Thieme

# Endometriosis and Fertility: A Practical Guide

## Results of the Working Group of the Weissensee 2025 Workshop of the Scientific Endometriosis Foundation

# Endometriose und Fertilität – eine praktische Handreichung

## Ergebnisse der Arbeitsgruppentagung Weissensee 2025 der Stiftung Endometriose Forschung



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## ABSTRACT

**Target Group**
Physicians interested in endometriosis and infertility as well as medical teams in reproductive medicine and endometriosis centers.

**Objective**
A practical guide for clinical decision-making. This guide was compiled by the working group at the 2025 Weissensee Workshop of the Scientific Endometriosis Foundation. The contents are based on the available evidence regarding fertility and endometriosis and, where this was lacking, on the authors' clinical experience. It is intended as a guide for persons responsible for caring and treating patients with this condition in everyday clinical practice. This work is explicitly not intended to be a guideline as the authors were not commissioned to draft a guideline. Rather, its aim is to provide quality care in clinical practice, avoid unnecessary or potentially harmful measures, and establish the optimal therapy for individual patients.

## ZUSAMMENFASSUNG

**Zielgruppe**
An Endometriose und Sterilität interessierte Ärzte sowie das Behandlungsteam in Reproduktions- und Endometriosezentren.

**Ziel**
Handreichung für klinische Entscheidungen. Die vorliegende Arbeit ist das Ergebnis einer Arbeitsgruppe, die sich bei der Weissensee-Tagung 2025 der Stiftung Endometriose Forschung zusammengefunden hat. Grundlage war die verfügbare Evidenz zum Thema Fertilität, und, wo sie gefehlt hat, die klinische Erfahrung der Autorinnen und Autoren. Der Text ist gedacht als Handreichung für alle, die im klinischen Alltag Verantwortung für Patientinnen mit dieser Erkrankung tragen. Explizit nicht gedacht ist der Text als Vorgabe im Sinne einer Leitlinie, zumal hierzu die Autorinnen und Autoren nicht berufen sind. Vielmehr verfolgt er das Ziel, die Qualität des Vorgehens zu sichern und dadurch unnötige oder möglicherweise schädliche Maßnahmen möglichst zu vermeiden und für die individuelle Patientin die optimale Therapie festzulegen.

## Abbreviations

| | |
|---|---|
| AFC | antral follicle count |
| AMH | anti-Müllerian hormone |
| ART | assisted reproductive technology |
| DIE | deep infiltrating endometriosis |
| EFI | endometriosis fertility index |
| HSC | hysteroscopy |
| LAP | laparoscopy |
| NCR | natural conception rate |

## Introduction

Endometriosis is a systemic estrogen-related disease in which endometrial-type tissue grows outside the uterine cavity, triggering chronic inflammatory responses [1]. The most common characteristics of the disease are chronic pain, infertility, and organ destruction and can lead to a reduced quality of life and high social costs. It is one of the most common benign gynecological pathologies although there is no definitive data on its prevalence and incidence. It is assumed that the global lifetime prevalence in the female population of reproductive age is about 7 % [2].

The definition of infertility is no clinical pregnancy after at least 12 months of regular, unprotected sexual intercourse. Infertility is considered a functional disorder resulting in a disability [3]. The global prevalence of infertility is estimated as 8–12 % of all couples of reproductive age, with a higher percentage in low and middle-income countries. However, the causes of infertility are distributed equally between women and men with 30 % of cases respectively due to female or male disorders, while in around 20 % of cases, both sexes have fertility problems [3].

Epidemiological studies to determine the prevalence of endometriosis in infertile women or to determine infertility in women with endometriosis are rare but there is consistent evidence that endometriosis is associated with reduced monthly fertility [4, 5, 6]. There are also conclusive indications that the prevalence of endometriosis is significantly higher (up to 50 %) in infertile women [3, 4, 5, 7]. This means that women with endometriosis have a two to four times higher risk of infertility compared to the general population [6]. However, 80 % of all participants in the Nurses' Health Study who were diagnosed with endometriosis stated that they were able to have at least one child before the age of 40 if they wished to have a child [8, 9].

