v. 5, n. 17, 2025

International Journal of Health Science

THE RELATIONSHIP BETWEEN DEEP ENDOMETRIOSIS AND THE RESULTS OF IN VITRO FERTILIZATION TREATMENTS

Acceptance date: 22/04/2025

Lívia Mathiazi Di Mateos
Athens College, Sorriso - MT
https://orcid.org/0009-0007-4488-2286

Julia Muniz Marques
Euro-American University Center - UNIEURO, Brasília - DF
https://orcid.org/0009-0002-4123-8536

Victoria Lima Bedori
Paulista University (UNIP)
Campinas - SP
http://orcid.org/0009-0001-6951-2464

Rafaela Rehem Rosa Moura
Salvador University (UNIFACS)
Salvador - BA
https://orcid.org/0000-0002-8777-1742

Amanda Marchezini e Silva
School of Sciences of the Santa Casa de Misericórdia de Vitória (EMESCAM)
Vitória - ES
https://orcid.org/0000-0002-8019-4831

Leonardo Henrique Abdalla da Silva
University of Mogi das Cruzes (UMC)
Mogi das Cruzes - SP
https://orcid.org/0009-0002-3843-5475

Julia Buzzi Arrotheia
Pontifical Catholic University of Paraná (PUC PR), Curitiba - PR
https://orcid.org/0009-0002-5509-0376

Gleice Mara Alves Nunes
University of Mogi das Cruzes (UMC)
Mogi das Cruzes - SP
https://orcid.org/0009-0005-7487-2578

Kyanne Santos Oliveira
Nove de Julho University (UNINOVE)
São Bernardo do Campo - SP
https://orcid.org/0009-0009-6222-6471

Ana Beatriz Tavares Rosa
Evangelical University of Goiás (UniEvangélica), Anapólis - GO
https://orcid.org/0009-0009-2589-5035

Mariana Soares Silva Oliveira
Salvador University (UNIFACS)
Salvador - BA
https://orcid.org/0009-0001-3973-2458

Gabriela Herrera Goes
Medical, Jaú - SP
https://orcid.org/0009-0007-4928-7718

Abstract: Objective: To analyze the influence of deep endometriosis on the results of in vitro fertilization treatments, addressing success rates, embryo quality, embryo implantation and gestational outcomes. **Methodology:** Bibliographic review using the PubMed - MEDLINE database, considering articles from 2015 to 2025 using the following search strategy: ("deep" AND ("endometriosis"[MeSH Terms] OR "endometriosis" OR "endometrioses") AND ("in vitro fertilisation" OR "fertilization in vitro"[MeSH Terms] OR ("fertilization" AND "vitro") OR "fertilization in vitro" OR ("vitro" AND "fertilization") OR "in vitro fertilization")). **Review: IUD** can compromise egg quality, endometrial receptivity and implantation rates. Some studies indicate that patients with IUD have lower pregnancy rates in IVF, while others suggest success similar to that of women without the disease. The need for surgery before IVF remains controversial, depending on the severity of the endometriosis and the ovarian reserve. **Final considerations:** DIE can impact fertility, but the choice between surgery and IVF must be individualized. More studies are needed to define optimal approaches.
Keywords: Deep endometriosis, In vitro fertilization, Infertility.

INTRODUCTION

Endometriosis is a disease characterized by the presence of ectopic tissue similar to the endometrium outside the uterine cavity. It affects between 5% and 10% of women of reproductive age and its main clinical manifestations are chronic pelvic pain and infertility (Alson *et al*., 2024; Roman, 2018). There are three distinct phenotypes of endometriosis, classified as superficial peritoneal disease, deep infiltrative endometriosis (DIE) and ovarian endometrioma. DIE, on the other hand, is characterized by the presence of endometriotic lesions that extend more than 5 mm

below the peritoneum and can compromise deep pelvic structures. In addition to depth, this form of the disease is defined by the functional impact of the lesions on adjacent organs, which can cause extensive adhesions and alterations in the anatomy and physiology of the affected tissues (Carneiro; Costa; De Ávila, 2021). In addition, it can be identified through imaging tests, such as ultrasound and magnetic resonance imaging, presenting as hypoechoic or heterogeneous nodules, with irregular or smooth contours, located in the anterior compartment of the pelvis (urinary bladder, ureterovesical region and distal ureters) or in the posterior compartment (rectovaginal septum, uterosacral ligaments, vaginal or intestinal walls) (Alson *et al.*, 2024).

