wauwatosa, WI, USA) with a probe frequency of 1.5–6.0 MHz was used to examine the patients. UGAES used a 6F-Straight Drainage Catheter (DIALL Medical Technology. Co., Zhengzhou, China). Hardner, a dehydrated alcohol injection [C_2H_6O ≥96.8% (g/g)], was provided by SINOPHARM Co. (Anhui, China). The lidocaine hydrochloride injection was provided by KELUNPHARM. Co. (Hunan, China).

UGAES combined with the intracapsular lidocaine irrigation of cysts

Before UGAES, ultrasonography and contrast-enhanced ultrasonography were performed to clarify the cyst location, size, intracapsular septum, blood flow signals in the cyst, and availability of safe pathways for puncture (*Figure 2*).

All OMAs were treated using the catheter method (29) by two qualified doctors. First, the patient underwent disinfection, draping, and local infiltration anesthesia by 1% lidocaine at the puncture site instead of general anesthesia. A disposable 6F-direct drainage catheter was then placed into the cyst under ultrasound guidance, avoiding vital organs and blood vessels (*Figure 3A*). Throughout the operation, the lateral hole of the catheter was located entirely in the cyst.

Second, following complete aspiration of the chocolate-colored content, the aspirated OMA volume was recorded (*Figure 3B*). All liquids were sent for pathological analysis. Immediately after the complete cyst content removal was confirmed by ultrasound, the cyst was flushed with saline solution until a clear liquid was obtained.

Third, depending on the aspirated OMA volume, 5 mL of the 2% lidocaine hydrochloride injection solution was diluted into 40 mL (0.25%), 30 mL (0.33%), 20 mL (0.50%), or 10 mL (1%) (30). The larger the size of the cyst, the lower the diluted concentration of lidocaine. For example, 10 mL (1%) of lidocaine was used for an aspirated OMA volume <70 mL, 20 mL (0.50%) of lidocaine was used for an aspirated OMA volume between 70–140 mL, 30 mL (0.33%) was used for an aspirated OMA volume between 140–210 mL, and 40 mL (0.25%) was used for an

