Journal of Obstetrics, Gynecology and Cancer Research | ISSN: 2476-5848

Ovarian Tissue Cryopreservation in Patients with Endometriosis: A Systematic Review of the Literature

Achmad Kemal Harzif[1]*, Mila Maidarti[1], Costan Tryono Parulian Rumapea[2], Sarah Miriam Ratna Pratamasari[2], Heidi Dewi Mutia[3], Nafi'atul Ummah[3], Aisyah Retno Puspawardani[3], Putri Nurbaeti[3], Budi Wiweko[1]

1. *Reproductive Immunoendocrinology Division, Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Indonesia, Dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia*
2. *Department of Obstetrics and Gynecology, Faculty of Medicine, University Indonesia, Dr. Cipto Mangunkusumo Hospital Jakarta, Jakarta, Indonesia*
3. *Human Reproduction, Infertility, and Family Planning Cluster, Indonesia Reproductive Medicine Research and Training Center, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia*

Article Info

10.30699/jogcr.10.5.351

Received: 2024/01/02;
Accepted: 2024/04/06;
Published Online: 13 Mar 2025;

Use your device to scan and read the article online

Corresponding Information:
Achmad Kemal Harzif,
Reproductive Immunoendocrinology Division, Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Indonesia, Dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia

Email: kemal.achmad@gmail.com

ABSTRACT

Background & Objective: Endometriosis is one of the primary etiology of subfertility in women; in severe cases, endometriosis surgery could result in infertility due to oophorectomy. Ovarian tissue cryopreservation is a method by which the ovarian cortex is frozen and retransplanted in patients. This method is unaffected by the menstrual cycle, can restore ovarian hormonal function, and does not require sperm donor or ovulation induction. This systematic review aims to review the utility of ovarian tissue cryopreservation in endometriosis patients.

Materials & Methods: We searched the literature using keywords such as "fertility preservation," "cryopreservation," "endometriosis," and "ovarian tissue cryopreservation" for relevant articles in Pubmed and Embase. We included all relevant articles, including case reports, cohort studies, and clinical trials.

Results: A total of 6 articles were included in this systematic review, including three retrospective studies and three case reports. In screening for candidates of ovarian tissue cryopreservation, serum antimullerian hormone (AMH) is a good marker for primordial follicle count. Patients undergoing ovarian tissue implantation after cryopreservation demonstrated an excellent pregnancy rate (41.2%) in one study. Follicle viability and hormonal function were preserved post-transplantation.

Conclusion: The current evidence shows that endocrine function and fertility in patients grafted with cryopreserved ovarian tissue are good. However, the evidence on the long-term outcome of ovarian tissue cryopreservation in endometriosis patients is lacking.

Keywords: Assisted Reproductive Technique, Endometriosis, Fertility Preservation, Ovarian Tissue Cryopreservation

Copyright © 2025, This is an original open-access article distributed under the terms of the Creative Commons Attribution-noncommercial 4.0 International License which permits copy and redistribution of the material just in noncommercial usages with proper citation.

1. Introduction

Endometriosis is defined as the existence of endometrial tissue, including endometrial glands and stroma outside of the uterus, usually affecting the peritoneum and ovaries; it results in dysmenorrhea and premenstrual discomfort **(1-3)**. Endometriosis affects approximately 10-15% of all women of reproductive age and contributes as one of the most common causes of infertility. About 25–50% of women with infertility have endometriosis, and 30–50% of women with endometriosis experience infertility **(4)**.

Several pathophysiologies underlying endometriosis-related infertility. In mild to moderate forms of endometriosis, ectopic endometrial tissue could promote inflammation of the peritoneal cavity, which recruits macrophages and induces secretion of prostaglandin, IL-1, TNF, and proteases **(4)**. Inflammation can cause anatomical disorder and affect ovarian function. This condition leads to functional impairment of oocytes, sperm, and embryo implantation. Severe endometriosis can result in pelvic organ adhesion that impairs tubal patency, ovum pickup, and/or ovum transport **(4, 5)**.

Severe endometriosis could also decrease ovarian reserve, irrespective of previous surgical history. In addition, the technique to treat severe endometriosis, such as excision and ablation could result in collateral ovarian tissue damage, resulting in impaired ovarian function **(6, 7)**. The recurrence of endometriosis is relatively high, nearing 50% after five years; it also further impairs ovarian function and fertility due to recurrent surgery and destruction of nearby ovarian tissue **(6)**.