Even though the concrete data varies considerably, an association between endometriosis and infertility is indisputable. But despite intensive research, the possible causes are still contentious [4]. Older age of the woman at conception is considered the most

important negative predictor for infertility; genetic factors, lifestyle factors, and environmental stresses and a number of other possible risk factors have been mentioned in connection with endometriosis [5]. The length of time between the first occurrence of symptoms and the final diagnosis is another factor which can result in obstetric challenges, problems with infertility, and expensive and emotionally draining treatments [10]. The quality of life of infertile women can be affected by increased depressive symptoms and anxiety. Infertile women with endometriosis tend to have a significantly worse quality of life and stronger symptoms of depression [11]. This may be due to the fact that in addition to worrying about whether they can have children, women with endometriosis have to cope with physical and psychological stresses over prolonged periods of time due to the lack of a diagnosis/wrong diagnosis and occasionally invasive therapy [12].

## Overview

### Fertility counseling of patients with endometriosis/adenomyosis

The issue of fertility should be addressed if endometriosis/adenomyosis is suspected – and it should be addressed even with young patients who do not yet specifically want to have children. The atmosphere during the conversation should be quiet and low key and, if possible, the talk should be held before initiating therapy. Counseling should comprehensively address the patient's need for information, especially with regard to classifying existing prior information. The following points are important:

- As long as a couple has not yet attempted to have children, precise estimation of fertility can only be a very rough approximation. Discouraging comments should be avoided.
- Patient age is the main prognostic factor for fertility, even for women with endometriosis, and it is important to increase the patient's awareness of the fact that she should focus on planning to have her family at an age when her fertility rate is optimal, even without endometriosis. This window of opportunity is from the 20th–30th year of life.
- Early forms of adenomyosis cannot be conclusively confirmed or excluded by ultrasound or MRI [13]. Great care should therefore be taken when making any comments to the patient about fertility.
- Even small and asymptomatic endometriomas should be treated with endocrine therapy after they have been diagnosed (expert consensus; based on: [14, 15]).
- Given the physiological function and phylogenetic importance of menstruation, it is important to emphasize that the higher frequency of menstruation and resultant symptoms are due to the changes in lifestyle during the last century [16].
- The patient must be informed about oocyte cryopreservation. It is important to bear in mind that the patient's age plays a decisive role as it is not just a matter of the quantity of available oocytes but also of their quality [17].
- Fertility-related factors which are specific to the patient should also be addressed.
- The patient should be recommended to have regular checkups and re-evaluations.

### Importance of adenomyosis for fertility

Adenomyosis should be considered in cases with dysmenorrhea. It is rare to be able to identify direct signs of adenomyosis on ultrasound; imaging more commonly shows indirect signs [18, 19, 20, 21]. The probability of obtaining a correct diagnosis of adenomyosis with 2D transvaginal sonography varies, with the sensitivity ranging from 86 % if a combination of subendometrial microcysts, myometrial cysts and heterogeneous myometrium is present to just 52–60 % if only uterine enlargement or uterine asymmetry can be detected [20]. Studies have also shown that changes in ultrasound findings can be cycle-dependent, making a conclusive diagnosis more difficult. Less severe forms are more common in young women: most indications detected on ultrasound are indirect [22, 23]. Several indications must be present to permit a positive predictive statement to be made [20, 24]. The kappa value for both interobserver and intra-observer variability relating to signs of adenomyosis is less than 0.4 (poor agreement) for most parameters [25]. The focus when counseling a young patient with severe dysmenorrhea should be on the patient's symptoms; it is important to avoid upsetting the patient by making a diagnosis of adenomyosis [26].

Theoretical considerations suggest that hormone treatment to achieve therapeutic amenorrhea could have a protective effect on fertility preservation, with such treatment considered a form of early secondary prevention (e.g., dienogest, LNG-IUD 52 mg, continuous use of the pill, GnRH agonists and antagonists with add-back). However, long-term prospective studies on this are lacking (expert consensus). Over the course of treatment, the patient should be asked whether she now wishes to have children.

For patients with infertility who wish to have children, there is some evidence that adenomyosis reduces the probability of nidation and pregnancy and increases the risk of miscarriage [27, 28].

