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Experience of using transvaginal sclerotherapy in the treatment of ovarian endometriomas

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ABSTRACT

BACKGROUND: Ethanol sclerotherapy is an effective and a safe surgical treatment method for ovarian endometrioma (OMA). Destruction with 95% ethanol solution of the capsule allows minimal impact on the ovarian reserve. However, this method should be thoroughly evaluated for the possibility to be used more frequently in practice.

AIM: To determine the indications for the use of transvaginal sclerotherapy in surgical treatment of OMA.

MATERIAL AND METHODS: Between October 2021 and October 2023, 17 patients with OMA were operated at the Moscow Regional Research Institute of Obstetrics and Gynecology, with sclerotherapy performed by transvaginal access. Clinical manifestations included pelvic pain (76.4%), dysmenorrhea (82.3%), dyspareunia (47.0%), bowel symptoms (35.3%), polymenorrhea (47.0%), and infertility (64.7%). Eleven (64.7%) of the patients had been previously operated because of OMA.

RESULTS: Postoperative anti-Mullerian hormone (AMH) levels were slightly reduced (mean difference before and after the surgery was 0.47 ng/ml). The mean antral follicle count in the both ovaries were 10.8 before surgery and 8.6 after surgery. The volume of the ovary decreased from 2 to 6 times after sclerotherapy of the endometrioma. Symptoms recurred in four women. Six (35.2%) recurrences of endometrioma were noted with ultrasound control after 3, 6, and 12 months postoperatively. Endometrioid detritus in the cyst capsule was not detected in 64.8% of cases.

CONCLUSION: Preliminary results indicates the use of sclerotherapy by transvaginal access with ultrasound control for the treatment of endometriomas in women of reproductive age and patients planning pregnancy by ART with any level of ovarian reserve and recurrent, previously histologically confirmed, symptomatic endometriomas in women of reproductive age with no plans for pregnancy presently with a reduced ovarian reserve (AMH <1.2 ng/ml) and with any level of ovarian reserve but with symptomatic endometrioma in the preserved ovary. Transvaginal access is applicable for symptomatic endometriomas in women who had undergone several operations in the past.

Keywords: endometrioma; infertility; surgical treatment of endometriomas; assisted reproductive technology.

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Опыт применения трансвагинальной аспирационно-пункционной склеротерапии в лечении эндометриом яичников

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АННОТАЦИЯ

Обоснование. Аспирационно-пункционная склеротерапия является эффективным и безопасным методом хирургического лечения эндометриоидных кист яичников. Деструкция капсулы 95% этанолом позволяет минимально воздействовать на фолликулярный аппарат яичника. Методика требует тщательной оценки для возможности более частого применения на практике.

Цель. Определение показаний для применения методики аспирационно-пункционной склеротерапии трансвагинальным доступом в хирургическом лечении эндометриом яичников.

Материал и методы. С октября 2021 г. по октябрь 2023 г. на базе Московского областного научно-исследовательского института акушерства и гинекологии им. акад. В.И. Краснопольского 17 пациенткам в качестве лечения эндометриом яичников провели аспирационно-пункционную склеротерапию. Доминантными жалобами при поступлении в стационар являлись хроническая тазовая боль, наиболее часто обостряющаяся в середине менструального цикла (76,4%), дисменорея (82,3%), диспареуния (47,0%), кишечные жалобы (35,3% — в основном частый жидкий стул в дни менструации), полименорея (47,0%). Репродуктивные планы имели 13 из 17 женщин. У 11 (64,7%) пациенток зарегистрировано бесплодие. Ранее по поводу эндометриоза яичников были оперированы 11 пациенток.

Результаты. Анализ динамики уровня антимюллерова гормона (АМГ) до и после операции показал его незначительное снижение (средняя разница до и после оперативного лечения составила 0,47 нг/мл). Среднее число антральных фолликулов в обоих яичниках при сонографии до операции составило 10,8, после операции выявлено его снижение до 8,6. Отмечено снижение объёма яичника после проведённого склерозирования эндометриомы от 2 до 6 раз. Возобновление симптоматики отмечено у 4 пациенток. При наблюдении через 3, 6 и 12 мес. после оперативного лечения при контрольной сонографии эндометриомы сохранялись в 6 (35,2%) случаях. Отсутствие эндометриоидного детрита в просвете капсулы кисты выявлено у 64,8% пациенток.

Заключение. Предварительные результаты исследования позволяют выделить следующие категории пациенток, которым может быть рекомендована аспирационно-пункционная склеротерапия трансвагинальным доступом под контролем УЗИ в качестве хирургического лечения эндометриом яичников: пациентки репродуктивного возраста с любым уровнем овариального резерва, планирующие беременность при помощи вспомогательных репродуктивных технологий; пациентки репродуктивного возраста со сниженным овариальным резервом (АМГ <1,2 нг/мл), не планирующие беременность в ближайшее время, с симптомными рецидивирующими, ранее гистологически подтверждёнными эндометриоидными кистами; пациентки с любым овариальным резервом, но с наличием симптомной эндометриомы в единственном сохранённом яичнике; пациентки без репродуктивных планов с симптомными эндометриомами и с осложнённым хирургическим анамнезом.