In patients with severe endometriosis and worsening ovarian function despite adequate treatment, a fertility preservation technique could be considered to preserve the patient's fertility after extensive impairment of ovarian function **(8)**. Fertility preservation technique has been widely used in patients who will receive a genotoxic treatment, such as chemotherapy **(8, 9)**. Recently, fertility preservation has also been offered to patients with premature ovarian insufficiency and patients who are at risk of premature menopause, including iatrogenic ovarian insufficiency such as in severe endometriosis patients undergoing ovarian surgery **(10-12)**.

Ovarian tissue vitrification or cryopreservation is a relatively new ovarian preservation method in which ovarian cortex tissue is excised and preserved to be implanted later. This method offers several advantages over traditional oocyte/embryo cryopreservation. One of its benefits is that it does not require ovarian hyperstimulation and a sperm donor. Additionally, it provides the possibility of restoring ovarian hormonal function. Moreover, ovarian tissue cryopreservation (OTC) is often preferred in many cases besides endometriosis due to its low risk of metastases to ovaries **(13-16)**.

Ovarian tissue cryopreservation has been used in endometriosis with convincing results. However, the evidence of ovarian tissue cryopreservation in endometriosis is scarce. This systematic review aims to summarize the current evidence on ovarian tissue cryopreservation in endometriosis patients.

2. Materials and Methods

We searched Pubmed and Embase for relevant literature using keywords such as “Ovarian tissue vitrification,” “ovarian tissue cryopreservation,” “endometriosis,” “endometrioma,” and “fertility preservation.” The total keywords for literature searching are listed in Table 1. After retrieving studies, we conducted deduplication for duplicate studies, screening the abstracts of the studies retrieved. We then retrieved the entire manuscript for the screened abstract. Critical appraisals were then conducted for respective studies using the JBI checklist for case reports, cross-sectional studies, and cohort studies. Data were then summarized using tables.

Table 1. Keywords for Literature Searching

Database	Keywords	Hits
Pubmed	((“endometrioma”[All Fields]) OR (“endometriosis”[All Fields])) AND ((“fertility preservation”[All Fields]) OR (“ovarian cryopreservation”[All Fields]) OR (“cryopreservation”[All Fields]) OR (“ovarian tissue cryopreservation”[All Fields]))	244
Embase	('endometrioma'/exp OR endometrioma OR 'endometriosis'/exp OR endometriosis) AND ('fertility preservation'/exp OR 'fertility preservation' OR 'ovarian cryopreservation'/exp OR 'ovarian cryopreservation' OR 'cryopreservation'/exp OR cryopreservation OR 'ovarian tissue cryopreservation'/exp OR 'ovarian tissue cryopreservation')	675

3. Results

We retrieved 919 studies from the literature. After deduplication, we retrieved 752 studies (Figure 1). We included 6 studies in the systematic review, including three case reports, one retrospective study, one prospective study, and one cross-sectional study. Risks of bias for the case reports were medium risk for Donnez et al **(17)** and Harzif et al **(18)** low risk for Fabbri et al **(19)** cross sectional study by Garavaglia et al **(20)** had low bias risk, while retrospective study by Lotz et al **(21)** had medium risk, and prospective study by Oktay and Oktem **(22)** also had medium bias risk.

The summary of the included study is presented in Table 2.

Table 2. Summary of Included Studies

Study	Design	Patients (n)	Patient Age	Age at Time of Freezing	Age at Time of Transplantation	Transplantation Site	Result
Donnez et al (17)	Case report	2	Patient A: 25 yo Patient B: 27 yo	Patient A 25 yo Patient B: 27 yo	Patient A 25 yo Patient B 27 yo	Orthotopic (pelvic peritoneal window)	Two patients with endometriosis who should undergo oophorectomy had their ovarian cortex tissue cryopreserved. Subsequent grafting of the ovarian tissue orthotopically resulted in vital ovarian tissue after three months of follow-up. Both patients had no natural pregnancy, but ovarian tissue graft shows viable primordial follicles and normal ovarian function
Harzif et al (18)	Case report	2	Patient A: 21 yo Patient B: 21 yo	Patient A: 21 yo Patient B: 21 yo	N/A	N/A	Two patients with endometriosis underwent cystectomy and ovarian cortex cryopreservation. Ovarian tissue was successfully frozen. No ovarian tissue graft was reported in the study.
Fabbri et al (19)	Case report	1	24 y.o	24 y.o	1st Transplantation 34 yo 2nd Transplantation 37 yo	1st transplantation: orthotopic (10 strip left ovary, 5 strips in the left peritoneal pocket)	One patient with cystic teratoma and endometriosis underwent ovarian tissue cryopreservation before receiving gonadotoxic

