Case Report

Oocyte Cryopreservation in Young Women with Low Ovarian Reserve Following Repeated Bilateral Ovarian Cystectomy

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Abstract

Objective: To present a case of fertility preservation in a young woman with diminished ovarian reserve following repeated ovarian cyst surgeries.

Methods: This is a case report of a 23-year-old nulligravid, unmarried, and non-sexually active woman with a history of recurrent ovarian cysts requiring multiple surgical interventions. Ovarian reserve was evaluated using serum Anti-Müllerian hormone (AMH) levels. The patient subsequently underwent controlled ovarian stimulation, followed by oocyte retrieval and cryopreservation.

Case: The patient demonstrated a markedly reduced AMH level (0.8 ng/mL), consistent with diminished ovarian reserve. Controlled ovarian stimulation resulted in the retrieval of three mature oocytes, all of which were successfully cryopreserved without complications. Evidence from previous studies indicates that AMH levels may decline by approximately 30–50% following ovarian cystectomy, particularly in cases involving bilateral disease or repeated surgical procedures.

Conclusion: Repeated ovarian surgery may significantly compromise ovarian reserve and threaten future reproductive potential in young women. Despite a limited number of retrieved oocytes in patients with diminished ovarian reserve, oocyte cryopreservation remains a feasible and effective strategy for fertility preservation.

Keywords: Anti Müllerian Hormone, cystectomy, fertility preservation, oocyte cryopreservation, ovarian reserve.

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INTRODUCTION

Fertility preservation has become an essential component of reproductive medicine, particularly for women at risk of diminished ovarian reserve. Oocyte cryopreservation (via slow freezing or vitrification) and embryo cryopreservation are considered first-line techniques for postpubertal women, with an increasing preference for oocyte cryopreservation.[1] The number of oocyte cryopreservation cycles for non-medical purposes has risen substantially; in the United Kingdom, it increased by 460% between 2010 and 2016.[2] Similarly, in the United States, the number of oocyte banking cycles increased from 16,786 in 2020 to 28,207 in 2022, regardless of indication.[3]

The Live Birth Rate (LBR) per patient among women undergoing oocyte vitrification for age-related or non-oncological medical indications has been reported to be approximately 50% in women aged ≤35 years, compared with 22.9% in those aged >36 years. Furthermore, younger women demonstrate higher and faster Cumulative Live Birth Rates (CLBR).[4] Initially, oocyte cryopreservation was recommended primarily for patients whose fertility was threatened by oncological conditions, autoimmune diseases, or the adverse effects of medical treatments.[5] However, its role has expanded to include benign gynecological conditions, such as ovarian cysts, and surgical interventions that may compromise ovarian reserve.[1]

Ovarian cystectomy is known to reduce ovarian reserve, as healthy ovarian tissue may be inadvertently removed along with the cyst

wall. In addition, surgical trauma can damage adjacent follicles.[6] This risk is further increased in recurrent cases requiring repeated surgeries, particularly in patients with endometriomas, which are associated with greater impairment of fertility.[7] For this reason, the American College of Obstetricians and Gynecologists (ACOG) recommends assessment of ovarian reserve in patients undergoing cystectomy.[8] Markers used to evaluate ovarian reserve include Follicle-Stimulating Hormone (FSH), luteinizing hormone (LH), estradiol (E2), inhibin B, Anti-Müllerian Hormone (AMH), and Antral Follicle Count (AFC).[9]

Although oocyte cryopreservation at a younger age is generally associated with more favorable reproductive outcomes, patients with diminished ovarian reserve present unique challenges due to the limited number of mature oocytes that can be retrieved. Reporting such cases is important to provide insights into clinical decision-making, patient counseling, and expected outcomes. Here, we present a case of a 23-year-old woman with a history of repeated ovarian cystectomies who exhibited diminished ovarian reserve and underwent oocyte cryopreservation as a fertility preservation strategy.

METHODS

This study is a case report describing a patient with diminished ovarian reserve following repeated ovarian cyst surgeries who underwent fertility preservation. A 23-year-old nulligravid, unmarried, and non-sexually active woman with a history of recurrent ovarian cysts requiring multiple cystectomies was evaluated at a reproductive medicine clinic.

Ovarian reserve was assessed using serum anti-Müllerian hormone (AMH) levels and transvaginal ultrasound to determine antral follicle count (AFC). Baseline hormonal evaluation, including follicle-stimulating hormone (FSH), luteinizing hormone (LH), and estradiol (E2), was also performed as part of the initial assessment.

The patient underwent controlled ovarian stimulation using a standard gonadotropin-based protocol. Follicular development was monitored through serial ultrasound examinations and serum estradiol measurements. When adequate follicular maturation was achieved, ovulation was triggered, followed by transvaginal oocyte retrieval under ultrasound guidance. Retrieved oocytes were assessed for maturity, and metaphase II (MII). Oocytes were cryopreserved using vitrification techniques. The procedure, outcomes, and any complications were documented. Written informed consent was obtained from the patient for the procedure and for publication of this case report, with all identifying information anonymized.

CASE

A 23-year-old nulligravid woman was referred to our fertility clinic for fertility preservation. She was unmarried, not sexually active, and had no immediate plans for pregnancy. The patient had a history of repeated ovarian surgeries. Her first laparotomy for ovarian cystectomy was performed nine years prior. Subsequently, she underwent another laparotomy one year before presentation, which included bilateral cystectomy, salpingectomy, and adhesiolysis for the management of large bilateral ovarian cysts. Histopathological examination revealed a follicular cyst in the right ovary, a serous cystadenoma in the left ovary, and chronic salpingitis in the right fallopian tube. No malignant cells were identified in the peritoneal fluid. Aside from a prior appendectomy, she had no significant medical history, including malignancy, autoimmune disease, or other chronic illnesses. She was not using contraception or hormonal therapy at the time of evaluation.

