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*Review*

# Fertility Preservation in Cancer Patients: A Current Challenge

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## ABSTRACT

Fertility preservation in female cancer patients has become a central topic in clinical practice, given the increased survival rates and improved quality of life among these patients. Oncological treatments, particularly chemotherapy and radiotherapy, have gonadotoxic potential, leading to decreased ovarian reserve and, in severe cases, premature ovarian failure. Various strategies have been developed and refined, including oocyte cryopreservation, embryo vitrification, ovarian tissue cryopreservation, the use of GnRH analogues during treatment and ovarian tissue transplantation. The choice of the most appropriate technique depends on the patient's age, cancer type, urgency of cancer treatment and the availability of a partner for in vitro fertilization. Studies show that transplanted ovarian tissue can survive in over 60% of cases and that pregnancy rates exceed 30% in some specialized centers. Fertility preservation should be routinely discussed with reproductive-aged patients through a multidisciplinary approach involving oncologists, reproductive endocrinologists and psychologists. It is concluded that structured institutional programs, supported by evidence-based protocols, are essential to offer safe and effective options, minimizing the impact of oncological treatments on reproductive capacity and promoting long-term reproductive autonomy.

**Keywords:** Fertility preservation; Cryopreservation; Ovarian tissue; Oncology; GnRH analogues

## Introduction

Female cancers currently represent one of the main causes of morbidity and mortality in women of reproductive age, with an estimated incidence of over 900,000 new cases per year worldwide[1]. Despite therapeutic advances that have significantly increased survival rates, the side effects of chemotherapy and radiotherapy pose a considerable risk to gonadal function[2]. Chemotherapy, particularly alkylating agents, has been shown to induce follicular atresia and direct DNA damage to oocytes, accelerating ovarian reserve depletion[1]. Similarly, pelvic and abdominal radiotherapy can impair the ovarian stroma and blood vessels, resulting in premature ovarian failure[3]. Historically, until the mid-2000s, fertility planning was often neglected in oncology patients due to the urgency of initiating cancer treatment. However, increasing awareness of gonad toxicity and the recognition of post-treatment quality of life have led to

the development of fertility preservation techniques. Initially described for non-oncological patients, gamete cryopreservation was adapted for women diagnosed with cancer, allowing for the preservation of mature oocytes through controlled ovarian stimulation followed by vitrification.

For patients who cannot delay the start of oncologic treatment, ovarian tissue cryopreservation performed laparoscopically before gonadotoxic therapy-has emerged as a promising alternative. The preserved fragments can be reimplanted after cancer remission, restoring endocrine function and even allowing for natural conception. Studies have shown that more than 60% of transplanted tissues regain hormonal activity and about one-third of patients achieve pregnancy[4].

Another approach is the use of GnRH analogues in an agonist regimen during chemotherapy, aiming to reduce ovarian blood flow and induce a "resting" follicular state, minimizing gonadotoxic impact. Although still controversial, a recent systematic review supports their adjuvant use in combination with other fertility preservation techniques. Finally, international guidelines emphasize the importance of institutional protocols ensuring prompt access to preservation techniques, professional training and early referral of reproductive-aged patients for fertility assessment[5]. The fertility preservation discussion should be individualized, informative and empathetic, taking into account ethical, moral and emotional aspects, as well as treatment urgency and cancer prognosis[6].

## Objectives

This article aims to critically review the main fertility preservation strategies for female cancer patients, in light of scientific and technological advancements in reproductive medicine.

## Materials and Methods

A literature review was conducted using the PubMed, SciELO, Google Scholar and ScienceDirect databases.

## Discussion

Fertility preservation methods can be classified as pharmacological or surgical interventions. Among pharmacological interventions, the use of GnRH analogues during chemotherapy stands out. A meta-analysis by Martin and Balsley demonstrated a significant reduction in the incidence of premature ovarian failure in women treated with GnRH agonists[7], although study heterogeneity and lack of standardized protocols limit definitive conclusions[7]. The main advantage of this technique is that it does not require delaying cancer treatment or additional surgical procedures, making it attractive in cases of urgent therapeutic needs. However, there is debate over whether the benefit stems from true ovarian protection or patient selection bias favouring those with better ovarian reserve.

In contrast, surgical techniques like ovarian tissue cryopreservation require laparoscopic harvesting of cortical tissue but show promising results. Doadas et al. reported hormonal reactivation in 64% of patients and a 29% pregnancy rate following retransplantation[8]. Despite the potential, concerns persist regarding the theoretical risk of reintroducing malignant cells, particularly in haematological malignancies[9]. Advances in tissue purification and mapping aim to mitigate this risk, though standardization is still lacking[2]. Oocyte and embryo cryopreservation via rapid vitrification has become the gold standard in assisted reproduction centres. Laurent, et al. reported oocyte survival rates exceeding 90% and fertilization rates above 70%, comparable to non-oncological patients[10]. However, the required ovarian stimulation period (approximately 10-14 days) may delay chemotherapy; random-start stimulation protocols help reduce this interval[10].

Although male fertility preservation is outside the direct scope of this article, lessons can be drawn from semen cryopreservation before treatment, which, despite low utilization rates, offers clear benefits for future reproductive options[11-13]. The success of an oncologic fertility preservation program thus depends on an integrated referral flow, technique availability, financial support and psychological care. Lastly, international guidelines such as those from ASCO and the European Society of Human Reproduction and Embryology emphasize that all reproductive-aged women diagnosed with cancer should receive counselling on gonadotoxic risk and preservation options before starting oncologic treatment. Adherence to these recommendations remains low in many centres, highlighting the need for institutional protocols and continuing education for oncologists and gynaecologists[14,15].

## Conclusion

Fertility preservation in oncology patients is an essential component of integrated care, aligning advanced reproductive technology with patient-centered medicine. Techniques such as oocyte, embryo and ovarian tissue cryopreservation, along with GnRH analogue administration, provide viable alternatives with increasingly favorable success rates. The decision on the most suitable strategy must consider clinical factors such as age, cancer type, treatment urgency and marital status, as well as emotional and ethical aspects. Despite progress, challenges remain, including the potential risk of tumor reintroduction in ovarian tissue transplantation, the need to optimize ovarian stimulation protocols and financial barriers that limit equitable access to preservation techniques.

Ongoing research, including randomized and long-term clinical trials, is crucial to validate the safety and efficacy of these approaches. To ensure that all reproductive-aged patients are adequately informed and benefited, we recommend: (1) implementation of clear institutional protocols for early referral; (2) continuous multidisciplinary training; (3) public and private funding for preservation programs; and (4) psychological and ethical support throughout the process[6,5]. Thus, the importance of an interdisciplinary care model that integrates oncology and assisted reproduction is reinforced-not only aiming for cancer cure but also for the preservation of quality of life and reproductive autonomy in women[1,10].

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