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OVARIAN RESERVE AND ITS ASSESSMENT IN PATIENTS WITH ENDOMETRIOMA

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Abstract

Endometriosis is a chronic inflammatory disease that affects a significant number of women of reproductive age. One of the most common manifestations of endometriosis is ovarian endometrioma, a cystic lesion of the ovary filled with altered blood products. The presence of endometrioma has been associated with impaired fertility and a reduction in ovarian reserve. Ovarian reserve represents the functional capacity of the ovary and reflects both the quantity and quality of the remaining follicles. The evaluation of ovarian reserve in patients with endometrioma is essential for predicting reproductive potential, selecting appropriate treatment strategies, and determining the prognosis of assisted reproductive technologies. This review article discusses the mechanisms by which endometrioma affects ovarian reserve and the main clinical and laboratory methods used to assess ovarian reserve.

Keywords: ovarian reserve, endometrioma, infertility, anti-Mullerian hormone, antral follicle count.

Introduction

Endometriosis is a gynecological disorder characterized by the presence of endometrial-like tissue outside the uterine cavity. It affects approximately 10–15% of women of reproductive age and up to 50% of women with infertility. Among the various forms of endometriosis, ovarian endometrioma is one of the most frequent manifestations. Endometriomas are cystic ovarian lesions formed by ectopic endometrial tissue and are often referred to as “chocolate cysts” because of the thick, dark fluid they contain.

One of the most important reproductive consequences of ovarian endometrioma is the potential impairment of ovarian function. In women with endometriosis, fertility may be compromised due to multiple mechanisms including pelvic adhesions, inflammatory changes, altered folliculogenesis, and decreased ovarian reserve. Ovarian reserve refers to the number and quality of oocytes remaining in the ovary at a given time. This parameter is crucial for assessing a woman's reproductive potential and predicting her response to fertility treatment.

The evaluation of ovarian reserve has become an essential component of modern reproductive medicine. In patients with endometrioma, the assessment of ovarian reserve is particularly important because both the disease itself and its surgical treatment may negatively affect ovarian function. Therefore, clinicians must carefully evaluate ovarian reserve before planning therapeutic interventions.

Pathophysiology of Endometrioma and Its Impact on Ovarian Reserve

The mechanisms by which endometrioma affects ovarian reserve are complex and multifactorial. Several pathological processes contribute to the decline in ovarian function in women with ovarian endometrioma.

One of the primary mechanisms is chronic inflammation. Endometriosis is associated with the production of inflammatory cytokines and reactive oxygen species within the pelvic environment. These inflammatory mediators can damage ovarian tissue and negatively affect

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follicular development. The persistent inflammatory state may also lead to fibrosis of the ovarian cortex, which can reduce the density of primordial follicles.

Another important mechanism is mechanical compression of ovarian tissue. As the endometrioma grows, it may exert pressure on the surrounding ovarian cortex. This compression can impair blood circulation within the ovary, leading to reduced oxygen supply and subsequent follicular loss. Over time, this process may result in a decrease in the number of viable follicles.

In addition, the presence of endometrioma may alter the microenvironment of the ovary. The cyst fluid inside an endometrioma contains high concentrations of iron, inflammatory mediators, and oxidative stress markers. These substances may diffuse into adjacent ovarian tissue and contribute to cellular damage.

Surgical treatment of endometrioma can also affect ovarian reserve. Laparoscopic cystectomy is considered the standard treatment for symptomatic endometriomas or large cysts. However, during the removal of the cyst wall, healthy ovarian tissue containing primordial follicles may be inadvertently removed. This may lead to a measurable reduction in ovarian reserve markers following surgery.

Concept of Ovarian Reserve

Ovarian reserve reflects the reproductive potential of a woman based on the number and quality of remaining follicles in the ovaries. Women are born with a finite number of primordial follicles, estimated at approximately one to two million at birth. This number gradually decreases throughout life due to natural follicular atresia and ovulation.

