Fertility Preservation in Adolescents and Young Adults with Cancer

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Fertility Preservation for Adolescents and Young Adults

- Improved Reproductive Technology
- Patient Advocacy
- Improved Survival
Organization Guidelines

ASCO

National Comprehensive Cancer Network®

American Society for Reproductive Medicine
Objectives

• Review Pathophysiology of Reproduction

• Review Fertility Preservation Options

• Discuss Gaps and Challenges
Males and Fertility Preservation
Reproductive Pathophysiology

http://iceteazegeg.wordpress.com/2009/02/25/gametogenesis/spermatogenesis/
Impact of Cancer Treatment on Male Fertility

• Depletion of Germ Cells
  – CT, RT, surgery
  – Temporary
  – Permanent

• Ductal system

• Pelvic Nerves

• Pituitary

http://www.mansoormedical.org/gynaecology/infertility.html
Sperm Banking

• Non-Experimental

• Most common method:
  – Masturbate to ejaculation
  – Semen Analysis
  – Cryopreservation
  – Storage

• Outpatient/Inpatient

http://www.soxtfirst.com/50226711/sperm_banking_boom.php
Sperm Banking: Challenges

• Impact of Disease
• Timing re: Therapy
• Cost
• Adolescents
• Religious/Cultural Beliefs
• Physical Limitations

http://www.sofoxfirst.com/50226711/sperm_banking_boom.php
Testicular Sperm Extraction (TESE)

- Outpatient procedure
  - Surgical removal of tissue
  - Sperm extraction

- Feasible in conjunction with ICSI

http://www.ecoivf.com/treatment-options/icsi/
Testicular Tissue Freezing

• Experimental
• Outpatient procedure
  – Removal of Tissue
  – Cryopreservation
  – Storage
• Early germ cells preserved
• No human births

http://www.berlin-spermbank.com/cryobank/cryobank.html
Gonadal shielding

- Radiation therapy
Parenthood After Cancer

• Natural Conception
  – Timing re: relapse risk
  – Semen analysis

• Assisted Reproduction
  – Banked Sperm/ICSI
  – TESE/ICSI
  – Donor Sperm

• Adoption
Summary Recommendations

• Sperm banking before therapy
  – All interested post pubertal males

• Semen Analysis post therapy
  – Assess whether to keep stored sperm
Females and Fertility Preservation
Reproductive Pathophysiology

http://www.britannica.com/EBchecked/media/19665/The-ovaries-in-addition-to-producing-egg-cells-secrete-and
Potential Impact of Cancer and Treatment on Fertility

- Removal of uterus or ovaries
- Damage to uterus (fibrosis, vascular insufficiency)
  - Implantation
  - Pre-term loss
- Hormonal dysfunction via the neuroendocrine system
- Germ Cell Loss

http://www.britannica.com/EBchecked/media/19665/The-ovaries-in-addition-to-producing-egg-cells-secrete-and
Reproductive Review:
Normal Ovarian Reserve

<table>
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<tr>
<th>AGE</th>
<th>FOLLICLE COUNT</th>
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<td>37</td>
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<tr>
<td>51</td>
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<tr>
<td>12</td>
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Menarche: 12 years old
Menopause: 37-51 years old
Acute Ovarian Failure

Follicle Count

Cancer Treatment

(37)

(51)
Premature Menopause

Follicle Count

25,000

1,000

Cancer Treatment
Embryo Cryopreservation

1. Ovarian Stimulation
2. Retrieval
3. IVF
4. Cryopreservation

http://www.advancedfertility.com/ovarstim.htm
http://www.infertile.com/infertility-treatments/icsi.htm
Embryo Cryopreservation

Limitations
- Age of patient
- Religious Beliefs
- Need a partner or donor sperm
- Expensive
- Takes time, impacts start of therapy
Oocyte Cryopreservation

1. Ovarian Stimulation
2. Retrieval
3. IVF
4. Cryopreservation
Oocyte Cryopreservation

Ovarian Stimulation → Retrieval → Cryopreservation
Oocyte Cryopreservation

Limitations

- Oocytes are more susceptible to injury than embryos
- Expensive
- Takes time, impacts start of therapy
Ovarian Tissue Cryopreservation

Removal of ovarian strips → Freezing → Reimplantation

http://www.infertile.com/inthenew/sci/2012-02-01-MHR.htm
Ovarian Tissue Cryopreservation

- Removal of ovarian strips
- Freezing
- Reimplantation

Limitations:
- Experimental
- Re-implantation not recommended in leukemia
- “12” live births with transplantation
- Cost

In vitro maturation
Radical Trachelectomy
Protection of Ovaries

Nakagawa, Bone Marrow Transplantation 2006
GnRH Agonist/Antagonist
Fertility Preservation Post Treatment

Assess with surrogate markers: AMH, AFC, OV

Oocyte and Embryo Cryopreservation may be appropriate post treatment
Parenthood after Treatment

• Natural conception
  – Timing

• Assisted Reproduction
  – Thawed embryos/oocytes
  – IVF
  – Donor Oocytes
  – Donor Embryos

• Surrogacy

• Adoption
Pregnancy Post Treatment

- Timing
- Late Effects
- PGD
Summary Recommendations

• Discussion about fertility at diagnosis
• Referral to Reproductive Endocrinology
  – Anyone who wants referral
  – Age
  – High Risk Exposure
• Post Treatment Assessment if not at diagnosis
Gaps and Challenges
Clinical Research: Information on risk remains limited

- Exposure
- Host
- New therapies
- Estimates of fertility
- Impact on Decision Making
Basic Science: Limitations of Options

• Improvements in Current Technologies
• Maturation of Testicular Tissue
• Maturation of Ovarian Tissue
Clinical Care: Integrating FP in AYA Care

• Mechanism to provide information to all patients
  – Institutional support
  – Many models
    • Fertility Czar
    • Fertility Navigator/consult service
  – Part of intake process

• Established referral mechanism
  – Established partnerships
Resources about Fertility Preservation

- Utilization of existing websites
  
  - [www.fertilehope.org](http://www.fertilehope.org)
  - [www.livestrong.org](http://www.livestrong.org)
  - [www.oncofertility.northwestern.edu](http://www.oncofertility.northwestern.edu)
Policy:
Cost of fertility preservation

- Insurance reform
- AMA policy statement
References


• Levine, J, Canada, A, Stein, C, Fertility Preservation in Young Adults, JCO, May 2010 (eprint)