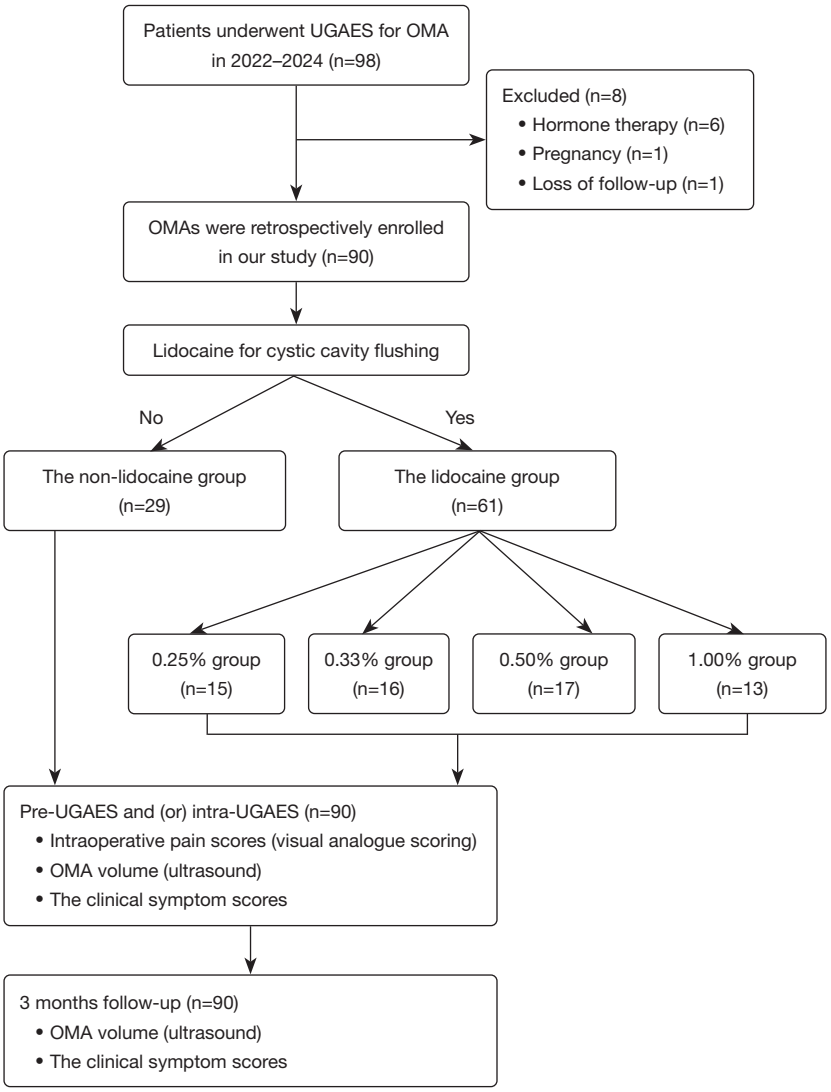


Figure 1 Study flowchart. OMA, ovarian endometrioma; UGAES, ultrasound-guided anhydrous ethanol sclerotherapy.

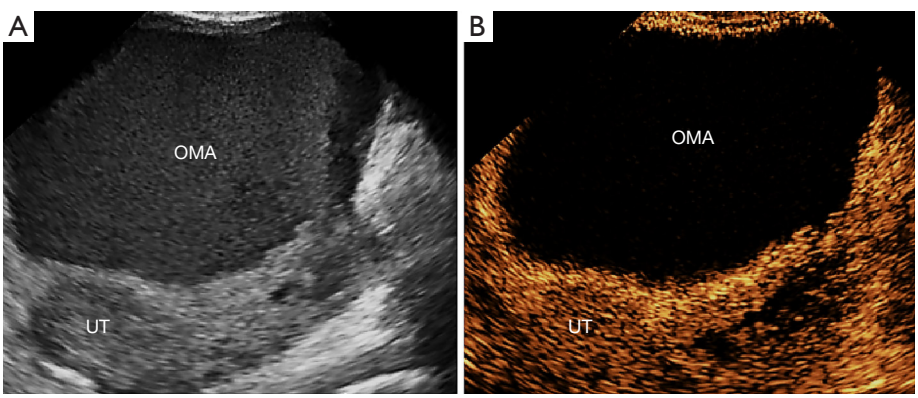


Figure 2 Preoperative evaluation of OMA. (A) Ultrasonography showed a smooth-wall cyst with no bulges, intracapsular separation, and blood flow signals. (B) Contrasted-enhanced ultrasonography showed safe pathways for puncture. OMA, ovarian endometrioma; UT, uterus.