Around 50% of women with infertility have endometriosis. However, the heterogeneous profile of patients with DIE makes it difficult to determine its real impact on fertility (Casals *et al.*, 2021). An accurate diagnosis of EUD is essential for defining clinical management, as the decision to perform surgery must be a careful one, taking into account the risks inherent in the procedure. As surgery for deep endometriosis can result in irreversible consequences for patients who wish to become pregnant, it is not recommended when the main objective is to treat infertility or improve the results of in vitro fertilization (IVF) (Carneiro; Costa; De Ávila, 2021). Although IVF is widely used as an effective strategy to treat infertility associated with endometriosis, the results in patients with IUD are still uncertain. While some research indicates that pregnancy and live birth rates are similar to those of women without the disease, other studies suggest that these outcomes may be substantially reduced in patients with IUD. In addition, the absence of a precise clinical diagnosis prior to the start of reproductive treatments makes it difficult to assess the real impact of IUD on IVF efficacy (Alson *et al.*, 2024).

Another controversial aspect among specialists is the role of surgery for endometriosis before IVF. Although some evidence suggests that surgical removal of endometriomas and IUD lesions can improve IVF success rates, other studies question this approach due to risks such as reduced ovarian reserve and a lack of consensus on the actual benefits of the procedure (Polat *et al.*, 2015). These controversies reinforce the need for a detailed and organized review of the available evidence, with the aim of clarifying the impact of IUD on IVF outcomes, guiding clinical conduct and identifying priorities for future research (Morcel *et al.*, 2024).

The aim of this article is to analyze the influence of deep endometriosis on the results of in vitro fertilization treatments, looking at success rates, embryo quality, embryo implantation and gestational outcomes.

METHODOLOGY

A literature review developed according to the criteria of the PVO strategy, which stands for: population or research problem, variables and outcome. This strategy was used to develop the research question "How does deep endometriosis affect the results of in vitro fertilization treatments in terms of success rates, embryo implantation and gestational complications?". The searches were carried out using the PubMed - MEDLINE (Medical Literature Analysis and Retrieval System Online) databases. The search terms were used in combination with the Boolean terms "AND" and "OR", using the following search strategy: ("deep" AND ("endometriosis"[MeSH Terms] OR "endometriosis" OR "endometrioses") AND ("in vitro fertilisation" OR "fertilization in vitro"[MeSH Terms] OR ("fertilization" AND "vitro") OR "fertilization in vitro" OR ("vitro" AND "fertilization") OR "in vitro fertilization")). From this search, 71 articles were found, which were then submitted to the se-

lection criteria. The inclusion criteria were: articles in English; published between 2014 and 2025 and which addressed the themes proposed for this research, studies of the type (review, meta-analysis, observational studies, experimental studies). The exclusion criteria were: duplicate articles, articles available in abstract form, articles that did not directly address the proposal studied and articles that did not meet the other inclusion criteria. After applying the inclusion and exclusion criteria, 15 articles were selected from the PubMed database to make up this study's collection.

DISCUSSION

Endometriosis is characterized by the presence of endometrial glands and stroma outside the uterine cavity, as well as local hypoestrogenism, progesterone resistance and a pro-inflammatory environment. These factors result in bleeding, inflammation, fibrin deposition, the formation of adhesions, scarring and changes in the anatomy of the peritoneal organs. The condition is associated with severe pelvic pain and reproductive difficulties, with adverse impacts on fertility (Colombi *et al.*, 2024).

DIE is associated with infertility, although its pathophysiology is not yet fully understood. According to Polat *et al.* (2015), DIE compromises endometrial receptivity and can affect embryo quality, although there is controversy on this last point. Some studies indicate that embryo quality is not affected, while others suggest the opposite. In turn, in oocyte donation cycles, the presence of endometriosis in the recipient can impact implantation rates, suggesting that endometrial receptivity may be a more relevant factor than oocyte quality alone (Polat *et al.*, 2015). However, Kolanska *et al.* (2017) disagree with this view, pointing out that recipients of oocytes with endometriosis can also show good results, suggesting that the inflammation and oxidative stress caused by the disease can impair oocyte quality, ovarian reserve and embryo quality.

In addition, Casals *et al.* (2021), Ferrero *et al.* (2024) and Colombi *et al.* (2024) complement the analysis by Polat *et al.* (2015), explaining that progesterone dysregulation can compromise the development of the endometrium for embryo implantation. In addition, the presence of inflammatory mediators in the peritoneal fluid can affect the release and quality of oocytes. The formation of adhesions also alters the anatomy of the pelvic region, compromising tubal function. Shi *et al.* (2021) point out that inflammatory factors such as prostaglandins (PGE2 and PGF2), high production of cyclooxygenase-2 (COX-2), poor trophoblastic invasion and abnormal uterine contractions are related to infertility associated with IUD.