Ключевые слова: эндометриома; бесплодие; хирургическое лечение эндометриом; вспомогательные репродуктивные технологии.

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经阴道抽吸穿刺硬化疗法治疗卵巢子宫内膜瘤的经验

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摘要

论证。抽吸穿刺硬化疗法是手术治疗子宫内膜样卵巢囊肿的一种有效而安全的方法。用95%的乙醇破坏囊肿对卵巢的卵泡器影响最小。该方法需要仔细评估，以便在实践中更频繁地使用。

目的。确定经阴道穿刺抽吸硬化疗法在卵巢子宫内膜手术治疗中的适应症。

材料和方法。2021年10月至2023年10月期间，17名患者在 V.I. Krasnopolsky Moscow Regional Research Institute of Obstetrics and Gynecology 接受了抽吸穿刺硬化疗法，以治疗卵巢子宫内膜瘤。入院时的主要主诉是慢性盆腔疼痛，最常见的是在月经周期中期加重（76.4%）、痛经（82.3%）、性交困难（47.0%）、肠道不适（35.3%的人在月经日经常大便呈液体状）和多发性痛经（47.0%）。17 名妇女中有 13 人有生育计划。11名患者（64.7%）患有不孕症。此前，11名患者曾接受过卵巢子宫内膜异位症手术。

结果。手术前后抗苗勒氏激素水平动态分析显示其略有下降（手术治疗前后的平均差异为 0.47 ng/mL）。手术前，超声检查显示双侧卵巢前卵泡的平均数量为 10.8 个，手术后降至 8.6 个。子宫内膜异位症硬化后，卵巢体积减少了2至6倍。有4名患者的症状再次出现。在手术治疗后 3 个月、6 个月和 12 个月的随访中，有 6 例（35.2%）患者的子宫内膜异位症在超声波检查中仍然存在。64.8%的患者在囊肿腔内未发现子宫内膜异位症残留物。

结论。该研究的初步结果使我们能够确定以下类别的患者，这些患者可能会被建议在超声引导下经阴道穿刺抽吸硬化治疗作为卵巢子宫内膜的手术治疗：育龄期患者，卵巢有任何程度的储备功能，计划在辅助生殖技术的帮助下怀孕；育龄患者，卵巢储备功能减退（抗苗勒氏管激素＜1.2 ng/mL），近期内无怀孕计划，有症状的复发性子宫内膜样囊肿，既往经组织学证实； 有任何卵巢储备功能，但在唯一保留的卵巢中患有症状性子宫内膜瘤的患者；无生育计划，患有症状性子宫内膜瘤且手术史复杂的患者。

关键词：子宫内膜瘤；不孕症；子宫内膜瘤的手术治疗；辅助生殖技术。

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BACKGROUND

Several publications and guidelines have been dedicated to ovarian endometrioma treatment. Nevertheless, multiple issues concerning their surgical treatment strategies remain controversial and not completely understood. One of the primary objectives of treating this group of patients is to alleviate pain, improve fertility, or combine the two.

Laparoscopic enucleation of endometriomas, also known as the "stripping technique," is currently the primary surgical procedure employed for endometrioid ovarian cysts.

In contrast to other benign ovarian masses, the mere presence of endometrioma indicates a reduction in ovarian reserve in most patients [1]. P. Hughesdon proposed in 1957 that endometrioma be regarded as a pseudocyst whose capsule is formed by the progressive invagination of the ovarian cortex due to bleeding from the superficial implant [2]. There is frequently the presence of dense subepithelial adhesions between the ovarian tissue and the cyst capsule. The cortical layer of the ovary, which contains the majority of primordial follicles, may be inadvertently damaged by the surgeon when this pseudocapsule is removed in this setting. The microscopic data obtained during the resection of endometriomas with a thicker and therefore "easier to remove" capsule (2.1±0.8 mm) compared to those with a thinner wall (1.8±0.4 mm) is of particular interest. T. Hachisuga et al. reported that in all cysts with a thicker wall, normal ovarian stroma was attached to the resected side of the capsule and contained primordial follicles in 68.9% of cases. Conversely, no primary follicles were detected in endometriomas with a thinner capsule [3].

The level of antimüllerian hormone (AMH), which is synthesized by primordial follicles and is correlated with their frequency, is one of the factors that affect ovarian reserve. The reduction in AMH levels that occurs following the enucleation of ovarian endometriomas has been repeatedly verified in studies comparing the effects of endometrioid cyst excision with the removal of benign ovarian masses of other origins [4–6].

L. Muzii et al. reported that repeated ovarian surgery for endometriosis is associated with an elevated risk of diminished ovarian reserve [7].

To alleviate pain syndrome and enhance access to the follicles, surgical treatment prior to IVF is only advised for ovarian endometriomas greater than 3–4 cm in diameter, as per the clinical guidelines of the European Society of Human Reproduction and Embryology (ESHRE) (2013) and (2022) [8].