Study	Design	Patients (n)	Patient Age	Age at Time of Freezing	Age at Time of Transplantation	Transplantation Site	Result
						2nd transplantation: heterotopic (17 strips in the small pockets of the abdominal wall)	chemotherapy. After orthotopic implantation of frozen ovarian tissue, menopausal symptoms disapeared, but serum hormonal levels remained at a menopausal level.
Oktay and Oktem (22)	Prospective Study	59 patients underwent ovarian tissue cryopreservation (only 3 had ovarian transplantation and only 1 out of 3 had endometriosis	Mean age of 59 patients 26.7 ± 1.2 years (range 4–44 years).	28 yo (patient with endometriosis)	29 yo (patient with endometriosis)	orthotopic (left pelvic peritoneum)	The study included patients with a risk of premature menopause due to gonadotoxic treatment and gonadectomy. Out of 59 patients, three patients had their ovarian tissue grafted after treatment. One patient with endometriosis had ovarian function only for nine months and no spontaneous pregnancy.
Garavaglia et al (20)	Cross Sectional study	202 (patients with endometriosis) 400 (control)	Mean age 34.7 ± 5.9 years (range 19–48 age years)	N/A	N/A	N/A	In patients with endometriosis who are candidates for ovarian tissue cryopreservation, anti-mullerian hormone is a reliable predictor of follicular density. Lower AMH level corresponded to the lower number of

Study	Design	Patients (n)	Patient Age	Age at Time of Freezing	Age at Time of Transplantation	Transplantation Site	Result
							primordial follicle
Lotz et al (21)	Retrospective study	17	Mean age 29.5±6.3 years (14-39 years).	Mean age 29.5±6.3 years (14-39 years)	Mean age 34.6± 4.3 years (28-40 years)	Orthotopic (peritoneal pocket of the pelvic peritoneum in the ovarian fossa)	Endometriosis patients undergoing ovarian tissue cryopreservation. Before ovarian tissue transplantation, none of the patients conceived spontaneously. After transplantation, seven (41.2%) became pregnant, with three spontaneous conception and four natural IVF cycles.

yo = years old, N/A = not available

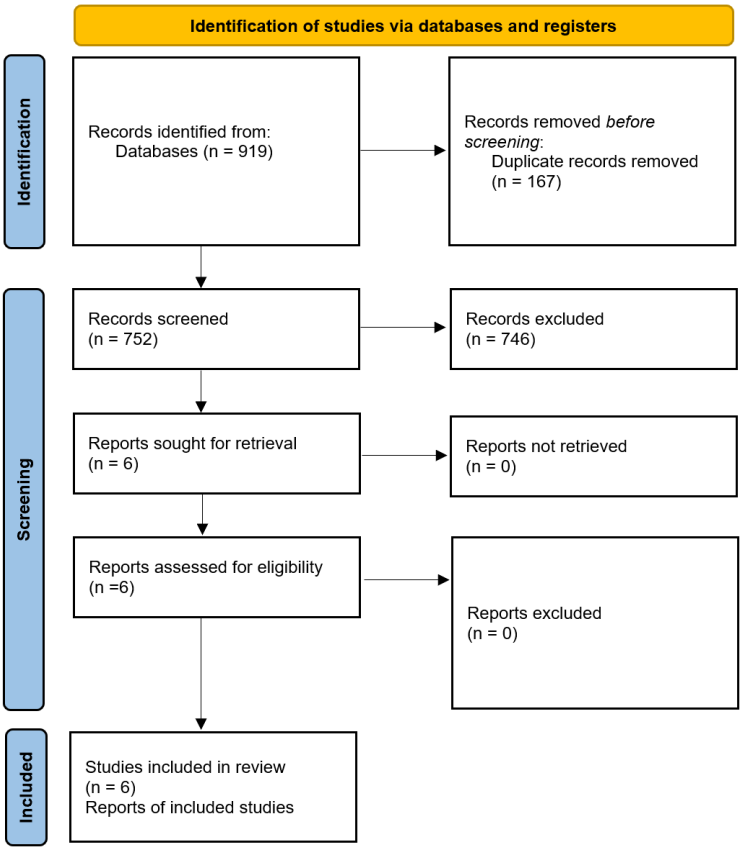


Figure 1. PRISMA Diagram. Firstly, 919 studies were retrieved, and 752 were retrieved after deduplication. Finally, only six studies were included.

