

Fertility Preservation for Cancer Patients

Beth Taylor, MD, FRCSC
Reproductive Endocrinology & Infertility
Clinical Associate Professor, UBC

Disclosure

- Co-owner of fertility clinic providing fertility preservation

Outline

- How does cancer treatment impact fertility?
- Male fertility preservation
- Female fertility preservation:
 - Transposition of the ovaries
 - Surgery to spare fertility
 - Downregulation of ovarian function
 - Ovarian tissue freezing
 - Egg freezing
- Options when fertility is not preserved

How does cancer impact fertility?

- Surgery on genital tract
- Gonadotoxic chemotherapy
- Pelvic radiation
- Hormone blockage (e.g. Tamoxifen) disrupting reproductive years

Gonadotoxic risks of chemotherapy

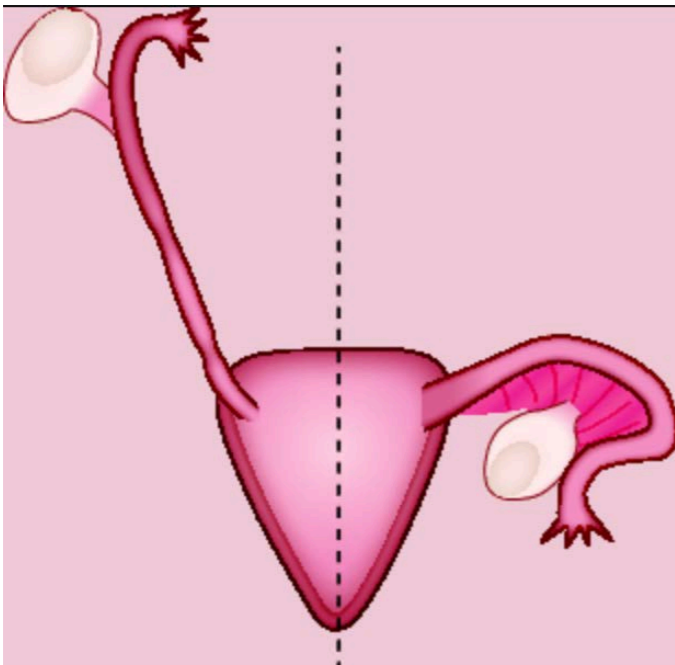
Drug	Class (action)		
Definitely associated with ovarian damage		Low probability of ovarian damage	
Nitrogen mustard	Mechlorethamine (alkylating agent)	Methotrexate	Antimetabolite
L-phenylalanine mustard	Mechlorethamine (alkylating agent)	Fluorouracil (5-FU)	Antimetabolite
Chlorambucil	Chloroethylamine (alkylating agent)	6-mercaptopurine	Antimetabolite
Cydophosphamide	Chloroethylamine (alkylating agent)	Vincristine	Vinca alkaloid
Melphalan	Mechlorethamine (alkylating agent)	Mitomycin	Antibiotic (alkylating agent)
Busulfan	Alkylalkane sulfonate (alkylating agent)	Unknown	
Procarbazine	Substituted hydrazine	VM-26	Podophyllotoxin
Dacarbazine	Alkylating agent	Daunorubicin	Anthracycline
Doxorubicin	Anthracycline	Bleomycin	Peptide
Probably associated with ovarian damage		Melphalan	Chloroethylamine
Vinblastine	Vinca alkaloid	Decarbazine	Substituted hydrazine
Cytosine arabinoside (Ara-C)	Antimetabolite	Vindesine	Vinca alkaloid
Cis-platinum	Heavy metal		
Carmustine	Nitrosourea (alkylating agent)		
Lomustine	Nitrosourea (alkylating agent)		
VP-16 (etoposide)	Podophyllotoxin		
Imatinib	Tyrosine kinase inhibitor		

Male Fertility Preservation

- Pre-pubertal: still largely experimental
- Post-pubertal: sperm freeze (usually ejaculated)
 - \$600 + annual storage \$350/year