By the time a woman reaches puberty, the number of follicles decreases to about 300,000–400,000. During the reproductive years, the follicular pool continues to decline, eventually leading to menopause when the number of remaining follicles becomes critically low.

Several factors may accelerate the decline of ovarian reserve. These include aging, genetic predisposition, autoimmune diseases, chemotherapy, radiation therapy, and certain gynecological conditions such as endometriosis and ovarian cysts.

In clinical practice, ovarian reserve cannot be measured directly. Instead, it is estimated using hormonal markers and ultrasound parameters that reflect follicular activity.

Methods for Assessing Ovarian Reserve

Anti-Mullerian Hormone

Anti-Mullerian hormone (AMH) is currently considered one of the most reliable biochemical markers of ovarian reserve. AMH is produced by granulosa cells of small growing follicles and reflects the number of early follicles in the ovary.

One of the advantages of AMH measurement is that its level remains relatively stable throughout the menstrual cycle. Therefore, it can be measured at any time without strict timing. In women with endometrioma, AMH levels are often lower compared with women without ovarian pathology.

Several studies have demonstrated that the presence of endometrioma may lead to a decrease in serum AMH levels even before surgical treatment. This suggests that the cyst itself may have a negative impact on ovarian reserve.

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However, AMH levels may also decrease after surgical removal of the endometrioma, especially if a significant amount of ovarian tissue is removed during cystectomy.

Antral follicle count (AFC) is another widely used method for evaluating ovarian reserve. It is determined by transvaginal ultrasound and represents the number of small follicles measuring 2–10 mm in diameter in both ovaries.

AFC is typically measured during the early follicular phase of the menstrual cycle. A higher AFC indicates a greater number of recruitable follicles and therefore better ovarian reserve.

In patients with endometrioma, the AFC may be reduced due to damage to ovarian tissue or because the cyst interferes with ultrasound visualization. Nevertheless, AFC remains an important predictor of ovarian response to controlled ovarian stimulation during assisted reproductive treatment.

Basal follicle-stimulating hormone (FSH) levels measured during the early follicular phase have historically been used as a marker of ovarian reserve. Elevated FSH levels indicate reduced ovarian function because the pituitary gland increases FSH secretion in response to decreased ovarian activity.

However, FSH has several limitations. Its levels may fluctuate between cycles, and mild decreases in ovarian reserve may not be detected by FSH testing alone. For this reason, FSH is often used in combination with other markers such as AMH and AFC.

Ovarian Volume and Ultrasound Assessment

Ultrasound evaluation of ovarian volume can also provide indirect information about ovarian reserve. Smaller ovarian volume may indicate a reduced follicular pool.

Advanced ultrasound techniques, including Doppler studies of ovarian blood flow, may also provide additional information about ovarian function. These methods are sometimes used in specialized fertility centers.

Clinical Significance

The assessment of ovarian reserve in women with endometrioma is crucial for clinical decision-making. Accurate evaluation allows clinicians to determine the most appropriate treatment strategy for each patient.

For women who desire pregnancy, early assessment of ovarian reserve may help identify those who would benefit from fertility preservation techniques such as oocyte cryopreservation.

In addition, ovarian reserve markers help predict the response to ovarian stimulation during in vitro fertilization. Women with diminished ovarian reserve may require individualized stimulation protocols or alternative reproductive strategies.

Clinicians must also consider the potential impact of surgical treatment on ovarian reserve. In some cases, conservative management or assisted reproductive technologies may be preferred over surgery, particularly in women with already reduced ovarian reserve.

Conclusion

Ovarian endometrioma is a common manifestation of endometriosis and may significantly affect reproductive function. Both the disease itself and its surgical treatment can lead to a reduction in ovarian reserve.

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Assessment of ovarian reserve is therefore an essential step in the management of women with endometrioma. The most commonly used markers include anti-Mullerian hormone, antral follicle count, and basal follicle-stimulating hormone levels.

A comprehensive evaluation of ovarian reserve allows clinicians to develop individualized treatment plans and improve reproductive outcomes in patients with endometrioma.

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