Fertility Preservation

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Fertility Preservation

- Egg and embryo freezing
- Ovarian tissue cryopreservation

INDICATIONS FOR FERTILITY PRESERVATION

- **Malignant Diseases**
- **Nonmalignant Conditions**
- **Fertility Decline Associated with Advanced Age**

CRYOPRESERVATION OF EMBRYOS AND OOCYTES

- Embryo and mature oocyte cryopreservation are **the only established effective fertility preservation approaches currently available**
- in a similar fashion to embryo cryopreservation, the live birth rate from cryopreserved versus fresh oocytes is now considered comparable

When planning embryo or egg cryopreservation, several factors should be taken into consideration

(1) Age

(2) Delay in cancer treatment

(3) Hormone sensitivity of malignancies

Advantages and Disadvantages of Embryo, Oocyte, and Ovarian Tissue Cryopreservation

	Embryo Cryopreservation	Oocyte Cryopreservation	Ovarian Tissue Cryopreservation
Sperm is required	+	−	−
Shared ownership	+	−	−
Delays chemotherapy	+	+	−
Can be used in prepuberty	−	−	+
Effect on endocrine function (at the time of procedure)	−	−	−
Requires ovarian stimulation	+	+	−
Considered experimental	−	−	+
Live births reported	+	+	+
Resumption of endocrine function potential	−	−	+[a]
Requires surgery	−	−	+
Risk of reseeding cancer	−	−	+

Ovarian Freezing Techniques

- **OVARIAN TISSUE CRYOPRESERVATION**

- **Whole Ovary Cryopreservation**

Ovarian Tissue Freezing Techniques and Transplantation Locations

The "physiologic" transplantation

Orthotopic transplantation, into the:

- remaining ovary
- the ovarian fossa
-the broad ligament

Ovarian Tissue Freezing Techniques and Transplantation Locations

Heterotopic transplantation

Into the:

- subcutaneous space of the forearm,
- subcutaneous tissue of the abdomen
- anterior wall of the abdomen
- just beneath the peritoneum
- in the rectus muscle
- heterotopic transplantation may produce

lower quality oocytes and embryos when compared to the orthotopic approach

In Vitro Follicle Maturation

- An alternative to orthotopic or heterotopic transplantation of frozen-thawed ovarian cortical fragments would be to mature follicles in vitro, especially primordial follicles, which constitute the largest pool of follicles stored in the ovary
- This approach would also allow the patient avoid potential reseeding of cancer cells that might have metastasized to the ovarian tissue
- However, in vitro maturation (IVM) of immature follicles has proven to be extremely challenging

Combination of Ovarian Tissue Cryopreservation with Other Assisted Reproductive Technologies

- Oocyte aspiration just prior to ovarian tissue cryobanking yielded more oocytes, with a better maturation rate than oocytes retrieved from ex vivo ovarian tissue

- The combination of ovarian tissue stimulation, egg retrieval, and tissue cryopreservation has the ability to optimize the endocrine function and fertility potential

Menopause and Premature Ovarian Failure in the Era of Tissue Cryopreservation

- excision of ovarian tissue will advance menopause marginally, but it will not reduce natural fertility

- If the tissue is autotransplanted at perimenopausal period, sufficient circulating concentrations of sex steroids may be maintained for years and may potentially delay postmenopausal symptoms for even decades

Potential Complications Resulting from Tissue Transplantation

- Posttransplantation ischemia is likely responsible for follicular loss

- Reimplantation of malignant cells together with the grafted ovarian tissue

MEDICAL MANAGEMENT OF OVARIAN PROTECTION

Gonadotropin-releasing hormone (GnRH) agonists:

(1) Inhibition of FSH-dependent accelerated follicular demise

(2) Decrease in utero-ovarian perfusion

- Despite unclear mechanism of protective action and low effectiveness, given the low cost and risk associated with a GnRH agonist cotreatment,its use remains at individual physician's discretion
- However, it is important to note that GnRH agonist administration should not be used as a substitute for proven fertility preservation techniques

FUTURE PROSPECTS

artificial ovary

- Selective implantation and maturation of “healthy” follicles in an artificial ovary could reduce or eliminate the possibility of reintroducing malignant cells to a patient who has been cured from cancer and wishes to conceive
- Further development in follicle isolation techniques and artificial ovary substrates may result in a cancer-free source of follicles that could last longer and be safer than pieces of ovarian cortex

FUTURE PROSPECTS

The minimization of follicular loss due to posttransplantation ischemia

The promotion of neovascularization at ovarian transplantation sites:

-Proangiogenic growth factors

-Inhibition of apoptosis

- Proliferation of ovarian stromal cells with the administration of Sphingosine-1-Phosphate

-Even introducing bone marrow stem cells to help stimulate follicle development