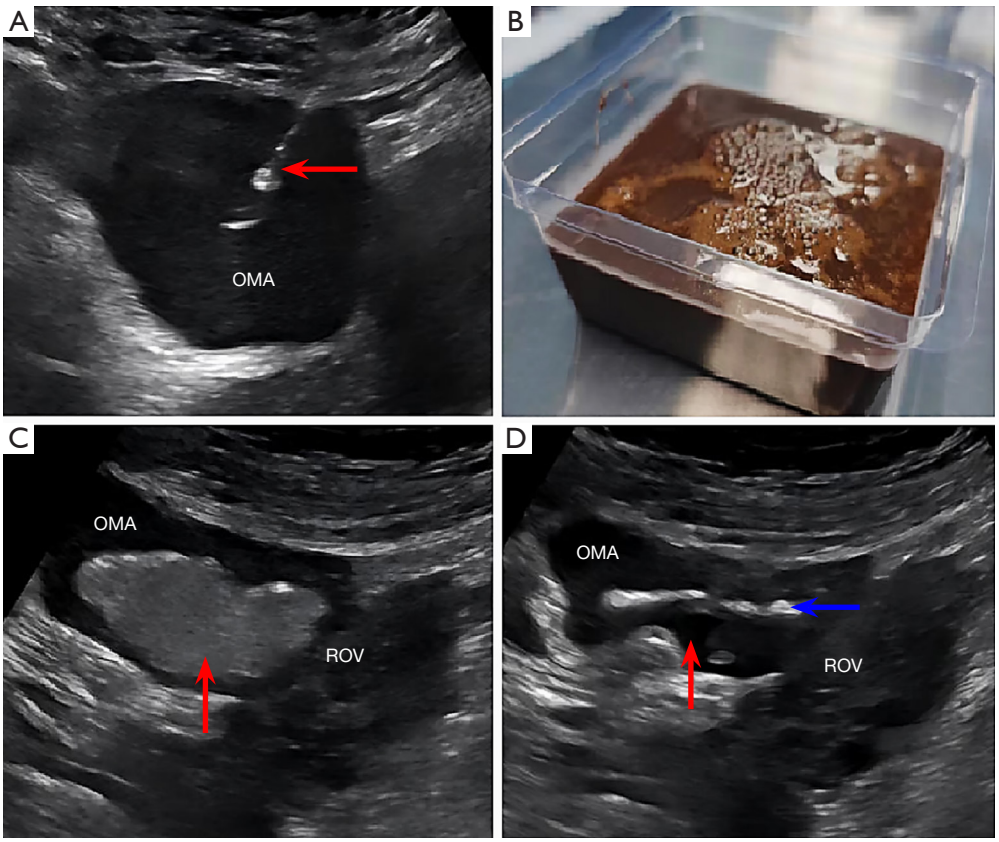


Figure 3 Demonstration of UGAES combined with the intracapsular lidocaine irrigation of cysts. (A) The 6F-catheter was placed inside the cyst through a safe pathway. The arrow indicates the tip of the catheter. (B) The chocolate-colored content was completely aspirated through the catheter. (C) Diluted lidocaine was injected into the cystic cavity. The arrow indicates nebulous echoes with a swirling motion at the tip of the catheter. (D) The cystic cavity disappeared after UGAES, and the 6F-catheter was removed. The red arrow indicates the edematous cyst wall, and the blue arrow indicates artifacts caused by air in the cystic cavity. OMA, ovarian endometrioma; ROV, right ovary; UGAES, ultrasound-guided anhydrous ethanol sclerotherapy.

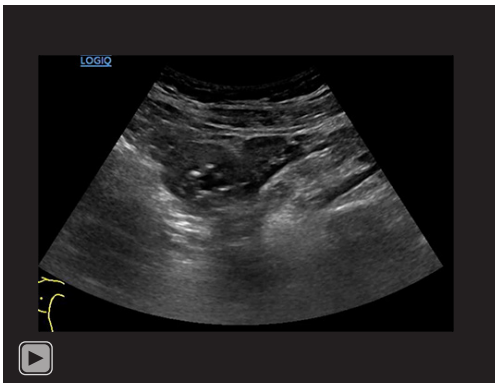
for aspirated OMA volume >210 mL. Diluted lidocaine was injected into the cystic cavity and withdrawn after repeated rinsing for 2 minutes to ensure adequate contact with the cystic wall (*Figure 3C*).

Finally, 96.8% ethanol was injected at one-fifth of the initial cyst volume (ICV) to avoid overexpansion or rupture of the cyst resulting in ethanol leakage into the pelvis. And the maximum dosage was less than 40 mL. The amount of ethanol in each flush was recorded. The ethanol was kept in the cyst for 15 minutes and then withdrawn, and the process was repeated twice. The ethanol was then pumped out, and the drainage catheter was removed. Local pressure was applied to stop bleeding at the end of treatment (*Figure 3D*) (*Video 1*).

Observation indicators

IPSs

The IPSs were recorded immediately after treatment. Visual analogue scoring was used to express the degree of pain as a number on a scale ranging from 0 to 10 (on which 0 represents no pain; 1–3 represents mild pain, which can be tolerated by the patient but does not affect their normal work and life; 4–6 represents moderate pain, which affects the patient's work, but not their life, and may affect their sleep; and 7–10 represents severe pain, which cannot be tolerated by the patient and may affect their work and life, and in severe cases may be accompanied by autonomic disorders or passive body position).



Video 1 UGAES combined with the intracapsular lidocaine irrigation of cysts. UGAES, ultrasound-guided anhydrous ethanol sclerotherapy.

CSSs

Before UGAES and three months after UGAES, five items (i.e., dysmenorrhea, painful intercourse, menstrual abnormalities, pelvic pain, and other symptoms, such as cyclic urinary frequency, urgency, pain of urination) were scored on a scale ranging from 0 to 3 (where 0 represents no pain; 1 represents a slight pain that can be tolerated; 2 represents the pain that interferes with sleep, but can still be tolerated, and 3 represents strong pain that is difficult to tolerate). All five scores were summed together, and the higher the score, the more severe the clinical symptoms.