Female Fertility Preservation: Ovarian transposition



- 90% preservation of hormone function
- Fertility - necessitates repeat surgery or IVF



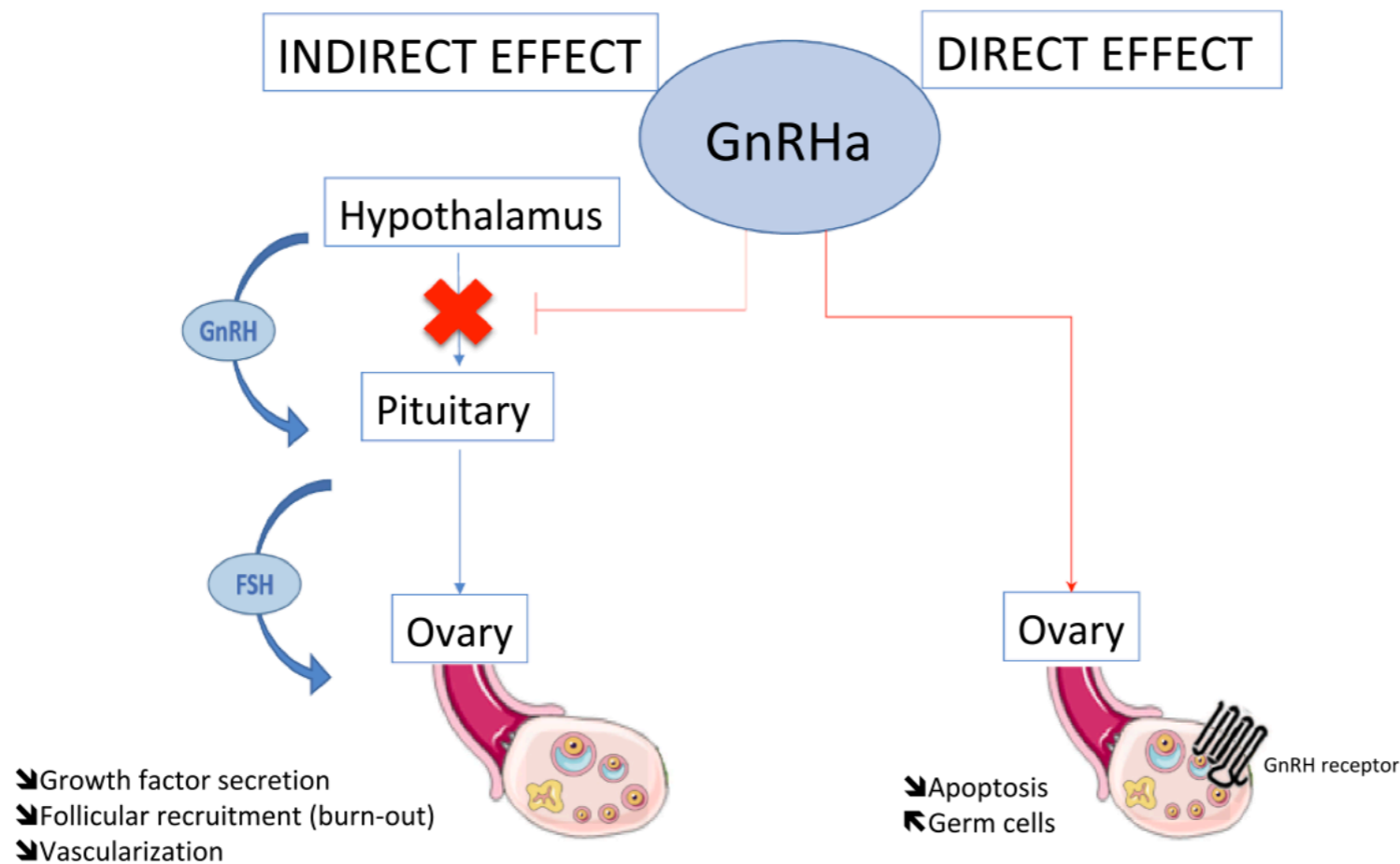
Cervical cancer: fertility preservation

- LEEP - no impact on fertility
- Conization - 56%
- Trachelectomy by laparoscopy - 65%
- Trachelectomy by laparotomy - 44%