4. Discussion

The present systematic review is purposed to summarize the evidence on ovarian tissue cryopreservation in endometriosis patients. Case reports on ovarian tissue cryopreservation show that ovarian tissue cryopreservation is a viable method to preserve ovarian function after genotoxic treatment or gonadectomy. However, the case reports did not show any outcome on fertility.

Ovarian tissue cryopreservation is a fertility preservation method that includes freezing ovarian tissues and grafting them at a later time, preferably after cessation of genotoxic treatment Ladanyi et al **(23)**. The majority of cases in which ovarian tissue was cryopreserved are in prepubertal patients who had malignancy and had to undergo genotoxic chemotherapy or radiotherapy. Given the limitation of ovarian stimulation in prepubertal patients, ovarian tissue cryopreservation remains the most promising option **(24)**. Ovarian tissue cryopreservation has been shown to induce puberty and result in normal endocrine function in these patients **(23, 25, 26)**.

There are several advantages of ovarian tissue cryopreservation compared to other fertility-preserving methods. Firstly, ovarian tissue cryopreservation does not require follicle stimulation, which takes time and could delay treatment. In patients with coexisting aggressive cancer or large endometrioma, follicle stimulation might delay treatment, which might worsen the prognosis of these patients. Secondly, ovarian tissue cryopreservation is the only fertility preservation method in prepubertal girls. Finally, ovarian tissue cryopreservation could preserve not only fertility but also ovarian endocrine function, which minimizes the requirement for long-term hormone supplementation **(27, 28)**.

However, the research by Oktay and Oktem **(22)** shows that cryopreserved tissue grafting is still underutilized. Only 3 out of 59 patients who underwent ovarian tissue cryopreservation eventually underwent grafting. This reveals that this technique is still needing to be utilized despite its benefits. Additionally, ovarian tissue cryopreservation is still considered an experimental method, which means the evidence around ovarian tissue cryopreservation still lack **(23, 29)**.

It must be considered that endometriosis affects the ovarian tissue in most cases. Fabbri et al **(19)** conducted a study that showed that a patient who underwent surgical excision for ovarian endometriosis might experience a negative impact on ovarian reserve **(19)**. This was evident from the high degree of damage in the ovarian tissue, with loss of stromal compartment and structural organization and presence of fibrotic areas in both fresh and thawed ovarian tissue. In another study by Harzif et al **(18)**, it was reported that the density of the follicle was lower in endometriosis patients than in normal ovarian tissue, which is a possible cause for low ovarian reserve. This correlates with the study that ovarian endometriosis cysts promote an inflammatory reaction causing fibrosis surrounding the normal ovarian cortex, which is associated with concomitant loss of cortex and reduced follicular density **(30, 31)**. The fluid contained in the endometriosis cysts, which is enriched with cellular damage mediating factors, may cause oocyte apoptosis and necrosis in primordial follicles. Thus, the follicles that are very close to the endometrioma wall could be altered **(31, 32)**. In a case report by Donnez et al **(17)** a patient with left endometrioma who had undergone two laparotomies showed compromised ovarian vascularization before transplantation. This correlates to a potential mechanism of surgery-related local inflammation and vascular damage due to electrosurgical coagulation during hemostasis that may have an impact on ovarian function **(33, 34)**.

Only one study stated no signs of endometriosis could be detected in any women by ultrasound after ovarian tissue transplantation **(21)**. The other studies did not mention the progression of endometriosis after transplantation.

One study by Garavaglia et al **(20)** shows that Antimüllerian hormone (AMH) level is associated with primordial follicle count. Ovarian tissue cryopreservation is highly dependent on the number of follicles in the removed ovarian strips, and the AMH level should be tested before offering the option for ovarian tissue cryopreservation. A case report by Harzif et al **(18)** also shows that patients with a serum AMH level of 7.2 ng/mL have an adequate follicle count on ovarian biopsy, with 1.8-166 follicles per mm^3 of ovarian tissue.