A recent review by S. Alshehre et al. revealed that the number of oocytes collected through transvaginal puncture was significantly reduced in females with endometrioid cysts compared with a control group of females with other types of infertility (tubal, uterine, male factor) [9]. M. Coccia et al. conducted a comparable study to investigate the impact of unilateral ovarian endometrioma on the efficacy of oocyte retrieval. The results indicated that fewer oocytes were extracted from ovaries affected by endometrioma than from healthy contralateral ovaries [10]. Furthermore, oocyte retrieval from endometrioma patients may have adverse effects such as detritus infiltration into the retrieved follicular fluid [11].

Due to the substantial ovarian trauma that is associated with diminished ovarian reserve using the stripping technique, alternate minimally invasive organ-sparing treatment techniques, such as aspiration puncture sclerotherapy, have emerged.

The first successful application of aspiration puncture sclerotherapy for treating ovarian endometriomas was reported by a group of Japanese authors in 1988. [12]. Ethyl alcohol is the most frequently employed sclerosing agent, as per G. Albanese et al. It is responsible for the destruction of the inner wall of the endometrioma pseudocapsule and its subsequent fibrosis [13]. Isolated destruction of the pseudocapsule has minimal effect on the follicular apparatus of the ovary and, in some cases, even contributes to an increase in ovarian reserve. S. Hsieh et al. demonstrated that the increase in AMH levels and antral follicle count (AFC) following endometrioma sclerotherapy may be linked to a reduction in the impact of the endometrioma on ovarian blood supply and follicular growth [14].

S. Vaduva et al. revealed a notable discrepancy in the decline of AMH levels between the endometrioma enucleation and aspiration puncture sclerotherapy groups. A decrease in AMH levels was observed in patients aged 20–29 years, with a decrease from 3.18 to 1.62 ng/mL and a decline from 2.38 to 1.16 ng/mL in patients aged 30–35 years. Following sclerotherapy, AMH levels declined from 3.24 to 3.05 ng/mL in patients aged 20–29 years and from 2.26 to 2.18 ng/mL in patients aged 30–35 years [15]. Conversely, J. Martinez-Garcia et al. detected no significant differences in pre- and postoperative AMH levels when examining the long-term results of ovarian sclerotherapy [16].

The primary details in the performance of the puncture were reflected in the publication by S. Yazbeck et al., who introduced many years of experience and systematization to the performance of this operation [17]. For instance, they identified the most suitable parameters for sclerosing endometriomas, constraining their diameter (20 to 65 mm) and number (maximum three), irrespective of whether they are unilateral or bilateral.

In 2021, a group of French authors presented the methodology for conducting endometrioma treatment through transvaginal access [18].

L. Miquel et al. indicated that performing aspiration puncture sclerotherapy prior to commencing an IVF program increased the probability of live births compared to a group of patients with endometriomas who did not undergo this procedure before IVF [19].

In a meta-analysis of eight publications, S. Alborzi et al. [20] discovered no significant differences in pregnancy rates between the four study groups. Patients who underwent

laparoscopic endometrioma enucleation and assisted reproductive technologies were categorized as Group 1. The pregnancy rate in this group was 38.3% (confidence interval (CI): 32.3–44.7). Group 2 consisted of patients who underwent only laparoscopic endometrioma removal, and the pregnancy rate was 43.8% (CI: 22.5–66.4). Group 3 comprised patients who underwent aspiration puncture sclerotherapy + assisted reproductive technology; the pregnancy rate in this group was 40.8% (CI: 27.7–54.6). Patients who underwent IVF without prior surgical treatment were included in Group 4; the pregnancy rate in this group was 32.0% (CI: 15.0–52.0%).

The assisted reproductive technology group exhibited the lowest pregnancy rate, which may be attributed to the difficulty in oocyte retrieval in the presence of endometrioma [20]. Comparable clinical indicators of pregnancy rate were reported by A. Cohen et al. However, the number of oocytes obtained was greater after endometrioma sclerotherapy than after laparoscopic cystectomy [21].

In a prospective comparative study by S. Yazbeck et al. [22], 31 patients with decreased ovarian reserve and recurrent endometriomas underwent transvaginal aspiration puncture sclerotherapy prior to assisted reproductive technology. Endometriomas recurred in 12.9% of cases on average 10 months after puncture. Subsequent publications by the authors demonstrated that a small amount of cystic content may persist for one month following the procedure and manifest as a residual endometrioma of irregular shape measuring less than 20 mm. The researchers concluded that this should not be regarded as a recurrence and does not necessitate any additional intervention [17].

A non-randomized study by A. Garcia-Tejedor et al. discovered that the risk of recurrence after sclerosing endometrioid cysts is directly correlated with ethanol exposure duration during the procedure. Currently, ethanol exposure for 10–15 minutes is effective, as the recurrence rate of ovarian endometriomas with such exposure was 5.9%, while it is nearly five times greater after stripping, at 28.6% [23]. In the study by J. Noma et al., the recurrence rate was 62.5% when the exposure time was less than 10 minutes and 9.1% when it was 10 minutes or more (P <0.01) [24]. The literature and our clinical experience indicate that incomplete evacuation of ethyl alcohol after the standard 10-minute exposure is the most appropriate and acceptable course of action. In a meta-analysis encompassing 18 studies from 1997 to 2015, the risk of recurrence of ovarian endometriomas was substantially lower in women who had ethanol retained in the endometrioma cavity compared with patients who underwent sclerotherapy for ten minutes followed by ethanol aspiration [21].