Efficacy evaluation

Participants were routinely followed up with ultrasound at three months after UGAES to monitor changes in three diameters (a, b, and c) and volume (V), as well as recurrence. The ICV and final cyst volume (FCV) were calculated using Eq. [1], which is expressed as:

$$V\left(cm^3\right)=\frac{\pi\times a\times b\times c}{6} \quad [1]$$

The change in OMA volume was expressed as the volume reduction ratio (VRR) and was calculated using Eq. [2], which is expressed as:

$$VRR(\%)=\frac{ICV-FCV}{ICV}\times 100\% \quad [2]$$

A cure was defined as a VRR >90%, a significant effect was defined as a VRR between 50% and 90%, and an ineffective effect was defined as a VRR <50% or as an increase in the maximum diameter of the cyst. The combination of cure and significant effect was defined as the total effective rate (TER). The cure rate (CR) was calculated as follows:

$$CR(\%)=\frac{Cure\ cases}{All treated\ cases}\times 100\% \quad [3]$$

The TER was calculated as follows:

$$TER(\%)=\frac{Total\ effective\ cases}{All treated\ cases}\times 100\% \quad [4]$$

Statistical analyses

All the statistical analyses were performed using IBM SPSS Statistics 29.0 (IBM Corp., Armonk, NY, USA). The normally distributed continuous variables are expressed as the mean ± standard deviation ($\bar{x}\pm s$), and the independent samples *t*-test was employed for between-group comparisons, while the paired samples *t*-test was used for within-group comparisons. The non-normally distributed continuous variables are presented as the median (Q1, Q3), and between-group comparisons were conducted using the Mann-Whitney *U* test, while multiple group comparisons were performed using the Kruskal-Wallis *H* test. The categorical variables are expressed as the frequency (percentage), and between-group comparisons were analyzed using the chi-square test. Additionally, a multiple regression analysis was conducted to explore the relationships among variables and their effects on outcomes. A P value <0.05 was considered statistically significant.

Post-hoc analysis

All the statistical analyses were performed using PASS 21.0 (NCSS Corp., Kaysville, UT, USA). In this study, the IPS was used as the primary outcome indicator to estimate the sample size. When the sample size of the lidocaine group and the non-lidocaine group were 61 and 29, respectively, the test effectiveness was greater than 90% as calculated by the two-sample *t*-tests allowing unequal variance (the significance level α was set at 0.05). Therefore, the final sample size included in this study was sufficient to ensure the robustness and accuracy of the findings.

Results

From January 2022 to June 2024, a total of 98 patients were considered for inclusion in the study, but eight were excluded from the study. The reasons for exclusion were hormone therapy (n=6), pregnancy (n=1), and loss to follow-

Table 1 Comparison of the baseline data between the lidocaine and non-lidocaine groups

Variable	Lidocaine group (n=61)	Non-lidocaine group (n=29)	*t* (*Z*)	P
Age (years)	29.49±6.40	29.52±7.07	–0.017	0.986
ICV (cm^3)	278.64 (171.10, 377.36)	268.60 (168.43, 389.76)	–0.073†	0.645
CSS (score)	8.90±2.62	9.17±2.30	–0.476	0.635
LDC (cm)	7.84±1.88	7.93±1.94	–0.210	0.834
NSF (pieces)	7.59±2.23	7.41±2.53	0.336	0.738
AMH (ng/mL)	3.18±1.50	2.97±0.96	0.696	0.488
CA125 (U/mL)	59.65±31.35	58.10±32.30	0.218	0.828

Data are presented as the median (Q1, Q3), or the mean ± standard deviation. †, *Z* value. AMH, anti-mullerian hormone; CSS, Clinical Symptom Score; CA125, carbohydrate antigen 125; ICV, initial cyst volume; LDC, longest diameter of cyst; NSF, number of sinus follicles.

Table 2 Comparison of the postoperative data between the lidocaine and non-lidocaine groups

Variable	Lidocaine group (n=61)	Non-lidocaine group (n=29)	*Z*	P
Aspirated OMA volume (mL)	138 (85, 186)	133 (83, 193)	–0.069	0.945
Amount of ethanol flush per session (mL)	20 (15, 30)	20 (15, 30)	–0.424	0.671
IPS (score)	2 (2, 3)	4 (3, 5)	–6.777	<0.001***
CSS (score)	3 (2, 4)	3 (2, 4)	–0.942	0.346
FCV (cm^3))	20.16 (14.26, 36.12)	25.08 (20.10, 46.41)	–1.36	0.174
VRR (%)	92 (86, 95)	90 (84, 93)	–1.84	0.066

Data are presented as the median (Q1, Q3). ***, significant difference (P<0.001). CSS, Clinical Symptom Score; FCV, final cyst volume; IPS, intraoperative pain score; OMA, ovarian endometrioma; VRR, volume reduction ratio.

up (n=1). The remaining patients (n=90) were allocated to the non-lidocaine group (comprising 29 patients) and the lidocaine group (comprising 61 patients) based on the use of lidocaine. The final analysis included 90 participants with 90 lesions, who had a mean age of 29.5 years (range, 18–47 years). The baseline participant and lesion characteristics are presented in *Table 1*. No statistically significant differences were found between the lidocaine and non-lidocaine groups in terms of the baseline participant and lesion characteristics (P>0.05).