Endometriosis patients who already have low AMH levels and subsequently low follicle counts also have a faster follicle depletion rate; in this case, ovarian tissue cryopreservation might not be an effective fertility preservation method. A threshold value of 1.28ng/mL is a good indicator for sufficient immature oocytes, and patients with AMH levels below 1.28ng/mL should not be offered ovarian tissue cryopreservation to avoid redundant surgery **(20)**. However, there is no evidence on the level of AMH on ovarian tissue cryopreservation success, and further research is warranted.

Most studies included in this systematic review use orthotropic grafting for ovarian tissue, meaning that the cryopreserved ovarian tissue is grafted in the remaining ovary, ovarian fossa, or broad ligament. Only one study conducted by Fabbri, Vicenti **(19)** used a heterotopic method that was located in the subcutaneous space of the abdominal wall as the second attempt of transplantation.

Two studies, one by Donnez et al **(17)** showed ovarian tissue viability was maintained and shown by the presence of neovascularization and covered with living endothelial cells, and another study by Fabbri et

al (19) showed small follicle growth after orthotropic transplantation and the disappearance of menopausal symptoms was shown after 6 months of the second transplantation using a heterotopic site. However, Donnez et al (17) reported low follicle count and the presence of fibrosis in one case 3 months after orthotropic transplantation located beneath the right ovarian hilus and close to the ovarian blood vessels, showing that ovarian tissue viability after orthotropic implantation could be poor.

Several factors impact the vitality of ovarian tissue after implantation. The cryopreservation technique plays a significant role in the vitality of ovarian tissue. Studies have shown that the slow freezing protocol using DMSO as a cryoprotectant resulted in better follicle survival compared to using ethylene glycol as a cryoprotectant. The majority of children born after autotransplantation of ovarian cortical tissue that was cryopreserved using Dimethyl Sulfoxide (DMSO) as cryopectants (CPA) (35, 36). Additionally, heterotopic implantation also provides a better vascular bed for the implant, resulting in better vitality and more mature oocytes (23).

Ovarian function after implantation appears to be good. One study shows ovarian function in endometriosis patients returned to normal for at least nine months (22).

In the case report by Fabbri et al (19), it was observed that although the symptoms of menopause disappeared, the endocrine function was still lost, as showed by the levels of FSH, LH, Progesterone, and Estrogen, which remained at menopausal levels even after successful ovarian tissue grafting. The case included several other pathologies aside from endometriosis, namely cystic teratoma and stroma ovary. The pathologies result in worse ovarian function before extraction of ovarian tissue, which might impact ovarian tissue function after grafting. The existing literature suggests that ovarian tissue cryopreservation resulted in lower ovarian endocrine function compared to other indications (19, 22). However, further research should be conducted to study endocrine function in endometriosis patients undergoing ovarian tissue cryopreservation.

The result of the study shows that heterotopic implantation resulted in more extended ovarian function compared to orthotropic implantation, as patients with heterotopic implantation had endocrine function for more than three years. However, Lotz et al (21) reported a good pregnancy rate in endometriosis patients with orthotopic implantation. Unfortunately, the study did not analyze hormonal levels before and after implantation.

The pregnancy rate seems to be good in patients undergoing orthotopic implantation of ovarian tissue. In one case by Donnez et al (17) a patient was able to conceive after three IVF attempts, despite not being able to conceive naturally. Lotz et al (21) reported that out of the 17 women who underwent orthotopic implantation, 7 (41.2%) became pregnant, with 3 of them conceiving naturally (42.8%) and 4 (57.2%) conceiving through natural cycle IVF/ICSI. However, it is important to note that only one out of two patients with endometriosis who underwent ovarian tissue removal for cryopreservation reported a successful pregnancy but were unable to carry it to term.

This result is in accordance to the previous result by Jensen et al (37), showing that ovarian tissue cryopreservation resulted in good pregnancy rate and live births. Additionally, the perinatal outcome is also good in patients undergoing ovarian tissue cryopreservation. Unfortunately, there is no research on perinatal outcomes in endometriosis patients undergoing ovarian tissue cryopreservation.