The meta-analysis also examined the most prevalent complications of ethanol sclerotherapy. These complications included abdominal pain (1.8–15.3%), postoperative fever (5.5%), alcohol intoxication (3.8%), and intracystic abscess in one study (2.0%).

Aim. This study aimed to determine the indications for employing transvaginal access for aspiration puncture sclerotherapy in the surgical management of ovarian endometriomas.

MATERIAL AND METHODS

The V.I. Krasnopolsky Moscow Regional Research Institute of Obstetrics and Gynecology conducted aspiration puncture sclerotherapy on 17 patients with ovarian endometriomas between October 2021 and October 2023. The mean age of the patients was 34 years. The sclerosing agent was 95% ethyl alcohol. The endometrioma was subjected to ethanol exposure for at least ten minutes. The aspirated endometrioid debris was sent for cytological examination in all patients; erythrocytes and squamous and glandular epithelium (endometrioid cells) cells were detected.

No intraoperative complications were observed during the transvaginal puncture of endometriomas.

The prominent complaints at the time of hospital admission were chronic pelvic pain, which was frequently aggravated during the middle of the menstrual cycle (76.4%), dysmenorrhea (82.3%), dyspareunia (47.0%), bowel complaints (35.3%, primarily frequent liquid stools on menstrual days), and polymenorrhea (47.0%). Thirteen of the seventeen females intended to start a family. Infertility was noted in 11 (64.7%) patients. Of these, four patients had primary infertility, while seven had secondary infertility. One patient had previously undergone laparoscopic puncture and sclerotherapy, and 11 patients had undergone surgery for ovarian endometriosis in the volume of endometrioma enucleation or ovarian resection. Preoperatively, eight women were receiving hormonal therapy. The ovarian lesions were unilateral in 11 patients and bilateral in six. The punctured endometrioma had a mean diameter of 46 mm.

Preoperative evaluation included evaluation of tumor marker levels (CA-125, HE4, and ROMA index), ovarian reserve status (blood AMH and ultrasound AFC), and hemodynamic features of ovarian blood flow.

RESULTS

A modest decrease in the AMH levels was observed in the analysis of its dynamics before and after surgery (the average difference before and after surgical treatment was 0.47 ng/mL). Furthermore, two patients exhibited an increase in AMH levels following transvaginal puncture of endometrioma (1.41 ng/mL before surgery and 2.07 ng/mL after surgery in the first case; 0.38 ng/mL preoperatively and 0.8 ng/mL postoperatively in the second case).

Prior to surgery, the average number of antral follicles in both ovaries on sonography was 10.8, which decreased to 8.6 after surgery.

It was crucial to ascertain the dynamics of ovarian volume and blood flow, in addition to establishing the ultrasound

criteria for evaluating ovarian reserve. The average reduction in ovarian volume following endometrioma sclerotherapy was 2–6 times, depending on the diameter of the punctured cyst.

The blood flow velocity curves were assessed using the following indices: The peak systolic velocity (cm/s), which is indicative of the contractile activity and elasticity of the ovarian artery, increased from 13.58 to 15.8 cm/s on average following surgical treatment; the resistance index, i.e., the ratio of the difference between the maximum and minimum velocity to the maximum blood flow velocity, increased from 0.68 to 0.80 on average after sclerotherapy; the pulsatility index, i.e., the ratio of the difference between maximum systolic and end diastolic velocities to the average blood flow velocity, values of this index increased from 1.53 to 2.28.

In the postoperative period, antiretroviral hormonal therapy was administered to 13 out of 17 patients. Dienogest was administered to 12 (70.5%) of the patients, while one (5.8%) patient was administered an intrauterine system containing levonorgestrel. The duration of antiretroviral hormonal therapy was 3–12 months, followed by pregnancy planning. In the urgent IVF program, most patients underwent endometrial sclerosis as a preliminary procedure for oocyte aspiration.

The symptoms recurred in four patients at the conclusion of hormonal treatment.

Endometriomas persisted in six (35.2%) patients on control ultrasound examination of ovarian cysts during the follow-up period of three, six, and 12 months after surgical treatment. In 64.8% of patients, the control examination only detected the capsule of the sclerosed cyst without signs of endometrioid detritus.

It was observed on the ultrasound scan that the endometrioma pseudocapsule wall did not completely disappear following aspiration puncture sclerotherapy. It was identified as a hyperechogenic inclusion of irregular shape, and avascular on color Doppler.

On the first day after sclerotherapy, an anechogenic heterogeneous mass was observed in the endometrioma cavity on control ultrasound. This mass was most likely the residue of the injected sclerosant — ethyl alcohol. Iso- and hyperechogenic inclusions that corresponded to the sludge of endometrioid debris were also visualized.

Monographic control after 3, 6, and 12 months exhibited a reduction in the diameter of the endometrioma (usually it did not exceed 3 cm), disappearance of the previously visualized anechogenic component (sclerosant), and an increase in the hyperechogenicity of the disseminated content (debris).