The patient was asymptomatic at presentation. Ovarian reserve assessment, including serum anti-Müllerian Hormone (AMH), Luteinizing Hormone (LH), and estradiol levels, was performed. The results showed a markedly reduced AMH level (0.8 ng/mL) and elevated estradiol (2,658 pg/mL), consistent with diminished ovarian reserve. Other hormonal parameters, including LH and progesterone, were within normal limits.

After appropriate fertility counseling, the patient elected to undergo oocyte cryopreservation. Controlled ovarian stimulation was initiated using a gonadotropin-releasing hormone (GnRH) antagonist protocol, with gonadotropin doses adjusted according to follicular response. Ultrasound monitoring identified nine follicles in the right ovary, with four follicles reaching a diameter of >18 mm. Transvaginal ultrasound-guided oocyte retrieval was subsequently performed. A total of three mature (metaphase II) oocytes were retrieved from the right ovary and successfully cryopreserved using vitrification. The procedure was well tolerated, with no complications observed.

DISCUSSION

This case highlights the reproductive challenges faced by young women with diminished ovarian reserve due to ovarian cysts and repeated surgical interventions. A national study conducted in a secondary hospital reported a high prevalence (76%) of ovarian cysts among young adults aged 18–21 years, with many patients presenting at an advanced stage.[10] Ovarian cystectomy has been consistently associated with a significant decline in serum AMH levels, ranging from 30% to 50%, particularly in cases of endometriotic cysts, bilateral involvement, or repeated surgeries.[7] Therefore, oophorectomy is discouraged in adolescents, and ovarian-preserving strategies are strongly recommended.[10]

Several studies have demonstrated a significant postoperative reduction in mean serum AMH levels following ovarian cystectomy for both endometriotic and non-endometriotic cysts.[11,12] The decline is more pronounced in bilateral disease.[6] In terms of cyst type, greater reductions in AMH levels are observed in endometriotic cysts compared to non-endometriotic cysts.[13] One study reported the greatest decrease in endometriosis (2.09 ± 0.7), followed by serous cystadenoma (1.51 ± 0.65) and dermoid cysts (0.79 ± 0.65).[11] The absence of a true capsule in endometriotic cysts often leads to inadvertent removal of healthy ovarian tissue, resulting in follicular loss and a greater decline in AMH levels.[6,13] In addition, thermal damage from cauterization may further injure surrounding ovarian tissue and vasculature, contributing to reduced ovarian reserve.[11]

In this patient, the low serum AMH level reflects diminished ovarian reserve, which may compromise future fertility. AMH is a reliable marker of ovarian reserve, as it reflects the follicular pool during the gonadotropin-independent phase and correlates with antral follicle count.9 Due to its minimal fluctuation throughout the menstrual cycle, AMH is widely used as a stable indicator of ovarian reserve.[11] It also plays a role in folliculogenesis by regulating the transition from FSH-independent to FSH-dependent stages.[9]

Oocyte cryopreservation is an established method of fertility preservation, particularly in women under 35 years of age. Clinical outcomes following thawing are comparable to those of fresh oocytes, supporting the effectiveness of vitrification. Age-stratified data show that Cumulative Live Birth Rates (CLBR) from cryopreserved oocytes are higher in younger women, with reported rates of 66.67% (<30 years), 65.38% (30–34 years), and 31.82% (≥35 years). Live birth rates per oocyte and the number of oocytes required per live birth also demonstrate a clear age-related trend.[14]

Accurate counseling should consider both patient age and the number of oocytes cryopreserved.[5] CLBR increases with the number of retrieved oocytes, exceeding 60% in women ≤35 years when 6–8 oocytes are obtained. However, this relationship weakens with advancing age.[15] In patients with diminished ovarian reserve, the number of mature oocytes retrieved is often limited. Although a higher number of metaphase II oocytes may improve clinical pregnancy rates by increasing embryo availability, live birth rates and CLBR may not significantly change.[16] In this case, only three mature oocytes were retrieved, underscoring the challenges of fertility preservation in patients with compromised ovarian function.

Although the procedure was well tolerated in this patient, oocyte cryopreservation carries potential risks. Ovarian hyperstimulation syndrome is the most common concern. Other complications related to oocyte retrieval include bleeding, pelvic pain, intraperitoneal fluid collection, organ injury, and anesthesia-related risks. Additionally, pregnancies resulting from in vitro fertilization are associated with increased risks of preeclampsia, preterm birth, and intrauterine growth restriction.[2] Despite its effectiveness, oocyte cryopreservation at a young age may have limited cost-efficiency due to low utilization rates.[5] However, studies have shown that cryopreservation at ≤35 years is more cost-effective compared to older age groups.[17]

Despite these limitations, oocyte cryopreservation provides an important opportunity for preserving future reproductive potential and should be considered in young women at risk of diminished ovarian reserve.

CONCLUSION

This case demonstrates that ovarian cysts, particularly when managed with repeated ovarian surgeries, can significantly impair ovarian reserve and increase the risk of future fertility loss. Early counseling and timely consideration of fertility preservation are essential, especially in young women. Oocyte cryopreservation

remains a feasible and effective strategy for fertility preservation, although the number of retrievable oocytes may be limited in patients with diminished ovarian reserve. Comprehensive counseling regarding expected reproductive outcomes, potential risks, and cost-effectiveness is crucial.

CONFLICT of INTEREST

There was no conflict of interest was declared by the author.

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