In terms of the IPS, intraoperative abdominal pain relief was more pronounced in the lidocaine group [2 (IQR, 2, 3)] than the non-lidocaine group [4 (IQR, 3, 5)], and the difference was statistically significant (*Z*=–6.777, P<0.001) (*Table 2*). After correcting for age, the ICV, and the preoperative CSS, the IPS in the lidocaine group was 2.576 points lower than that in the non-lidocaine group (95% confidence interval: 1.122–4.029, P<0.05).

The CSSs of the patients in both groups improved significantly following treatment. The statistical analysis revealed substantial reductions in the CSSs, with the lidocaine group showing a marked decrease (*Z*=–9.124, P<0.001), and the non-lidocaine group also exhibiting significant improvement (*Z*=–6.537, P<0.001). There was no statistically significant difference between the postoperative CSSs of the two groups (*Z*=–0.942, P>0.05) (*Table 2*).

At the three-month follow-up, the cyst volume was reduced in both the lidocaine and non-lidocaine groups. The median cyst volume decreased from 278.64 (171.10, 377.36) cm^3 to 20.16 (14.26, 36.12) cm^3 in the lidocaine group, and 268.60 (168.43, 389.76) cm^3 to 25.08 (20.10, 46.41) cm^3 in the non-lidocaine group. The median VRRs were 92% (86%, 95%) and 90% (84%, 93%) in the lidocaine and non-lidocaine groups, respectively, while the mean cyst VRRs were 89.43%±8.02% and 88.03%±5.57%, respectively. In our study, no recurrence was observed. The TER was 100% (90/90), while the CR was 62.3% (38/61) in the lidocaine group and 51.7% (15/29) in the non-lidocaine

Table 3 Comparison of the TERs and CRs between the two groups

Treatment outcome	Lidocaine group (n=61)	Non-lidocaine group (n=29)	χ^2	P
Cure (n=53)	38 (62.3%)	15 (51.7%)	0.907	0.341
Significant effect (n=37)	23 (37.7%)	14 (48.3%)		
Ineffective effect (n=0)	0	0		
TER	61 (100%)	29 (100%)		

CR, cure rate; TER, total effective rate.

Table 4 Comparison of pain scores of lidocaine solutions with different concentrations

Group	ICV (cm^3)	IPS (score)	CSS (score)	VRR (%)
0.25% (n=15)	318.40 (261.24, 341.68)	2 (2, 2.5)	3 (2, 4)	93 (86, 94)
0.33% (n=16)	171.20 (164.74, 192.43)	2 (2, 3)	3 (3, 4)	93 (88, 94)
0.50% (n=17)	104.78 (91.73, 110.32)	2 (2, 3)	3 (2, 3)	92 (89, 95)
1.00% (n=13)	52.65 (48.22, 64.18)	3 (2, 3)	4 (3, 4)	87 (83, 93)
H	5.164	2.214	0.685	1.788
P	<0.001***	0.529	0.877	0.618

Data are presented as the median (Q1, Q3). ***, significant difference (P<0.001). CSS, Clinical Symptom Score; ICV, initial cyst volume; IPS, intraoperative pain score; VRR, volume reduction ratio.

group; the difference was not statistically significant (P>0.05) (*Table 3*).

Multiple comparisons were made between the four lidocaine subgroups, but no statistically significant differences were found in terms of the IPS (*H*=2.214, P>0.05), CSS (*H*=0.685, P>0.05), and cyst VRR (*H*=1.788, P>0.05) in the presence of the statistically significant difference in the ICV (*Table 4*).

Discussion

Endometriosis is a chronic systemic disease that affects a wide range of women of all ages, and presents with various clinical features. Ultrasound-guided cyst sclerotherapy, as one of the most commonly used treatments, has been used globally for many years since its introduction. However, issues, such as severe abdominal pain during treatment, has limited its clinical application. Thus, methods for alleviating intraoperative pain are essential to improve the intraoperative experience and enhance the success of the treatment. In this study, we made three main findings.