5. Conclusion

Ovarian tissue cryopreservation is a viable fertility preservation technique for endometriosis patients who are at risk of premature ovarian insufficiency or require gonadectomy. While the current evidence suggests good endocrine function and fertility in these patients, more research is needed to determine the long-term outcomes.

6. Declarations

Acknowledgments

Not applicable.

Ethical Considerations

This study was approved by the Ethics and Research Committee of the Faculty of Medicine Universitas Indonesia, under registration number: KET - 1292/UN2.F1/ETIK/PPM.00.02/2023, and protocol number: 23-09-1467.

Authors' Contributions

A.H., M.M., contributed to the search strategy, research design of the systematic review, and aided in data analysis. C.R. and S.P. were responsible for drafting the manuscript and conducting article screening. H.M., N.U., and A.P., thoroughly revised the manuscript for significant intellectual content and granted approval for the final version to be published. B.W. oversaw the study and provided important intellectual content revisions for the manuscript. All authors have reviewed the manuscript and given their approval for publication.

Conflict of Interest

The authors declare no conflict of interest.

Fund or Financial Support

This research received no specific grant from any funding agency in the public, commercial, or not for profit sector.

References

1. Parasar P, Ozcan P, Terry KL. Endometriosis: Epidemiology, Diagnosis and Clinical Management. Curr Obstet Gynecol Rep. 2017; 6(1):34-41. [DOI:10.1007/s13669-017-0187-1] [PMID] [PMCID]
2. Chauhan S, More A, Chauhan V, Kathane A. Endometriosis: A Review of Clinical Diagnosis, Treatment, and Pathogenesis. Cureus. 2022; 14(9):e28864. [DOI:10.7759/cureus.28864]
3. Horne AW, Missmer SA. Pathophysiology, diagnosis, and management of endometriosis. BMJ. 2022;379:e070750. [PMID] [DOI:10.1136/bmj-2022-070750]
4. Bulletti C, Coccia ME, Battistoni S, Borini A. Endometriosis and infertility. J Assist Reprod Genet. 2010;27(8):441-7. [PMID] [PMCID] [DOI:10.1007/s10815-010-9436-1]
5. Wu M-H, Hsiao K-Y, Tsai S-J. Endometriosis and possible inflammation markers. Gynecol Minim Invasive Ther. 2015;4(3):61-7. [DOI:10.1016/j.gmit.2015.05.001]
6. Benaglia L, Somigliana E, Vighi V, Ragni G, Vercellini P, Fedele L. Rate of severe ovarian damage following surgery for endometriomas. Hum Reprod. 2010;25(3):678-82. [DOI:10.1093/humrep/dep464] [PMID]
7. Llarena NC, Falcone T, Flyckt RL. Fertility Preservation in Women With Endometriosis. Clin Med Insights Reprod Health. 2019;13: 1179558119873386. [PMID] [PMCID] [DOI:10.1177/1179558119873386]
8. Dolmans MM, Manavella DD. Recent advances in fertility preservation. J Obstet Gynaecol Res. 2019;45(2):266-79. [DOI:10.1111/jog.13818] [PMID]
9. Lambertini M, Del Mastro L, Pescio MC, Andersen CY, Azim HA Jr, Peccatori FA, et al. Cancer and fertility preservation: international recommendations from an expert meeting. BMC Med. 2016;14:1. [PMID] [PMCID] [DOI:10.1186/s12916-015-0545-7]
10. Suzuki N, Yoshioka N, Takae S, Sugishita Y, Tamura M, Hashimoto S, et al. Successful fertility preservation following ovarian tissue vitrification in patients with primary ovarian insufficiency. Hum Reprod. 2015;30(3):608-15. [DOI:10.1093/humrep/deu353] [PMID]
11. Carrillo L, Seidman DS, Cittadini E, Meirow D. The role of fertility preservation in patients with endometriosis. J Assist Reprod Genet. 2016; 33(3):317-23. [PMID] [PMCID] [DOI:10.1007/s10815-016-0646-z]
12. Rangi S, Hur C, Richards E, Falcone T. Fertility Preservation in Women with Endometriosis. J Clin Med. 2023;12(13):1179558119873386. [DOI:10.3390/jcm12134331] [PMID] [PMCID]
13. Donnez J, Martinez-Madrid B, Jadoul P, Van Langendonckt A, Demylle D, Dolmans MM. Ovarian tissue cryopreservation and transplantation: a review. Hum Reprod Update. 2006;12(5):519-35. [DOI:10.1093/humupd/dml032] [PMID]
14. Dietl AK, Dittrich R, Hoffmann I, Denschlag D, Hanjalic-Beck A, Müller A, et al. Does it make sense to refreeze ovarian tissue after unexpected occurrence of endometriosis when transplanting the tissue?. J Ovarian Res. 2022;15(1):53. [DOI:10.1186/s13048-022-00972-8] [PMID] [PMCID]
15. Khattak H, Malhas R, Craciunas L, Afifi Y, Amorim CA, Fishel S, et al. Fresh and cryopreserved ovarian tissue transplantation for preserving reproductive and endocrine function: a systematic review and individual patient data meta-analysis. Hum Reprod Update. 2022;28(3): 400-16. [DOI:10.1093/humupd/dmac015] [DOI:10.1093/humupd/dmac003] [PMID] [PMCID]
16. Aminimoghaddam S, Azh N, Noei Teymoordash S, Ghaffari F. Fertility Preservation in Endometrial Cancer: Current Knowledge and Practice. J Obstet Gynecol Cancer Res. 2022; 7(5):362-73. [DOI:10.30699/jogcr.7.5.362]
17. Donnez J, Squifflet J, Dolmans MM, Martinez-Madrid B, Jadoul P, Van Langendonckt A. Orthotopic transplantation of fresh ovarian cortex: a report of two cases. Fertil Steril. 2005; 84(4):1018. [DOI:10.1016/j.fertnstert.2005.06.011] [PMID]
18. Harzif AK, Pratama G, Maidarti M, Prameswari N, Shadrina A, Mutia K, et al. Ovarian cortex freezing as a method of fertility preservation in endometriosis: A case report. Ann Med Surg (Lond). 2022;74:103222. [PMCID] [DOI:10.1016/j.amsu.2021.103222] [PMID]

