Semen banking in patients with cancer: 20-year experience

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Summary

Modern techniques of banking sperm provide an effective way to preserve the option of future fertility for most teenagers and young men diagnosed with a variety of malignancies that will necessitate treatment with chemotherapy, pelvic surgery, or significant radiation doses to the testes. Results of cumulative data collected at the Cleveland Clinic Foundation from patients with testicular cancer, lymphoma, leukemia, sarcoma, carcinoma and other kinds of malignancy have revealed that: (1) pretreatment semen quality (pre-freeze and post-thaw) in patients with cancer is poorer compared with healthy donors; (2) the percentage decline in semen quality (from pre-freeze to post-thaw) in patients with cancer is similar to that of normal donors. This suggested that the effect of cryodamage on spermatozoa from patients with cancer is similar to that of normal donors. (3) The stage of cancer in patients with testicular cancer and Hodgkin's disease shows no relationship to their semen quality. Based on studies conducted at the Cleveland Clinic Foundation, we recommend that sperm cryopreservation be offered to all men of reproductive age who have malignancies. Cryopreservation is safe and inexpensive, and gives patients a chance to establish pregnancies in the future with an assisted reproductive technique.

Keywords: cancer, male infertility, sperm cryopreservation

Introduction

The survival of cancer patients has increased significantly over the last few decades with the advent of multimodality treatment approaches and sophisticated diagnostic tools. However, men with newly diagnosed cancer frequently have poor semen quality that may limit the success of conventional assisted reproductive methods. Recent advances in assisted reproductive techniques allow the use of a single sperm for the fertilization and cryopreservation methods have also improved, therefore semen cryopreservation has become an important option for patients with cancer.

The importance of sperm banking before cancer treatment

Modern techniques of banking sperm provide an effective way to preserve the option of future fertility for most teenagers and young men diagnosed with a variety of malignancies that will necessitate treatment with chemotherapy, pelvic surgery or significant radiation doses to the testes.

According to the American Cancer Society's 1999 Cancer Facts and Figures, this year oncologists will have seen an estimated 7400 new cases of testicular cancer, 3800 new cases of males with Hodgkin's disease, 16800 new male adult cases of the combined types of leukemias, 1400 malignancies of the bones and joints, 4200 soft tissue malignancies, 25 800 new male cases of melanoma, 9500 new cases of brain and central nervous system tumors, and 36 400 new cases of lymphoma. Many of these malignancies strike teenagers and young men during their reproductive
years, and are treated with pelvic surgery, pelvic irradiation or chemotherapy that can damage fertility. The 5-year survival rate for all cancers is now 60%, and the most common in young men, such as testicular cancer (5-year survival of 95%) and Hodgkin's disease (5-year survival of 92%), are some of the most treatable. Thus, there is a pool of men who will survive their malignancies and go on to potentially want children. An estimate including both men and women is that each year, 76,600 Americans treated for cancer are at risk for subsequent infertility (Meistrich et al., 1997a).

Our recent pilot survey at the Cleveland Clinic Foundation of 132 cancer survivors under age 45 (Schover et al., 1999) revealed that only 46% had children. Of those who remained childless, 76% wished to have children in the future. Of those with at least one child, 31% would like to have more children. Men were just as likely as women to wish to be parents. Only 16% of the sample believed that having cancer had decreased their wish for children, and most of this group had been parents already at the time of the diagnosis.

As this research suggests, sperm banking appears to be very much underutilized. In the United Kingdom, recent letters in the British Medical Journal have documented the low rates of sperm banking before cancer and challenged oncologists to offer cryopreservation of semen to all postpubertal men interested in preserving reproductive potential after cancer (Lass et al., 1999). Similar calls for routine counseling about banking sperm before cancer treatment have been made in the United States (Opsahl et al., 1997; Hallak et al., 1998a).

**The increasing feasibility of sperm banking**

Until fairly recently, banking sperm before cancer treatment was considered impractical by most oncologists. Many men diagnosed with cancer already had such poor semen quality that after freezing and thawing, their samples would be useless for infertility treatments such as intrauterine insemination (IUI).

