Advances in cryopreservation: we are not frozen in time

Eve C. Feinberg, M.D.

Northwestern University Feinberg School of Medicine, Chicago, Illinois

Life is like riding a bicycle, to keep your balance you must keep moving.
—Albert Einstein

In the December 1967 issue of *Fertility and Sterility* Dr. Sawada et al. (1) described methods to optimize sperm cryopreservation. The first successful case of sperm freezing that resulted in pregnancy was reported by Bunge and Sherman in 1953 and subsequently, protocols continued to evolve (2).

Fifty years later, in 2017, sperm cryopreservation is permanently woven into the fabric of our everyday existence. Sperm freezing is universally used for donor sperm banking and has resulted in millions of live births. Sperm banking prior to chemotherapy has allowed cancer survivors to have children after sterilizing treatments. Testicular sperm extraction with cryopreservation has bypassed obstructive azoospermia and enabled men who would otherwise be sterile to reproduce. Sperm freezing in the arena of in vitro fertilization (IVF) is used to facilitate FDA testing in third party reproduction, to provide a back-up in the event of failed sperm collection, and to alleviate the stress of the potential absence of the male partner due to travel. In 2017, the latest indication for sperm freezing is to bank sperm to prevent Zika transmission prior to travel in Zika-affected areas.

The use of cryopreservation has evolved to include embryos and, in the last decade, oocytes. Embryo vitrification facilitates the use of pre-implantation genetic testing for aneuploidy and single gene disorders. The ability to freeze supernumerary embryos allows for frozen embryo transfer after a failed IVF cycle in lieu of a repeat stimulation cycle. Embryo freezing has been used to preserve the ability to have biologic children after cancer therapy or to electively bank embryos for future childbearing. The remarkable success of embryo cryopreservation has improved the safety and success of IVF with freeze-all cycles for risk reduction of ovarian hyperstimulation syndrome and optimized endometrial synchronization.

New technology brings new ethical questions. The use of cryopreserved sperm post-mortem has created a debate that didn't exist 50 years ago. The ability to have supernumerary embryos has further sparked controversy on reproductive choice. Oocyte cryopreservation is revolutionary, but it has also been met with criticism when used to electively delay childbearing. Fifty years from today we hope that progress in science, technology, innovation and ethics continues, and does not remain frozen in time.

REFERENCES

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