DISCUSSION

The preliminary study results allow us to recognize several categories of patients for whom aspiration puncture sclerotherapy through transvaginal access under ultrasound control can be recommended as a surgical treatment for ovarian endometriomas. These include:

1. Patients of reproductive age with any level of ovarian reserve who are contemplating pregnancy employing assisted reproductive technologies. The optimal visualization of oocytes during perforation for the purpose of oocyte retrieval is likely influenced by the reduced volume of the ovary as a result of sclerosing the endometrioma. Furthermore, the absence of endometrioid debris has a favorable effect on the oocyte maturation rate, the quality of future embryos, and the pregnancy rate in IVF programs [9–11, 19, 20].

2. Patients of reproductive age with reduced ovarian reserve (AMH <1.2 ng/mL), who are not planning to conceive in the near future, with symptomatic, recurrent, previously histologically confirmed endometrioid cysts, and have any ovarian reserve but experience symptomatic endometrioma in the only preserved ovary. In the postoperative period, patients were recommended hormonal therapy to prevent recurrence of endometrioma if reproductive plans were not a priority.

3. Patients without reproductive plans with symptomatic endometriomas and a complex surgical history.

CONCLUSIONS

The experience we gained enabled us to establish the requirements for performing endometrioma sclerotherapy through a transvaginal approach. These include the following:

1. Absence of elevated levels of blood tumor markers (CA125, HE4, and ROMA index) and sonographic signs, considering that about 0.8% of all endometrioid ovarian cysts subsequently become malignant [25]. For endometriosis that exhibits a dynamic increase, a moderate increase in CA125 is considered acceptable [26, 27]. The sensitivity and specificity of transvaginal ultrasound in the differential diagnosis of endometriomas and other ovarian masses are 75–84% and 88–91%, respectively [28].

2. Endometriomas that range from 20 to 65 mm in diameter. To optimize the exposure of ethanol and the endometrial capsule lining and mitigate the risk of recurrence, larger diameter masses should preferably be sclerosed laparoscopically.

3. Absence of small (up to 20 mm) cysts surrounding the main endometrioma. Their minimal volume prevents puncture and further sclerosing. Endometriomas of this size should either be excised or coagulated during laparoscopy, as they have the potential to cause rapid recurrence and reduce the success of the surgery.

4. Sclerotherapy under anesthesia is the preferred treatment when there is evidence of multiple endometriomas (not more than 3) and single endometriomas of small size (less than 3 cm) combined with evidence of adhesions in retrocervical endometriosis, which makes transvaginal access difficult.

5. Informed, voluntary consent to undergo the procedure. It is imperative to provide the patient with a coherent explanation of the nuances of aspiration puncture sclerotherapy (for e.g., the lack of a stage involving the

excision of endometrioma pseudocapsule and the possibility of endometrioma recurrence). It was advised to conduct a control ultrasound examination on the first day following the operation to ascertain the diameter of the sclerosed ovarian endometrioma capsule and subsequently to monitor its size alterations.

6. Sufficient training of the sonographer to evaluate the potential of accessing the puncture needle through the posterior vaginal arch to avoid injury to adjacent organs (colon, bladder, and major vessels) and the development of infectious disease complications.

7. Equipment: Transvaginal probe guide, fine needle aspiration needle (17G), 20/50 ml syringe or aspiration system, 0.9% saline to liquefy endometrioid debris, and 95% ethyl alcohol. Occasionally, it is difficult to aspirate dense endometrioid debris during transvaginal puncture. We have discovered that forced injection of 0.9% saline into the cyst cavity can effectively dilute its contents, i.e., reduce the density of endometrioid debris and aid the aspiration process.

8. The endometrioma capsule should be exposed to ethanol for at least 10 minutes to reduce the recurrence rate. It is permissible to retain a small quantity of sclerosant in the endometrioma cavity.

9. Aspirated endometrioid debris should be submitted for cytologic examination considering the prevalent cancer protocols for any ovarian mass.

ADDITIONAL INFO

Authors' contribution. A.A. Popov — surgical treatment of the patient, literature review, writing the text and editing the article; M.R. Ovsiannikova — curation of patient, collection and analysis of literary sources, writing the text and editing the article; J.I. Sopova — surgical treatment of the patient, editing the article; A.A. Fedorov — surgical treatment of the patient, editing the article; V.V. Troshina — editing the article; E.V. Pelshe — laboratory diagnostics, editing the article; I.Yu. Ershova — editing the article. All authors confirm that their authorship meets the international ICMJE criteria (all authors made a substantial contribution to the conception of the work, acquisition, analysis, interpretation of data for the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work).