19. Fabbri R, Vicenti R, Paradisi R, Rossi S, De Meis L, Seracchioli R, et al. Transplantation of cryopreserved ovarian tissue in a patient affected by metastatic struma ovarii and endometriosis. Gynecol Endocrinol. 2018;34(7):558-62. [DOI:10.1080/09513590.2017.1423468] [PMID]
20. Garavaglia E, Sala C, Taccagni G, Traglia M, Barbieri C, Ferrari S, et al. Fertility Preservation in Endometriosis Patients: Anti-Müllerian Hormone Is a Reliable Marker of the Ovarian Follicle Density. Front Surg. 2017;4:40. [PMID] [DOI:10.3389/fsurg.2017.00040] [PMCID]
21. Lotz L, Dietl A, Hoffmann I, Müller A, Burghaus S, Beckmann MW, et al. Endometriosis in women undergoing ovarian tissue transplantation due to premature menopause after gonadotoxic treatment or spontaneous premature ovarian failure. Acta Obstet Gynecol Scand. 2022;101(7): 771-8. [DOI:10.1111/aogs.14374] [PMID] [PMCID]
22. Oktay K, Oktem O. Ovarian cryopreservation and transplantation for fertility preservation for medical indications: report of an ongoing experience. Fertil Steril. 2010;93(3):762-8. [DOI:10.1016/j.fertnstert.2008.10.006] [PMID]
23. Ladanyi C, Mor A, Christianson MS, Dhillon N, Segars JH. Recent advances in the field of ovarian tissue cryopreservation and opportunities for research. J Assist Reprod Genet. 2017;34(6):709-22. [DOI:10.1007/s10815-017-0899-1] [PMID] [PMCID]
24. Dinikina Y, Belogurova M, Zaritskey A, Govorov I, Tsibizova V, Gamzatova Z, et al. Ovarian tissue cryopreservation in prepubertal patients with oncological diseases: multidisciplinary approach and outcomes. J Matern Fetal Neonatal Med. 2021;34(14):2391-8. [DOI:10.1080/14767058.2019.1666364] [PMID]
25. Rivas Leonel EC, Lucci CM, Amorim CA. Cryopreservation of Human Ovarian Tissue: A Review. Transfus Med Hemother. 2019;46(3): 173-81. [DOI:10.1159/000499054] [PMID] [PMCID]
26. Kristensen SG, Andersen CY. Cryopreservation of Ovarian Tissue: Opportunities Beyond Fertility Preservation and a Positive View Into the Future. Front Endocrinol (Lausanne). 2018;9:347. [DOI:10.3389/fendo.2018.00347] [PMID] [PMCID]
27. Bahroudi Z, Zarnaghi MR, Izadpanah M, Abedelahi A, Niknafs B, Nasrabadi HT, et al. Review of ovarian tissue cryopreservation techniques for fertility preservation. J Gynecol Obstet Hum Reprod. 2022;51(2):102290. [DOI:10.1016/j.jogoh.2021.102290] [PMID]
28. Silber S. Ovarian tissue cryopreservation and transplantation: scientific implications. J Assist Reprod Genet. 2016;33(12):1595-603. [PMID] [DOI:10.1007/s10815-016-0814-1] [PMCID]
29. Barnett R, Banks N, Decherney AH. Endometriosis and Fertility Preservation. Clin Obstet Gynecol. 2017;60(3):517-23. [PMID] [DOI:10.1097/GRF.0000000000000311]