The concern about poor semen quality has become almost irrelevant since 1992, when the technique of in vitro fertilization with intracytoplasmic sperm injection (IVF-ICSI) first made it possible for men to father children with just a handful of live sperm cells rather than the millions usually required (Opsahl et al., 1997; Meistrich et al., 1997b). The success of IVF-ICSI makes it worthwhile for young men to bank cryopreserved semen before cancer treatment, even if their sperm counts and motility are impaired at the time of cancer diagnosis. Even one semen sample can be divided into small amounts and frozen, providing ample material for several cycles of IVF-ICSI (Opsahl et al., 1997). A recent follow-up of 10 cancer patients who used cryopreserved semen specimens for assisted reproductive treatments found that the pregnancy rate per cycle of IVF-ICSI was 36% (Hallak et al., 1998a). Three couples out of this group were able to have a child. Success rates of 30%-40% pregnancies per cycle are not unusual in competent IVF-ICSI programmes when the female partner in the couple is under age 35 (Opsahl et al., 1997; Naysmith et al., 1998).
When men's semen quality is normal, or only mildly impaired, cryopreserving more than one semen sample may allow the use of less complex forms of infertility treatment, particularly IUI alone, or IUI combined with a milder degree of ovarian stimulation for the female partner than is used in IVF (often termed super ovulation) (Opsahl et al., 1997; Naysmith et al., 1998).

Although it is true that many men diagnosed with cancer have impaired semen quality, samples from patients with testis tumors or other malignancies with suboptimal semen parameters survive freezing and thawing as well as sperm from men of normal fertility. There is no additional loss of semen quality beyond that always expected from cryopreservation (Agarwal et al., 1995b; Padron et al., 1997).

It is also possible to bank an adequate number of specimens without delaying cancer treatment. A study of 95 cancer patients found that acceptable post-thaw semen quality could be obtained when men abstained for only 24-48 h (Agarwal et al., 1995). Samples can be collected over several consecutive days if necessary, or even during the first few days of chemotherapy or radiation if a man has highly aggressive disease. If a man feels well enough to try, he can even collect a sample in the privacy of his hospital room. Mature sperm cells are relatively resistant to mutagenic effects of radiation or chemotherapy drugs. It is the cells that are in the maturation process that are most sensitive.

Although preliminary evidence suggests that the genetic mutations in sperm cells produced by cancer treatment may be transient (Robbins, 1996), some patients may be more comfortable using cryopreserved sperm collected before cancer treatment and thus not exposed to chemotherapy or radiotherapy.

**Current utilization of cryopreserved semen**

A recent study examined the reasons why men who had banked sperm before cancer treatment decided to discard their cryopreserved specimens (Hallak et al., 1998b). Fifty-six (16%) of 342 cancer patients in the data base of the sperm bank requested to discontinue sperm storage. Out of these 56 men, 21 had died and the families were discarding the samples, 23 had already conceived all the children they wanted without using their stored sperm, eight had a return of good semen analyses and four had decided not to have children. The cost of banking sperm was not a factor in these decisions. The authors believe that these outcomes reinforce the worth of banking sperm to most men at risk for cancer-related infertility. The availability of IVF-ICSI is already increasing the number of men who take advantage of this option (Hallak et al., 1998a).

**Conclusion**

Results of cumulative data collected at the Cleveland Clinic Foundation from patients with testicular cancer, lymphoma, leukemia, sarcoma, carcinoma and other kinds of malignancies (Shekarriz et al., 1995; Agarwal et al., 1995b, 1996; Padron et al., 1997; Hallak et al., 1998a, 1999a, b; Schover et al., 1998) has revealed that: (1) Pretreatment semen quality (pre-freeze and post-thaw) in patients with cancer is poorer compared with healthy donors; (2) percentage decline in semen quality (from pre-freeze to post-thaw) in patients with cancer is similar to that of normal donors, this suggested that the effect of cryodamage on spermatozoa from patients with cancer is similar to that of normal donors; and (3) the stage of cancer in patients with testicular cancer and Hodgkin's disease shows no relation- ship with their semen quality. Based on multiple studies conducted at the Cleveland Clinic Foundation, we recommend sperm cryopreservation be offered to all men of reproductive age who have malignancies. Cryopreservation is safe and inexpensive and gives patients a chance to establish pregnancies in the future with an assisted reproductive technique.
References