There are also indications that pretreatment prior to embryo transfer increases the likelihood of a successful pregnancy [29, 30, 31].

Possible approaches before initiating an embryo transfer are:

- LNG-IUD
- long/ultra-long protocol
- stimulation – suppression – embryo transfer
- progestins or oral GnRH antagonists may also be used, although the scientific data on the use of these therapies in this context is limited.

The younger generation is often skeptical about hormone therapy. The following points should be raised when explaining the additional benefits of taking hormones to the patient:

- avoidable long-term consequences of taking analgesics (gastritis, kidney problems, etc.)
- lower pregnancy and live birth rates with adenomyosis
- increased miscarriage rates with adenomyosis
- risk of chronic lower pelvic pain [32, 33]
- hypermenorrhea, anemia

## Which tests should be used to diagnose infertility and suspected endometriosis?

If the patient wishes to have a child, the patient and her partner should be informed early on about reproductive medical treatment options. Information can be provided either by an experienced gynecologist or in a center for reproductive medicine.

Treatment should start by taking a detailed medical history of the patient which focuses on endometriosis-specific complaints and the infertility history of both partners should be investigated. The man should have a spermiogram.

Signs indicating endometriosis may be detected during physical examination with a speculum and on palpation. The examination should also include an assessment of the posterior fornix [34].

Transvaginal ultrasound (TVS) is the currently recommended first-line approach to diagnose endometriosis. TVS can also reliably detect ovarian endometriomas. With practice, it is also possible to reliably detect deep infiltrating endometriosis using a standardized approach such as IDEA [35]. Documentation of the findings should be done using the #ENZIAN classification [36].

The Morphological Uterus Sonographic Assessment (MUSA) criteria can be used to diagnose adenomyosis (see ▶ **Table 1**; [18]).

Renal sonography should be performed if the sonographic findings are suspicious for deep infiltrating endometriosis to exclude urinary retention [34].

Complementary MRI may be used in addition to ultrasound to investigate specific areas or if the findings are inconclusive, and additional MRI will be arranged by the endometriosis center.

Other infertility tests include cycle-related diagnostic tests such as antral follicle count (AFC) and the measurement of AMH and gonadotropin levels. These tests are used to evaluate the patient's ovarian reserve.

Diagnostic laparoscopy to obtain histological evidence of endometriosis is no longer necessary in all cases. If a surgical examination is carried out it must include: hysteroscopy, laparoscopy, chromopertubation, and adequate assessment of the fallopian tubes by an experienced surgeon (see below).

▶**Table 1** MUSA criteria. Data from [18].

| Direct signs | Indirect signs |
|---|---|
| Myometrial cysts | Asymmetrical myometrial thickening |
| Hyperechogenic myometrial islands | Fan-shaped shadowing |
| Echogenic subendometrial buds | Irregular junctional zone |
| | Interrupted junctional zone |
| | Globular uterus |
| | Increased myometrial perfusion |

## Ovarian reserve – how and when should it be assessed?

Ovarian reserve is already determined in utero by the number of primordial follicles and defines hormonal ovarian activity until menopause. Surrogate markers such as the number of antral follicles (antral follicle count, AFC) and anti-Müllerian hormone (AMH) levels are used to assess ovarian reserve. The determination of these surrogate markers of ovarian reserve is useful for all women of reproductive age, especially when ovarian tumors such as endometriomas or other pathologies which can affect ovarian reserve are present in the lesser pelvis. Determination of the ovarian reserve using AFC or AMH levels must always be carried out when investigating the causes of infertility in a woman.

The AFC is determined with transvaginal sonography (TVS), ideally performed in the early follicular phase (on days 2–5 of the menstrual cycle) in the absence of a dominant follicle or the corpus luteum, but it can also be reliably carried out with slight fluctuations throughout the entire cycle. All antral follicles between 2–10 mm in both ovaries are included in the AFC [37]. Measurement may be performed in 2D real time, 2D cine loop or 3D mode, using automated evaluations for greatest precision and reproducibility if necessary. It is important to move the transducer in a standardized manner in two planes, for example, in a medial to lateral direction and in a cranial to caudal direction. How to interpret the findings is shown in ▶ **Table 2**. As ovarian reserve decreases with age, nomograms provide additional indicators to enable rapid assessment of whether the AFC percentiles are normal and age-appropriate [38].