First, the intracavitary irrigation of OMA with lidocaine significantly reduced patients' IPSs, thus confirming the effectiveness of lidocaine in relieving alcohol-induced irritant pain. Lidocaine is widely used to relieve pain after minor surgeries or invasive procedures, such as biopsies, minor excisions, or dental surgery. It can be used in different ways (i.e., via injection, inhalation, or as a topical agent) to provide anesthesia (31). Yang *et al.* (32) found that pre-emptive intra-lesional anesthesia with lidocaine during ethanol sclerotherapy of venous malformations was effective in relieving intraoperative pain even without general anesthesia. In the treatment of OMA, the ethanol injected into the cyst can cause chemical irritation to the cyst wall, leading to a local inflammatory response. This inflammatory response activates nerve endings around the OMA, which causes pain. When lidocaine is injected into the OMA, it will rapidly act on the surrounding nerve endings, blocking the sodium channels in the nerve cell membranes and preventing the generation and conduction of nerve impulses. In this way, pain signals cannot be transmitted to the central nervous system, and pain can be effectively relieved (33).

The selection of drugs for intracapsular flushing was carefully considered. The local anesthetics commonly used are lidocaine, procaine, and ropivacaine. Procaine has a fast onset of action, but only lasts for about 1 hour and carries a risk of allergy (34). Ropivacaine has a good

effect and can lasts for 3 to 6 hours, but it takes at least 8 to 20 minutes to work (35). Lidocaine is the first choice for sclerotherapy because of its fast onset of action (about 1–3 minutes), few adverse effects, and long duration of action (about 3 hours), which was enough to cover the entire procedure (36). Therefore, we tried lidocaine intracapsular flushing combined with local infiltration anesthesia, and its use was ultimately supported by the data of this study.

Second, UGAES combined with the intracapsular lidocaine irrigation of cysts did not affect the treatment outcome. The rates of cyst reduction three months after UGAES in the lidocaine group versus the non-lidocaine group were 92% (86%, 95%) and 90% (84%, 93%), respectively. This is consistent with previous research findings (37). Moreover, previous studies have shown that whenever factors exist that affect the adequate interaction of the sclerosing agent with the capsule wall, they may affect the final therapeutic outcome. These influences include low hardener concentration, and a retention time ≤10 minutes (38). However, since there is no standardized procedure for the operation of UGAES, in our study it was decided to set the duration of sclerotherapy at 15 minutes (39), and to drain all the fluid inside the cyst adequately after lidocaine irrigation, so that the adequate interaction of the sclerosing agent with the cyst wall was not compromised.

Third, different concentrations of 0.25%, 0.33%, 0.50%, and 1.00% for capsular flushing did not affect the pain relief or the effectiveness of the treatment. Determining the appropriate amount of lidocaine to use is a challenge. Generally speaking, the higher the concentration of lidocaine, the better the anesthesia effect, but overdose can lead to serious toxic side effects, such as cardiac arrest and respiratory depression (40). Conversely, if the dosage is too low, lidocaine may not be able to make full contact with all of the cystic wall, and the effect may be poor. The mean aspirated volume of the 90 cysts in this study was 169.78±13.00 mL, while the commonly used subcutaneous infiltration anesthetic preparation was 5 mL of 2% lidocaine (only 2.9% of the mean volume of the cysts). We decided to dilute the 2% lidocaine solution into 0.25%, 0.33%, 0.50%, and 1.00% based on the volume of the cysts. Thus, we used a highly innovative approach to flush the cystic cavity, and promising preliminary results were obtained. This observation has clinical significance, as it gives physicians more flexibility in their choices, allowing them to select the appropriate dilution ratio of lidocaine according to the size of the cyst to ensure the effectiveness of abdominal pain relief during UGAES, while avoiding any increased risk of unwanted toxic side effects without sacrificing efficacy.

This study had a number of limitations. It was a single-center retrospective study, and the sample size was small, which might have introduced selection bias. In addition, the follow-up period was short (three months), and the long-term effect of the treatment needs to be studied. Subsequent studies should increase the follow-up period, as well as the number of follow-up visits.

Conclusions

This study provides an innovative pain management strategy for UGAES, which greatly improves patients' tolerance to the procedure, while ensuring the effectiveness of the treatment. Future studies should seek to explore narcotic types, optimal dilution concentrations and dosages, and consider individual differences to offer targeted treatment plans.

Acknowledgments

None.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist (available at https://qims.amegroups.com/article/view/10.21037/qims-24-2072/rc).

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://qims.amegroups.com/article/view/10.21037/qims-24-2072/coif). The authors have no conflicts of interest to declare.

Ethical 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 Institutional Review Board of Zhejiang Hospital (No. 2024 11G), and written informed consent was obtained from all the participants.

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