Fertility Preservation in Children and Adolescents

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KEYWORDS

• Fertility preservation • Infertility • Cryopreservation • Sperm • Egg • Oocyte • Cancer • Survivorship

KEY POINTS

- Fertility preservation counseling should be discussed and considered in the pediatric and adolescent population.
- Oocyte cryopreservation and embryo cryopreservation are the standard of care for fertility preservation in girls and ovarian tissue cryopreservation is still considered experimental.
- Sperm cryopreservation is the standard of care for fertility preservation in boys, whereas testicular tissue cryopreservation is experimental.
- Oncofertility is the field of medicine in which oncologist and reproductive fertility specialist work together to address the reproductive health of patients with cancer.

INTRODUCTION

Case presentation: A 16-year-old girl presents from an outside institution to see you for management of newly diagnosed Hodgkin lymphoma. Her parents are anxious to begin treatment as soon as possible and the patient's mother is crying off and on throughout the visit. At the end of the appointment, you ask if there are any further questions. The patient tentatively remarks that she has always wanted to have children someday. How do you respond?

Fertility preservation is the process whereby gametes are maintained for the future goal of developing a pregnancy. The ability to maximize fertility potential and options to allow for future fertility is an emerging crucial survivorship issue. Many medical advancements have allowed the pediatric and adolescent population to survive their oncologic conditions[1] and other medical diseases that lead to continuation of life beyond the reproductive years. The American Society of Clinical Oncology

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reconfirmed its recommendation to discuss the risk of infertility and fertility preservation options in patients with cancer who are anticipating treatment.[2,3] The American Society for Reproductive Medicine also advocates for informing patients receiving potentially gonadotoxic therapies about fertility preservation and future reproduction options.[4] It is critical to engage our patients in discussions regarding fertility preservation because of the public health impact of this process with regard to the increasing numbers of childhood survivors and increased maternal age at time of pregnancy.[5]

Oncofertility is the multidisciplinary approach of oncologists and reproductive fertility specialists working together to achieve the goals of patients with cancer. This field also incorporates research endeavors, applying new technology to practice, and includes involvement in the psychosocial issues that pervade the process of balancing life-preserving treatment with fertility-preserving options.[6–8] Although there are many reasons for fertility preservation in children and adolescents, cancer is currently the main indication for fertility preservation, and interest in this group of patients has led to development of the oncofertility focus.

INDICATIONS FOR FERTILITY PRESERVATION

The main indications for fertility preservation in children and adolescents encompass medical conditions or treatments that are gonadotoxic or may result in premature ovarian insufficiency or will result in removal of ovarian or testicular tissue (**Box 1**). Cancer and its treatment is a potential significant risk factor for loss of gonadal function and infertility. In 2015, approximately 10,000 children in the United States younger than 15 will be diagnosed with cancer, and cancer is the second leading cause of death in children. Overall, there has been a slight rise in childhood cancer rates over the past few decades. In comparison with 5-year survival rates of approximately 58% in the mid-1970s, more than 80% of children with cancer now survive 5 years or more.[9,10] The following are the types of cancers that occur most often in children[11]:

- Leukemia (30%)
- Brain and central nervous system (CNS) tumors (26%)
- Lymphoma (Hodgkin and non-Hodgkin) (6%)
- Neuroblastoma
- Wilms tumor
- Rhabdomyosarcoma
- Retinoblastoma
- Bone cancer (including osteosarcoma and Ewing sarcoma)

For adolescents ages 15 to 19, the most common types of cancers are Hodgkin lymphoma, thyroid carcinoma, brain and CNS, and testicular germ cell tumors.[12] Cancer accounts for approximately 5% of deaths and is the fourth leading cause of death in the adolescent age group. Survival rates for cancer in teens have not undergone significant change in recent decades, which differs from the advancements seen in many cancers in children. The chance of developing cancer is approximately equal for adolescent boys and girls, but cancer survival rates are slightly higher in girls than in boys. Overall, approximately 85% of girls are still alive 5 years after being diagnosed with cancer, compared with approximately 80% of boys, which may be the result of the type of cancers identified in males and females. The following are the most common cancers in adolescents:

- Lymphomas (Hodgkin lymphoma and non-Hodgkin lymphoma)
- Leukemias (mostly acute lymphocytic leukemia and acute myeloid leukemia)
- CNS tumors