The AMH level has been validated as a predictor for the response to ovarian stimulation; however, it also characterizes the functional ovarian reserve and shows a good correlation with the AFC [39]. Determination of the AMH level is particularly recommended in the following situations:

- When the result of the AFC is not clear, for example, in cases with ovarian tumors or cranially located ovaries which are difficult to visualize with imaging [37].

▶**Table 2** Antral follicle count (AFC) for both ovaries. Data from [37].

| Nomenclature | AFC | Interpretation for stimulation |
|---|---|---|
| Very low functional ovarian reserve | 0–4 | Greatly reduced probability of pregnancy, very high risk of poor response to ovarian stimulation |
| Reduced functional ovarian reserve | 5–8 | High risk of poor response to ovarian stimulation |
| Normal functional ovarian reserve | 9–19 | Normal response to ovarian stimulation probable |
| High functional ovarian reserve | >20 | Risk of increased response to ovarian stimulation and ovarian overstimulation |

- Prior to planned surgical treatment, especially in cases with deep infiltrating ovarian endometriosis [34].

Counseling about measures to protect fertility such as cryopreservation of oocytes and, in cases who are in a stable relationship, cryopreservation of embryos is recommended for women with age-related lower AFC or AMH levels [17, 34]. It is important to be aware that AMH levels are difficult to evaluate during hormone therapy (*gestagens, combined oral contraceptives, relugolix CT, Linzagolix*) and are usually up to 20% lower [40, 41]. Like AMH levels, the AFC is difficult to evaluate during hormone therapy (gestagens *or combined oral contraceptives*) and is usually lower [37].

## The EFI score and its alternatives – how to use the #Enzian score

The endometriosis fertility index (EFI) is currently the only validated prognostic tool to assess the fertility of patients with endometriosis [42]. It is based on medical history parameters (age, duration of infertility, medical history of pregnancy) and intraoperative findings. Intraoperative findings show the morphological and functional condition of the fallopian tubes, fimbria and ovaries, and these findings are complemented by the intraoperative classification of endometriosis in accordance with ASRM (https://endometriose-sef.de/wp-content/uploads/2023/10/EFI_Skore_Deutsch_14.pdf). Despite its widespread use, the EFI score has significant limitations. Out of a total of 10 possible points, only 2 relate to the extent of endometriosis, while tubal ovarian structures are recorded as a separate score (with a maximum of three points). As the ASRM classification does not take account of DIE (deep infiltrating endometriosis) nor the presence of adenomyosis, this means that key pathophysiological factors for therapeutic decision-making are not taken into consideration. In addition, EFI is a purely intraoperative evaluation which cannot be applied to imaging procedures such as sonography (USD) or magnetic resonance imaging (MRI).

The medical history factors included in the EFI and sonographic findings already provide a good basis to counsel patients who wish to have a child.

### The #Enzian score [36] as an expanded classification

The #Enzian score was developed as an alternative to the rASRM (revised American Society for Reproductive Medicine) classification and provides a more nuanced picture at every stage of endometriosis. The #Enzian score takes account of the different anatomical compartments (anterior, middle, and posterior compartments) as well as the extent of infiltration. In contrast to the EFI score, the #Enzian score can also be used with imaging (e.g., using transvaginal sonography or MRI) for the non-invasive assessment of the extent of disease [43, 44, 45].

Large studies confirming the prognostic value of the #Enzian score with regard to fertility are still lacking.

### Combination of EFI and #Enzian score

Recent studies have proposed combining the benefits of both classification systems as this could result in a more precise estimation of pregnancy outcome probability.

### Artificial intelligence (AI) and classification

Artificial intelligence (AI) is playing an increasingly important role in non-invasive diagnostic investigations for endometriosis, especially with the increased use of deep learning algorithms for the analysis of ultrasound (USD) and magnetic resonance imaging (MRI). Increased integration of multimodal data sources including clinical parameters, imaging, and molecular biological markers which will optimize diagnostic accuracy, treatment planning, and prognostic models is expected in the future.