30. Maneschi F, Marasá L, Incandela S, Mazzarese M, Zupi E. Ovarian cortex surrounding benign neoplasms: a histologic study. Am J Obstet Gynecol. 1993;169(2 Pt 1):388-93. [DOI:10.1016/0002-9378(93)90093-X] [PMID]
31. Kitajima M, Murakami N, Kitajima Y, Kajimura I, Matsumura A, Matsumoto K, et al. Accumulation of fibrosis and altered perifollicular stromal differentiation in vitrified-thawed human ovarian tissue xenografted to nude mice. Reprod Med Biol. 2022;21(1):e12451. [DOI:10.1002/rmb2.12451] [PMID] [PMCID]
32. Sanchez AM, Viganò P, Somigliana E, Panina-Bordignon P, Vercellini P, Candiani M. The distinguishing cellular and molecular features of the endometriotic ovarian cyst: from pathophysiology to the potential endometrioma-mediated damage to the ovary. Hum Reprod Update. 2014;20(2):217-30. [DOI:10.1093/humupd/dmt053] [PMID]
33. Pergialiotis V, Prodromidou A, Frountzas M, Bitos K, Perrea D, Doumouchtsis SK. The effect of bipolar electrocoagulation during ovarian cystectomy on ovarian reserve: a systematic review. Am J Obstet Gynecol. 2015;213(5):620-8. [DOI:10.1016/j.ajog.2015.04.006] [PMID]
34. Garcia-Velasco JA, Somigliana E. Management of endometriomas in women requiring IVF: to touch or not to touch. Hum Reprod. 2009;24(3): 496-501. [DOI:10.1093/humrep/den398] [PMID]
35. Bastings L, Westphal JR, Beerendonk CC, Bekkers RL, Zusterzeel PL, Hendriks JC, et al. Clinically applied procedures for human ovarian tissue cryopreservation result in different levels of efficacy and efficiency. J Assist Reprod Genet. 2016;33(12):1605-14. [PMID] [PMCID] [DOI:10.1007/s10815-016-0816-z]
36. El Cury-Silva T, Nunes MEG, Casalechi M, Comim FV, Rodrigues JK, Reis FM. Cryoprotectant agents for ovarian tissue vitrification: Systematic review. Cryobiology. 2021;103:7-14. [DOI:10.1016/j.cryobiol.2021.08.001] [PMID]
37. Jensen AK, Macklon KT, Fedder J, Ernst E, Humaidan P, Andersen CY. 86 successful births and 9 ongoing pregnancies worldwide in women transplanted with frozen-thawed ovarian tissue: focus on birth and perinatal outcome in 40 of

these children. J Assist Reprod Genet. 2017; 34(3):325-36. [DOI:10.1007/s10815-016-0843-9] [DOI:10.1007/s10815-017-0873-y] [PMCID]

How to Cite This Article:

Harzif, A. Kemal, Maidarti, M., Rumapea, C. Tryono Parulian, Pratamasari, S., et al. Ovarian Tissue Cryopreservation in Patients with Endometriosis: A Systematic Review of the Literature. J Obstet Gynecol Cancer Res. 2025;10(5):351-60.

Download citation: RIS | EndNote | Mendeley |BibTeX |