Ovarian cancer: fertility preservation

- Limited options
- USO, ovarian preserving surgeries: Stage 1A-1B, borderline tumors, germ cell and sex-cord stromal tumours

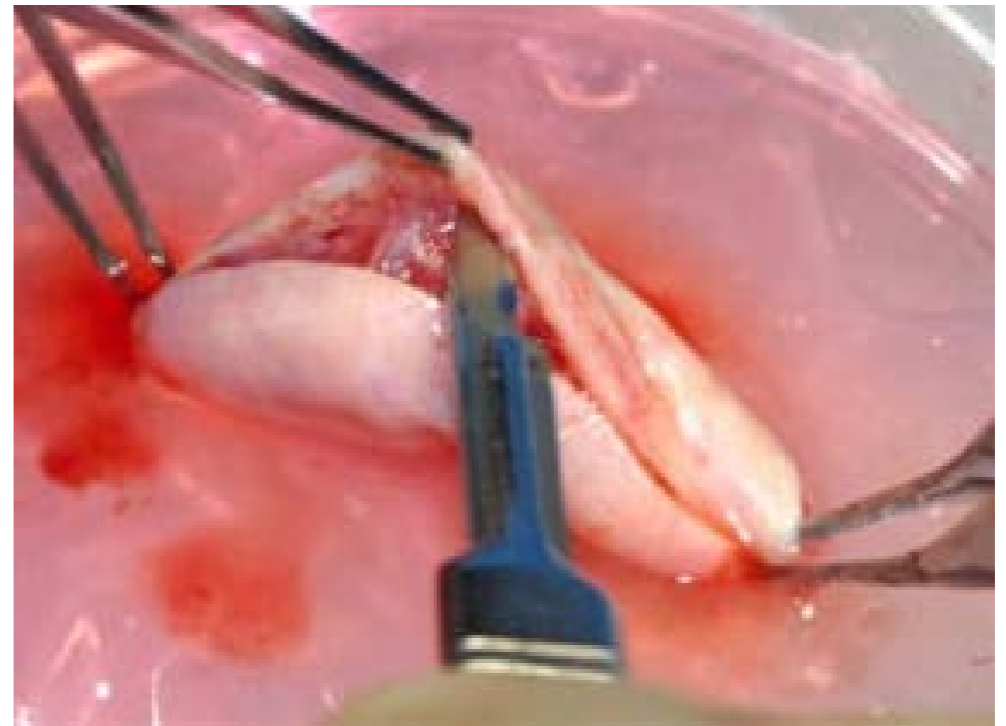
GnRH down regulation



Lambertini M, Horicks F, Del Mastro L, Partridge AH, Demeestere I. Ovarian protection with gonadotropin-releasing hormone agonists during chemotherapy in cancer patients: From biological evidence to clinical application. *Cancer Treat Rev.* 2019 Jan;72:65-77.

Ovarian Tissue Cryopreservation

- Portion of cortex or whole ovary removed and pieces frozen
- Orthotopic or heterotopic transplantation
- 130 live births



Who might qualify for ovarian tissue cryopreservation?