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REFERENCES

1. Chen Y, Pei H, Chang Y, et al. The impact of endometrioma and laparoscopic cystectomy on ovarian reserve and the exploration of related factors assessed by serum anti-Mullerian hormone: a prospective cohort study. *J Ovarian Res.* 2014;7:108. doi: 10.1186/s13048-014-0108-0
2. Hughesdon PE. The structure of endometrial cysts of the ovary. *J Obstet Gynaecol Br Emp.* 1957;64(4):481–487. doi: 10.1111/j.1471-0528.1957.tb06276.x
3. Hachisuga T, Kawarabayashi T. Histopathological analysis of laparoscopically treated ovarian endometriotic cysts with special reference to loss of follicles. *Hum Reprod.* 2002;17(2):432–435. doi: 10.1093/humrep/17.2.432
4. Somigliana E, Berlanda N, Benaglia L, et al. Surgical excision of endometriomas and ovarian reserve: a systematic review on serum antimüllerian hormone level modifications. *Fertil Steril.* 2012;98(6):1531–1538. doi: 10.1016/j.fertnstert.2012.08.009
5. Alborzi S, Keramati P, Younesi M, et al. The impact of laparoscopic cystectomy on ovarian reserve in patients with unilateral and bilateral endometriomas. *Fertil Steril.* 2014;101(2):427–434. doi: 10.1016/j.fertnstert.2013.10.019
6. Raffi F, Metwally M, Amer S. The impact of excision of ovarian endometrioma on ovarian reserve: a systematic review and meta-analysis. *J Clin Endocrinol Metab.* 2012;97(9):3146–3154. doi: 10.1210/jc.2012-1558
7. Muzii L, Achilli C, Lecce F, et al. Second surgery for recurrent endometriomas is more harmful to healthy ovarian tissue and ovarian reserve than first surgery. *Fertil Steril.* 2015;103(3):738–743. doi: 10.1016/j.fertnstert.2014.12.101
8. Dunselman GA, Vermeulen N, Becker C, et al. ESHRE guideline: management of women with endometriosis. *Hum Reprod.* 2014;29(3):400–412. doi: 10.1093/humrep/det457
9. Alshehre SM, Narice BF, Fenwick MA, Metwally M. The impact of endometrioma on in vitro fertilisation/intra-cytoplasmic injection IVF/ICSI reproductive outcomes: a systematic review and meta-analysis. *Arch Gynecol Obstet.* 2021;303(1):3–16. doi: 10.1007/s00404-020-05796-9
10. Coccia ME, Rizzello F, Barone S, et al. Is there a critical endometrioma size associated with reduced ovarian responsiveness in assisted reproduction techniques? *Reprod Biomed Online.* 2014;29(2):259–266. doi: 10.1016/j.rbmo.2014.04.019
11. Benaglia L, Busnelli A, Biancardi R, et al. Oocyte retrieval difficulties in women with ovarian endometriomas. *Reprod Biomed Online.* 2018;37(1):77–84. doi: 10.1016/j.rbmo.2018.03.020
12. Akamatsu N, Hirai T, Masaoka H, et al. Ultrasonically guided puncture of endometrial cysts-aspiration of contents and infusion of ethanol. *Nihon Sanka Fujinka Gakkai Zasshi.* 1988;40(2):187–191.
13. Albanese G, Kondo KL. Pharmacology of sclerotherapy. *Semin Intervent Radiol.* 2010;27(4):391–399. doi: 10.1055/s-0030-1267848
14. Hsieh CL, Shiau CS, Lo LM, et al. Effectiveness of ultrasound-guided aspiration and sclerotherapy with 95% ethanol for treatment of recurrent ovarian endometriomas. *Fertil Steril.* 2009;91(6):2709–2713. doi: 10.1016/j.fertnstert.2008.03.056
15. Vaduva CC, Dira L, Carp-Veliscu A, et al. Ovarian reserve after treatment of ovarian endometriomas by ethanolic sclerotherapy compared to surgical treatment. *Eur Rev Med Pharmacol Sci.* 2023;27(12):5575–5582. doi: 10.26355/eurrev_202306_32795
16. Martinez-Garcia JM, Candas B, Suarez-Salvador E, et al. Comparing the effects of alcohol sclerotherapy with those of surgery on anti-Müllerian hormone and ovarian reserve after endometrioma treatment. A prospective multicenter pilot cohort study. *Eur J Obstet Gynecol Reprod Biol.* 2021;259:60–66. doi: 10.1016/j.ejogrb.2021.01.027
17. Yazbeck C, Koskas M, Cohen Scali S, et al. Comment je fais… la sclérothérapie à l'éthanol d'un endométriome [How I do… ethanol sclerotherapy for ovarian endometriomas]. *Gynecol Obstet Fertil.* 2012;40(10):620–622. doi: 10.1016/j.gyobfe.2012.07.029
18. Miquel L, Preaubert L, Gnisci A, et al. Transvaginal ethanol sclerotherapy for an endometrioma in 10 steps. *Fertil Steril.* 2021;115(1):259–260. doi: 10.1016/j.fertnstert.2020.08.1422
19. Miquel L, Preaubert L, Gnisci A, et al. Endometrioma ethanol sclerotherapy could increase IVF live birth rate in women with moderate-severe endometriosis. *PLoS One.* 2020;15(9):e0239846. doi: 10.1371/journal.pone.0239846
20. Alborzi S, Zahiri Sorouri Z, Askari E, et al. The success of various endometrioma treatments in infertility: A systematic review and meta-analysis of prospective studies. *Reprod Med Biol.* 2019;18(4):312–322. doi: 10.1002/rmb2.12286
21. Cohen A, Almog B, Tulandi T. Sclerotherapy in the management of ovarian endometrioma: systematic review and meta-analysis. *Fertil Steril.* 2017;108(1):117–124. doi: 10.1016/j.fertnstert.2017.05.015
22. Yazbeck C, Madelenat P, Ayel JP, et al. Ethanol sclerotherapy: a treatment option for ovarian endometriomas before ovarian stimulation. *Reprod Biomed Online.* 2009;19(1):121–125. doi: 10.1016/s1472-6483(10)60055-7
23. Garcia-Tejedor A, Martinez-Garcia JM, Candas B, et al. Ethanol sclerotherapy versus laparoscopic surgery for endometrioma treatment: a prospective, multicenter, cohort pilot study. *J Minim Invasive Gynecol.* 2020;27(5):1133–1140. doi: 10.1016/j.jmig.2019.08.036
24. Noma J, Yoshida N. Efficacy of ethanol sclerotherapy for ovarian endometriomas. *Int J Gynaecol Obstet.* 2001;72(1):35–39. doi: 10.1016/s0020-7292(00)00307-6
25. Haraguchi H, Koga K, Takamura M, et al. Development of ovarian cancer after excision of endometrioma. *Fertil Steril.* 2016;106(6):1432–1437. doi: 10.1016/j.fertnstert.2016.07.1077
26. Sasamoto N, DePari M, Vitonis AF, et al. Evaluation of CA125 in relation to pain symptoms among adolescents and young adult women with and without surgically-confirmed endometriosis. *PLoS One.* 2020;15(8):e0238043. doi: 10.1371/journal.pone.0238043
27. Kvaskoff M, Mahamat-Saleh Y, Farland LV, et al. Endometriosis and cancer: a systematic review and meta-analysis. *Hum Reprod Update.* 2021;27(2):393–420. doi: 10.1093/humupd/dmaa045
28. Mais V, Guerriero S, Ajossa S, et al. The efficiency of transvaginal ultrasonography in the diagnosis of endometrioma. *Fertil Steril.* 1993;60(5):776–780. doi: 10.1016/s0015-0282(16)56275-x