## Cryopreservation and endometriosis

### Appropriate counseling on cryopreservation in cases with endometriosis

Women with endometriosis have a lower ovarian reserve and therefore lower AMH levels compared to women without endometriosis. Endometriomas per se and especially their surgical removal have a damaging impact on ovarian reserve and therefore on future fertility. Women should therefore be informed **before** undergoing surgery that there are options to protect fertility by cryopreserving oocytes, even if there is currently no international consensus about the benefits of and indications for this approach [17].

The following issues must be considered [46]:

- The information about cryopreservation must be adapted to the findings and dynamics of the disease in the individual patient. If cryopreservation is indicated, counseling should be provided by a gynecologist trained in reproductive medicine or by specialists from an endometriosis center or center for reproductive medicine.
- To date, the recall rates for different programs range from 13% [47] to 46% [48].
- The probability of a live birth increases with the number of cryopreserved oocytes and decreases with increasing age at the time of oocyte retrieval. From the age of 35 and above, the patient's age has the greatest impact on prognosis [48, 49, 50, 51].
- The patient should know about the benefits and risks of oocyte vitrification before undergoing ovarian surgery to allow her to make an informed autonomous decision [52].

### Cryopreservation of oocytes as an option for patients who may want to have children in future

- Bilateral endometriomas
- Unilateral endometrioma and low AMH level
- Recurrence of an endometrioma
- Unilateral endometrioma after surgery on the contralateral side
- Young patient whose AMH level is already low

### Cryopreservation of oocytes not required

- Age-appropriate AFC and AMH levels
- Young patient who wants to have a child and who has a good chance of spontaneous conception
- Patient is currently undergoing fertility treatment
- Unilateral, small, stable endometrioma (even under hormone therapy)
- No current or future wish to have a child

## Reasonable indication for HSC, LAP, chromopertubation, and surgical treatment to remove endometrial growths

Morphological and clinical examinations should be carried out if a patient wants to have children, with investigations particularly focusing on DIE or ovarian endometriosis as well as adenomyosis. When planning the patient's further care, we recommend differentiating between a concrete wish to have children and the potential wish to have children sometime in the future in the context of the WHO's definition of infertility (12 months of unprotected sexual intercourse without a pregnancy).

If the patient meets the above criteria for infertility, the factors outlined above must first be investigated. The issue of possible male infertility must also be investigated (expert consensus). The older the female patient, the earlier diagnostic steps will need to be initiated. Viewed pragmatically, diagnostic steps should be initiated at the latest after the patient has had unprotected sexual intercourse without pregnancy for: < 35 years of age: 1 year; 35–40 years of age: 6 months; over the age of 40: immediately.

If the suspicion ultimately remains that infertility has an organic cause, the patient may be offered invasive examinations and, possibly, therapeutic measures including HSC, LAP or chromopertubation. The therapeutic impact of these measures to resect endometrial foci in the peritoneum is still controversial: both the German guideline "Diagnosis and Therapy Prior to Assisted Reproductive Treatment" and the ESHRE guideline recommend this approach based on moderate to good evidence. Other studies came to the conclusion that the benefit is limited [17, 34, 53]. This approach does not have to be carried out in cases where ART is clearly indicated. The greater the evidence of other infertility factors, the more caution is needed when proposing surgical therapy. Ultimately, an individualized approach is recommended before performing surgical diagnostic investigations and therapy for infertility, and this includes providing appropriate information based on the most current data and ensuring the active inclusion and involvement of the couple.

## Which type of surgery for which type of endometrioma?

### Arguments in support of the surgical treatment of endometriomas [54]:

- Pain
- Intact ovarian reserve
- Unilateral endometrioma
- Suspected malignancy

### Arguments against the surgical treatment of endometriomas [54]:

- Patient is oligosymptomatic
- There are additional causes of infertility
- Patient is older
- Reduced ovarian reserve
- Bilateral endometriomas
- Recurrent endometriomas

### Surgical procedure and spontaneous conception:

In contrast to expectant management or limited surgical procedures, surgical resection of endometriomas increases the probability of a spontaneous pregnancy [21, 54].