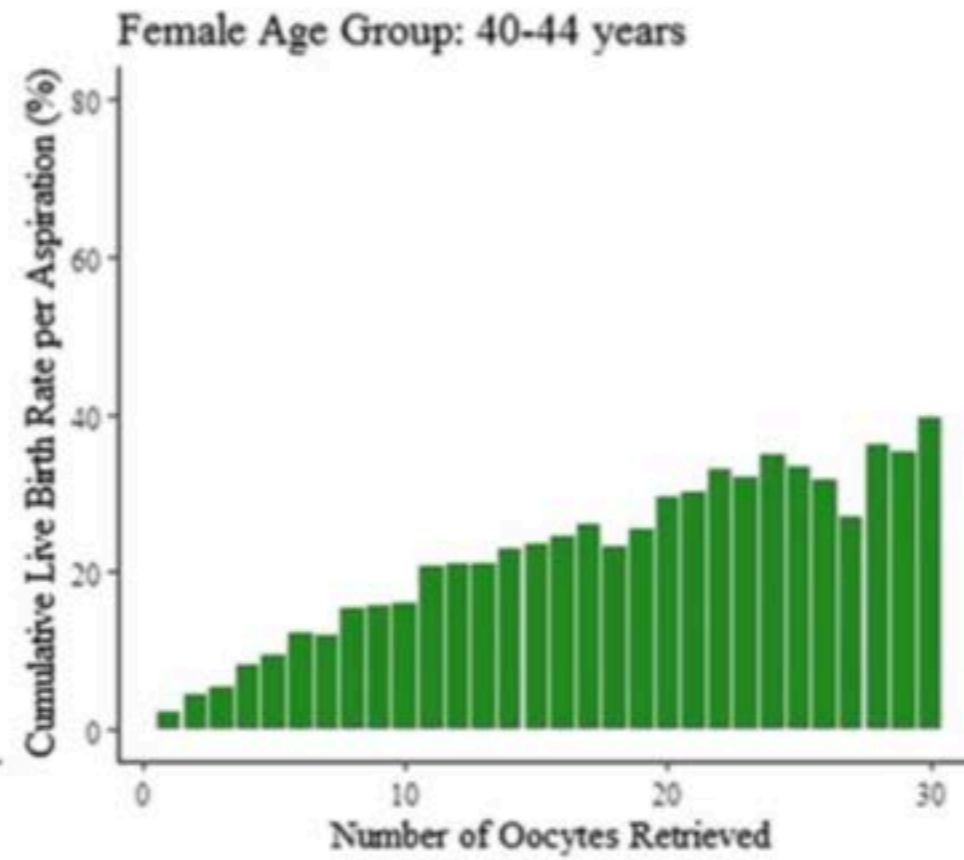
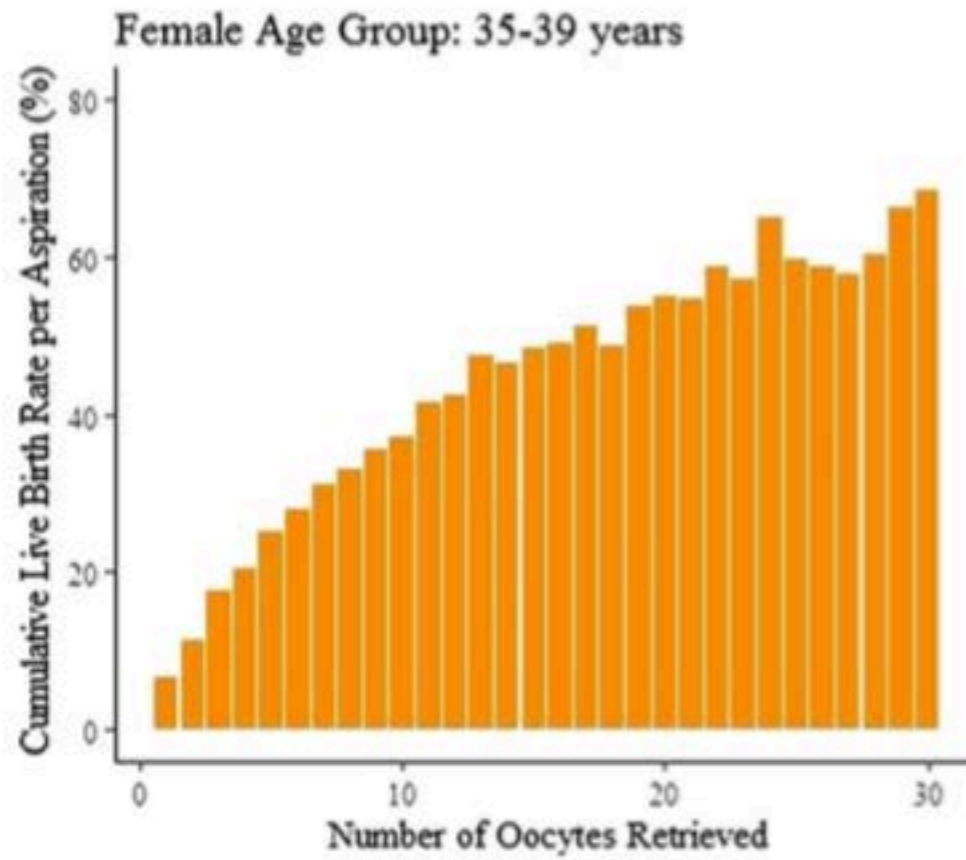
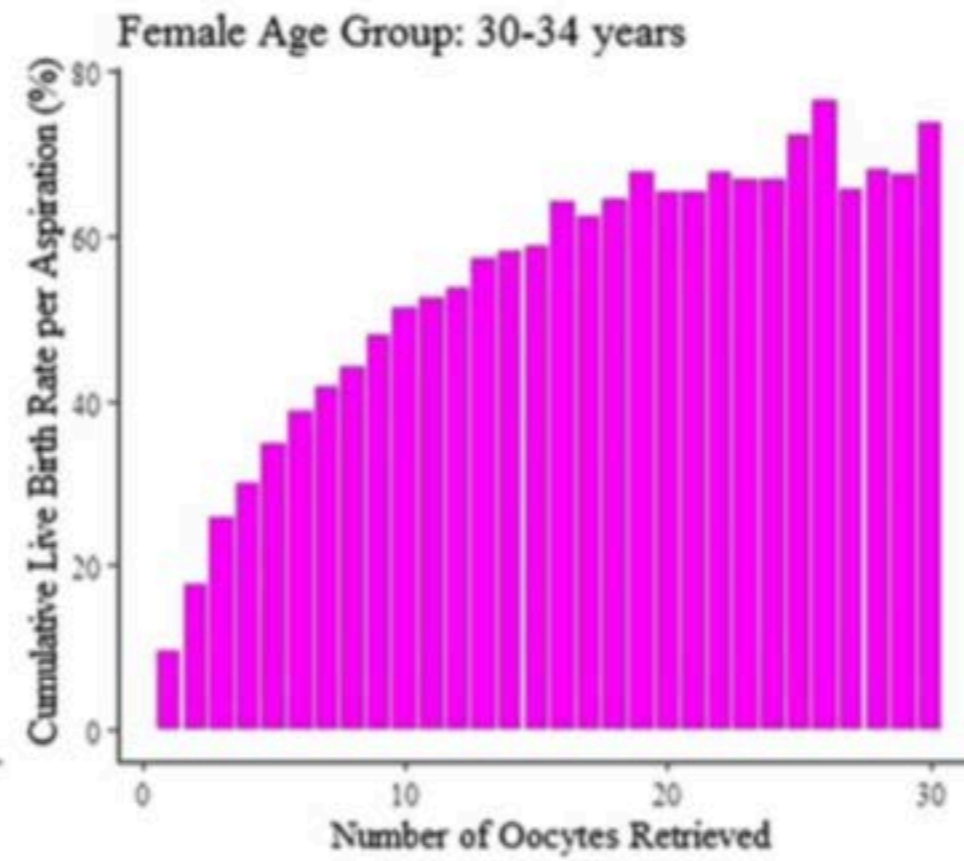
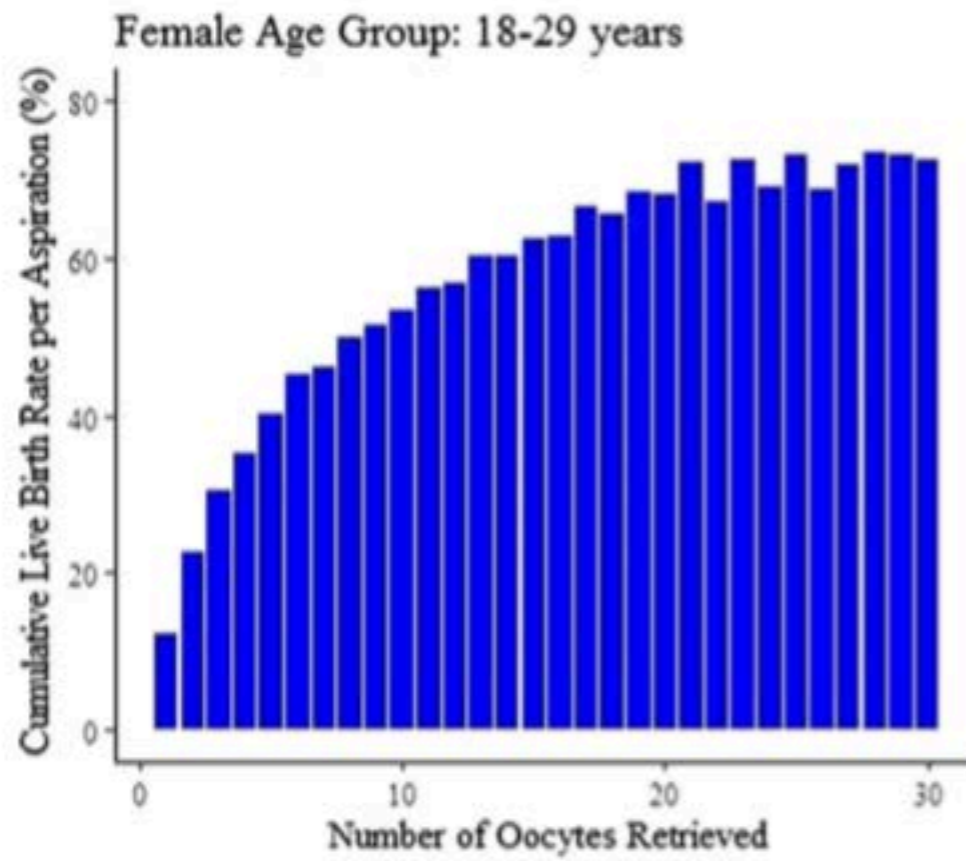
- pre-pubertal
- no time for ovarian stimulation and egg retrieval
- ovarian stimulation contraindicated

Where can my patients access ovarian tissue cryopreservation?

- SickKids in Toronto
- CHEO in Ottawa
- McGill

Egg Freezing

- Ovarian stimulation with FSH and LH x 10-12 days
- Transvaginal egg retrieval
- Eggs can be frozen or fertilized to create embryos



Olive Fertility Centre

Experience: past 18 months

Age at freeze	# thaws	Oocyte Survival Rate	Pregnancy rate/embryo transfer
< 35	27	76%	57%
35-37	26	75%	61%
40	10	77%	0%
Overall	63	75%	57%

How much does oocyte cryopreservation cost?

- \$7800 treatment fee
- \$4000 medications
- \$350/year storage

If performed prior to cancer treatment ~\$4000 total

Uterine Transplantation

- 1/500 women have absolute uterine factor infertility
- Most will access surrogacy or adoption
- First live birth from Sweden 2012
- Total 17 reported

What are the options when fertility is not preserved?

- Donor egg IVF
- Gestational surrogacy
- Adoption
- Childfree

Summary

- fertility preservation part of modern oncology care
- ovarian tissue cryopreservation is still experimental
- oocyte cryopreservation reasonable option if under 40
- uterine transplantation - limited
- many pathways to parenthood