СПИСОК ЛИТЕРАТУРЫ

1. Chen Y., Pei H., Chang Y., et al. The impact of endometrioma and laparoscopic cystectomy on ovarian reserve and the exploration of related factors assessed by serum anti-Mullerian hormone: a prospective cohort study // J Ovarian Res. 2014. Vol. 7. P. 108. doi: 10.1186/s13048-014-0108-0
2. Hughesdon P.E. The structure of endometrial cysts of the ovary // J Obstet Gynaecol Br Emp. 1957. Vol. 64, N 4. P. 481–487. doi: 10.1111/j.1471-0528.1957.tb06276.x
3. Hachisuga T., Kawarabayashi T. Histopathological analysis of laparoscopically treated ovarian endometriotic cysts with special reference to loss of follicles // Hum Reprod. 2002. Vol. 17, N 2. P. 432–435. doi: 10.1093/humrep/17.2.432
4. Somigliana E., Berlanda N., Benaglia L., et al. Surgical excision of endometriomas and ovarian reserve: a systematic review on serum antimüllerian hormone level modifications // Fertil Steril. 2012. Vol. 98, N 6. P. 1531–1538. doi: 10.1016/j.fertnstert.2012.08.009
5. Alborzi S., Keramati P., Younesi M., et al. The impact of laparoscopic cystectomy on ovarian reserve in patients with unilateral and bilateral endometriomas // Fertil Steril. 2014. Vol. 101, N 2. P. 427–434. doi: 10.1016/j.fertnstert.2013.10.019
6. Raffi F., Metwally M., Amer S. The impact of excision of ovarian endometrioma on ovarian reserve: a systematic review and meta-analysis // J Clin Endocrinol Metab. 2012. Vol. 97, N 9. P. 3146–3154. doi: 10.1210/jc.2012-1558
7. Muzii L., Achilli C., Lecce F., et al. Second surgery for recurrent endometriomas is more harmful to healthy ovarian tissue and ovarian reserve than first surgery // Fertil Steril. 2015. Vol. 103, N 3. P. 738–743. doi: 10.1016/j.fertnstert.2014.12.101
8. Dunselman G.A., Vermeulen N., Becker C., et al. ESHRE guideline: management of women with endometriosis // Hum Reprod. 2014. Vol. 29, N 3. P. 400–412. doi: 10.1093/humrep/det457
9. Alshehre S.M., Narice B.F., Fenwick M.A., Metwally M. The impact of endometrioma on in vitro fertilisation/intra-cytoplasmic injection IVF/ICSI reproductive outcomes: a systematic review and meta-analysis // Arch Gynecol Obstet. 2021. Vol. 303, N 1. P. 3–16. doi: 10.1007/s00404-020-05796-9
10. Coccia M.E., Rizzello F., Barone S., et al. Is there a critical endometrioma size associated with reduced ovarian responsiveness in assisted reproduction techniques? // Reprod Biomed Online. 2014. Vol. 29, N 2. P. 259–266. doi: 10.1016/j.rbmo.2014.04.019
11. Benaglia L., Busnelli A., Biancardi R., et al. Oocyte retrieval difficulties in women with ovarian endometriomas // Reprod Biomed Online. 2018. Vol. 37, N 1. P. 77–84. doi: 10.1016/j.rbmo.2018.03.020
12. Akamatsu N., Hirai T., Masaoka H., et al. Ultrasonically guided puncture of endometrial cysts-aspiration of contents and infusion of ethanol // Nihon Sanka Fujinka Gakkai Zasshi. 1988. Vol. 40, N 2. P. 187–191.
13. Albanese G., Kondo K.L. Pharmacology of sclerotherapy // Semin Intervent Radiol. 2010. Vol. 27, N 4. P. 391–399. doi: 10.1055/s-0030-1267848
14. Hsieh C.L., Shiau C.S., Lo L.M., et al. Effectiveness of ultrasound-guided aspiration and sclerotherapy with 95% ethanol for treatment of recurrent ovarian endometriomas // Fertil Steril. 2009. Vol. 91, N 6. P. 2709–2713. doi: 10.1016/j.fertnstert.2008.03.056