### Surgical procedure and assisted reproduction:

If an assisted reproductive procedure is planned, the chances of success will probably not be increased by the excision of endometriomas prior to ART. Ovarian surgery must only be considered if it is necessitated by pain and/or the ovarian reserve is sufficiently high [54] or ART is not possible because of anatomical features.

### Impact of surgery on ovarian reserve:

- All forms of treatment have the potential to negatively affect fertility.
- Sclerotherapy is an effective therapeutic option. The current data report higher rates of live births after laparoscopic sclerotherapy and ART [55]. The decrease in AMH levels after sclerotherapy appears to be lower than after cyst excision [55].
- Ablation procedures, if used, must have a limited penetration depth [17].
- Surgical removal of endometriomas through complete excision of cysts reduces ovarian reserve and function [56, 57, 58].
- Different hemostasis methods affect ovarian function in varying degrees. The use of bipolar current for hemostasis appears to result in more ovarian damage than the use of sutures or of topical hemostatic agents [59, 60, 61].
- No sutures are required for small endometriomas and a smooth peritoneum. In cases with large endometriomas requiring resection of the peritoneum on that side, an ovarian suture must be used for hemostasis and adhesion prophylaxis (expert consensus).
- Other factors such as the size of the cyst, bilaterality, and the experience of the surgeon all play a relevant role. But the data on this varies [59, 62].

### Impact of surgery on the probability of recurrence:

Cyst excision for complete removal of an endometrioma is superior to other surgical approaches with regard to the probability of recurrence (cyst recurrence, pain recurrence) [21, 59, 63]. Patient age is one factor which affects the probability of recurrence and recurrence is higher in women under the age of 35 [64]. Recent observational studies have reported a low probability of recurrence for endometriomas smaller than 4 cm endometriomas treated with laparoscopic sclerotherapy [65, 66].

### Impact of hormone therapy on endometriomas:

In contrast to reports in earlier publications, the symptoms and size of endometriomas can also be reduced by means of medically induced menstrual suppression (therapeutic amenorrhea) [14, 15]. The cessation of chronic inflammatory irritation reduces the formation of fibrosis in ovarian tissue and this also reduces oocyte loss [67]. But this requires a closely monitored re-evaluation with proper consideration of the patient's personal circumstances.

Hormone therapy using oral contraceptives reduces the probability of recurrence [68, 69, 70].

▶**Table 3** Prognostic score for the classification of distal tubal pathologies.

| | | | | |
|---|---|---|---|---|
| Wall thickness | thin | | | thick (> 2 mm) |
| Adhesions | none | a few | extensive | |
| Mucosa | > 75 % | 25–75 % | < 25 % | none |
| Score | 0 | 1 | 2 | 3 |
| Stage | I | II | III | |
| Points | 0–5 | 6–10 | 11–16 | |

Few adhesions = avascular or thin; mucosa = estimated extent of ampullary mucosa in %. The point score doubles if the contralateral side is absent or occluded. Data from [75].

Patients with endometriomas who do not want hormone therapy should be informed about the risk of progression, also with regard to fertility. If hormone therapy is not wanted, the first check-up should be carried out after three months, followed by further evaluations every six months (expert consensus).

## Does non-ovarian endometrial surgery affect ovarian reserve?

The authors do not know of any valid studies about non-ovarian endometriosis surgery and its impact on ovarian reserve. Such studies are not possible because of the lack of standardization of surgical procedures. When considering such surgery, it is important to be aware that evidence about the positive impact of this type of surgery is shaky. Our recommendation is therefore to carefully weigh up the benefits and risks of every type of surgery.

In a double-blinded randomized study published in 1993, Chris Sutton found that peritoneal excision of endometrial foci resulted in significantly higher pregnancy rates compared to merely identifying the foci. However, he did not measure ovarian reserve [71]. But it is known that peritoneal excision of endometrial foci and surgical resection of endometriomas decreases AMH levels [72].

Surgical enucleation of endometrial cysts (endometriomas), even when carried out very carefully, is only indicated if the patient is in pain or for cysts with diameters which prevent follicular growth [73].