Another relevant factor is the presence of endometriomas (OMAs), which interfere with folliculogenesis and affect endometrial receptivity (Casals *et al.*, 2021; Colombi *et al.*, 2024). Furthermore, Colombi *et al.* (2024) reveal that not only oocyte quality and endometrial receptivity affect implantation rates, but also ovarian reserve. In in vitro fertilization (IVF) studies, women with and without endometriosis had similar conception rates when they had reduced ovarian reserve (Colombi *et al.*, 2024).

Given this evidence, there is still controversy over the impact of IUD on oocyte and embryo quality, making further research necessary to assess the real influence of endometriosis on reproductive physiology. Endometriosis has been associated with poor egg quality in IVF and is a multifactorial disease characterized by the presence of endometrial glands and stroma outside the uterine cavity (Colombi *et al.*, 2024). It is estimated that up to 50% of women who have difficulty getting pregnant have endometriosis (Casals *et al.*, 2021).

Infertility, defined as the inability to conceive naturally after one year of trying, is a growing concern, especially when associated with pathologies such as endometriosis (Shi *et al.*, 2021). IVF has emerged as an alternative for these women, offering new opportunities for conception. However, it is still controversial whether endometriosis negatively influences IVF success rates. Polat *et al.* (2015) indicate that the results are conflicting: in some studies, women with endometriosis had lower success rates, while in others there was no significant difference in fertilization when compared to women without the disease.

Maternal age, the number of antral follicles and the number of embryos were identified as determining factors in the live birth rate. However, endometriosis alone has not been shown to have a negative impact on IVF outcomes, suggesting that patients with the disease can achieve similar results to women without endometriosis (Polat *et al*., 2015).

Patients with deep endometriosis have various anatomical and hormonal alterations that make conception difficult. In an observational study of 359 infertile patients with endometriosis undergoing assisted reproductive therapy (ART), Liang *et al.* (2024) identified a pregnancy rate of 44%, achieving a cumulative success rate of 65.8% after four ART cycles. Failure was associated with a previous surgical history and low ovarian reserve (antimüllerian hormone <2 ng/mL and antral follicle count <10), suggesting that surgery itself to remove endometriotic lesions can compromise ovarian reserve.

Although IVF is an effective alternative, rare gestational complications such as spontaneous hemoperitoneum in pregnancy (SHiP) can occur. Spontaneous hemoperitoneum in pregnancy (SHiP) arises abruptly in the third trimester due to the rupture of pelvic or abdominal vessels, resulting in severe internal bleeding and hypovolemic shock, requiring immediate surgical intervention. The presence of pelvic adhesions and decidualization due to ovarian hyperstimulation contribute to the incidence of this complication, which occurs in 0.3% of pregnant women with endometriosis undergoing IVF, with a maternal mortality rate of 2% and a perinatal mortality rate of 27% (Benaglia *et al.*, 2021).

The choice between surgery and IVF to treat infertility related to deep endometriosis is still controversial (Ottolina *et al.*, 2022). According to Maignien *et al.* (2017), the decision should consider factors such as age, symptoms and severity of the disease. Younger patients with severe symptoms may benefit from surgery, although the process is longer. IVF, on the other hand, may be indicated to circumvent anatomical problems and speed up conception.

Evidence shows that endometriosis impacts several spheres of patients' lives, affecting professional, emotional and social aspects due to chronic pain and the impact of infertility (Gremillet *et al.*, 2023). The chronic inflammatory process induced by endometriosis interferes with all phases of the reproductive process, including oocyte production, ovulation, fertilization and embryo implantation (Ferrero *et al.,* 2024). In some cases, surgical excision of endometriosis may be necessary to restore fertility, especially when there are severe adhesions or intestinal nodules.

The literature differs as to the effectiveness of surgery to excise deep endometriosis before IVF. Some studies indicate improved implantation and pregnancy rates after surgery, while others report lower live birth rates in patients operated on prior to IVF (Ferrero *et al.*, 2024). Therefore, the decision must be individualized, taking into account symptoms, disease severity, age and reproductive history.

New therapeutic strategies include plasma energy ablation of endometriomas, which has demonstrated pregnancy rates similar to

those observed after cystectomy, while better preserving ovarian tissue (Motte *et al.*, 2016). The choice between surgery and IVF should be personalized, taking into account factors such as symptoms, ovarian reserve and surgical risks, in order to maximize the chances of successful assisted reproduction (Maignien *et al.*, 2017).