15. Vaduva C.C., Dira L., Carp-Veliscu A., et al. Ovarian reserve after treatment of ovarian endometriomas by ethanolic sclerotherapy compared to surgical treatment // Eur Rev Med Pharmacol Sci. 2023. Vol. 27, N 12. P. 5575–5582. doi: 10.26355/eurrev_202306_32795
16. Martinez-Garcia J.M., Candas B., Suarez-Salvador E., et al. Comparing the effects of alcohol sclerotherapy with those of surgery on anti-Müllerian hormone and ovarian reserve after endometrioma treatment. A prospective multicenter pilot cohort study // Eur J Obstet Gynecol Reprod Biol. 2021. Vol. 259. P. 60–66. doi: 10.1016/j.ejogrb.2021.01.027
17. Yazbeck C., Koskas M., Cohen Scali S., et al. Comment je fais… la sclérothérapie à l'éthanol d'un endométriome [How I do… ethanol sclerotherapy for ovarian endometriomas] // Gynecol Obstet Fertil. 2012. Vol. 40, N 10. P. 620–622. doi: 10.1016/j.gyobfe.2012.07.029
18. Miquel L., Preaubert L., Gnisci A., et al. Transvaginal ethanol sclerotherapy for an endometrioma in 10 steps // Fertil Steril. 2021. Vol. 115, N 1. P. 259–260. doi: 10.1016/j.fertnstert.2020.08.1422
19. Miquel L., Preaubert L., Gnisci A., et al. Endometrioma ethanol sclerotherapy could increase IVF live birth rate in women with moderate-severe endometriosis // PLoS One. 2020. Vol. 15, N 9. P. e0239846. doi: 10.1371/journal.pone.0239846
20. Alborzi S., Zahiri Sorouri Z., Askari E., et al. The success of various endometrioma treatments in infertility: A systematic review and meta-analysis of prospective studies // Reprod Med Biol. 2019. Vol. 18, N 4. P. 312–322. doi: 10.1002/rmb2.12286
21. Cohen A., Almog B., Tulandi T. Sclerotherapy in the management of ovarian endometrioma: systematic review and meta-analysis // Fertil Steril. 2017. Vol. 108, N 1. P. 117–124. doi: 10.1016/j.fertnstert.2017.05.015
22. Yazbeck C., Madelenat P., Ayel J.P., et al. Ethanol sclerotherapy: a treatment option for ovarian endometriomas before ovarian stimulation // Reprod Biomed Online. 2009. Vol. 19, N 1. P. 121–125. doi: 10.1016/s1472-6483(10)60055-7
23. Garcia-Tejedor A., Martinez-Garcia J.M., Candas B., et al. Ethanol sclerotherapy versus laparoscopic surgery for endometrioma treatment: a prospective, multicenter, cohort pilot study // J Minim Invasive Gynecol. 2020. Vol. 27, N 5. P. 1133–1140. doi: 10.1016/j.jmig.2019.08.036
24. Noma J., Yoshida N. Efficacy of ethanol sclerotherapy for ovarian endometriomas // Int J Gynaecol Obstet. 2001. Vol. 72, N 1. P. 35–39. doi: 10.1016/s0020-7292(00)00307-6
25. Haraguchi H., Koga K., Takamura M., et al. Development of ovarian cancer after excision of endometrioma // Fertil Steril. 2016. Vol. 106, N 6. P. 1432–1437. doi: 10.1016/j.fertnstert.2016.07.1077
26. Sasamoto N., DePari M., Vitonis A.F., et al. Evaluation of CA125 in relation to pain symptoms among adolescents and young adult women with and without surgically-confirmed endometriosis // PLoS One. 2020. Vol. 15, N 8. P. e0238043. doi: 10.1371/journal.pone.0238043

27. Kvaskoff M., Mahamat-Saleh Y., Farland L.V., et al. Endometriosis and cancer: a systematic review and meta-analysis // Hum Reprod Update. 2021. Vol. 27, N 2. P. 393–420. doi: 10.1093/humupd/dmaa045

28. Mais V., Guerriero S., Ajossa S., et al. The efficiency of transvaginal ultrasonography in the diagnosis of endometrioma // Fertil Steril. 1993. Vol. 60, N 5. P. 776–780. doi: 10.1016/s0015-0282(16)56275-x

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