## Surgery to treat hydrosalpinx

Disorders of the fallopian tubes are responsible for about 20 % of infertility. Hydrosalpinx represents an especially severe form of fallopian tube disorder [74]. Distal tubal pathologies are classified according to the characteristics shown here (▶ **Table 3**):

The pathogenesis differs, depending on whether the cause is infectious disease or endometriosis. Any attempt to draw conclusions by analogy should be treated with caution.

Hydrosalpinx is characterized by distal occlusion of the fallopian tube(s) and fluid accumulation in the tube(s) which significantly impairs both spontaneous conception and assisted reproduction. Studies show that implantation and pregnancy rates are significantly lower in affected women compared to healthy women [74, 76]. The underlying negative mechanisms include mechanical abrasion caused by fluid accumulation, embryotoxic hydrosalpinx fluid, and reduced endometrial receptivity [74, 76].

Empirical evidence indicates that tubal surgery can be effective to reduce the negative impact of hydrosalpinx on implantation. According to some studies, salpingectomy or proximal occlusion of the fallopian tube(s) before assisted reproduction technology (ART) can significantly increase the clinical pregnancy rate (CPR) compared to no intervention. The reported pregnancy rate without surgery is 19 % but the pregnancy rate can increase to 27–52 % after salpingectomy [76].

Tubal reconstruction results in a natural conception rate (NCR) of 25–27 % but it is also associated with an increased risk of ectopic pregnancy (EUG), with a reported EUG rate of 4.76–10 % [74, 77]. Current studies have shown that the success rates vary, depending on the severity of hydrosalpinx. The natural conception rate (NCR) reported for mild hydrosalpinx was 50.49 %, while the ectopic pregnancy rate (EUG) was 7.41 %. The NCR for moderate hydrosalpinx was 32.89 % and the EUG was 9.09 %. The NCR in cases with severe hydrosalpinx was 10.71 % and the EUG was 8.26 % [74].

These data confirm that laparoscopic tubal surgery can be an effective strategy to restore natural fertility, especially in cases with mild to moderate hydrosalpinx. However, the chances of success in cases with severe hydrosalpinx are limited and salpingectomy is recommended to improve pregnancy rates in such cases.

There are no definitive data on the optimal fertility treatment strategy with endometriosis. It depends on the extent of disease, possible surgical procedures such as adhesiolysis and their potential impact on ovarian perfusion. The decision for treatment must therefore be made after taking individual factors into account to ensure the best possible fertility prognosis.

## DIE – ART sequence

Small well-designed studies have reported that it can be better to resect DIE before starting ART. Most of these studies focused on rectal DIE [78, 79]. Even without subsequent ART, surgical resection of DIE appears to improve pregnancy rates [78]. However, for patients with relatively limited pain symptoms, complication rates play a more significant role: the incidence of grade three and four

complications according to the Clavien-Dindo classification in a large cohort of patients was reported to be about 4% [80]. Surgery may be indicated more readily for patients with symptomatic deep-infiltrating endometriosis who wish to have children compared to asymptomatic or oligosymptomatic patients. However, if the outcome of ART is unsuccessful, oligosymptomatic and asymptomatic patients may also be offered DIE excision before they have exhausted the available reproductive medicine options.

Cumulative pregnancy rates of 64% over 4 ART cycles have been reported for primary ART in patients with DIE [81].

Following the decision to have ART as the primary medical procedure, it is important to ensure that renal ultrasound monitoring is carried out regularly in cases with DIE.

If repeated embryo transfers are unsuccessful, the indications for surgery should be reviewed before exhausting the available reproductive medicine procedures. The authors are of the opinion that this would be the right time to critically re-evaluate continuing with ART.

## Conclusion

These recommendations by the working group of the 2025 Weissensee Workshop of the German Scientific Endometriosis Foundation offer targeted guidance with the aim of improving fertility counseling and treatment for patients with endometriosis. Treatment must be based on the right diagnostic tests and must take the patient's personal circumstances into consideration.

### Conflict of Interest

Prof. Rene Wenzel: Gedeon Richter.

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