FINAL CONSIDERATIONS

IUD represents a significant challenge for fertility, with a controversial impact on the results of in vitro fertilization (IVF). While some studies indicate that IUD compromises endometrial receptivity and embryo quality, others suggest that its effects are limited in patients with good ovarian reserve. Furthermore, the decision between surgery and IVF to treat infertility associated with endometriosis is still not consensual, since surgery can reduce ovarian reserve and negatively influence reproductive outcomes. It is therefore recommended that the therapeutic choice be individualized, taking into account factors such as age, disease severity and reproductive history. Current limitations include the heterogeneity of the studies analyzed and the lack of robust clinical trials that clarify the definitive impact of IUD on IVF. Thus, further research is needed to deepen the relationship between endometriosis, oocyte quality and IVF success rates, allowing for more assertive conduct in clinical practice.

REFERENCES

ALSON, Sara *et al.* Endometriosis diagnosed by ultrasound is associated with lower live birth rates in women undergoing their first in vitro fertilization/intracytoplasmic sperm injection treatment. **Fertility and Sterility**, v. 121, n. 5, p. 832-841, 2024.

CARNEIRO, Márcia Mendonça; COSTA, Luciana Maria Pyramo; DE ÁVILA, Ivete. To operate or not to operate on women with deep infiltrating endometriosis (DIE) before in vitro fertilization (IVF). **JBRA Assisted Reproduction**, v. 21, n. 2, p. 120, 2017.

CASALS, Gemma *et al.* Impact of surgery for deep infiltrative endometriosis before in vitro fertilization: a systematic review and meta-analysis. **Journal of minimally invasive gynecology**, v. 28, n. 7, p. 1303-1312. e5, 2021.

COLOMBI, Irene *et al.* Combine Surgery and In Vitro Fertilization (IVF) in Endometriosis-Related Infertility: When and Why. **Journal of Clinical Medicine**, v. 13, n. 23, p. 7349, 2024.

FERRERO, Simone *et al. I*mpact of surgery for endometriosis on the outcomes of in vitro fertilization. **Best Practice & Research Clinical Obstetrics & Gynaecology**, p. 102496, 2024.

GREMILLET, Letizia *et al.* Endometriosis, infertility and occupational life: women's plea for recognition. **BMC women's health**, v. 23, n. 1, p. 29, 2023.

KOLANSKA, K. *et al.* Pregnancy outcomes after controlled ovarian hyperstimulation in women with endometriosis-associated infertility: GnRH-agonist versus GnRH-antagonist. **Journal of gynecology obstetrics and human reproduction**, v. 46, n. 9, p. 681-686, 2017.

LIANG, Ying *et al.* First-line surgery versus first-line assisted reproductive technology for women with deep infiltrating endometriosis: a systematic review and meta-analysis. **Frontiers in Endocrinology**, v. 15, p. 1352770, 2024.

MAIGNIEN, Chloé *et al.* Prognostic factors for assisted reproductive technology in women with endometriosis-related infertility. **American journal of obstetrics and gynecology**, v. 216, n. 3, p. 280. e1-280. e9, 2017.

MORCEL, Karine *et al*. What is the impact of endometriosis and the AFS stage on cumulative pregnancy rates in IVF programs?. **Reproductive Health**, v. 21, n. 1, p. 13, 2024.

MOTTE, I. *et al.* In vitro fertilization outcomes after ablation of endometriomas using plasma energy: A retrospective case-control study. **Gynecologie Obstetrique & Fertilite**, v. 44, n. 10, p. 541-547, 2016.

OTTOLINA, Jessica *et al.* Surgery versus IVF for the treatment of infertility associated to ovarian and deep endometriosis (SVIDOE: Surgery Versus IVF for Deep and Ovarian Endometriosis). Clinical protocol for a multicenter randomized controlled trial. **Plos one**, v. 17, n. 8, p. e0271173, 2022.

POLAT, Mehtap *et al.* In vitro fertilization for endometriosis-associated infertility. **Women's Health**, v. 11, n. 5, p. 633-641, 2015.

ROMAN, H. Endometriosis surgery and preservation of fertility, what surgeons should know. **Journal of Visceral Surgery**, v. 155, p. S31-S36, 2018.

SHI, Jinghua *et al.* Pregnancy outcomes in women with infertility and coexisting endometriosis and adenomyosis after laparoscopic surgery: a long-term retrospective follow-up study. **BMC Pregnancy and Childbirth**, v. 21, n. 1, p. 383, 2021.