Oocyte Cryopreservation

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The proportion of monopronuclear zygote (1PN) after intracytoplasmic sperm injection (ICSI) is significantly higher in frozen-thawed oocytes than fresh oocytes

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Study question

Is there different distribution of pronuclear types between fresh and frozen-thawed oocytes after ICSI ?

Summary answer

The proportion of monopronuclear zygote (1PN) in frozen-thawed oocytes is significantly higher than fresh oocytes, irrespective of recipient or infertile group.

What is known already

In in vitro fertilization (IVF), the first check point is to confirm the appearance of pronuclei, including shape and number, around 16-18 hours after insemination. The formation of two pronuclei is defined as a successful and normal fertilization; however, the other pronuclear types such as more or less than two pronuclei or uneven pronuclei are considered as abnormal fertilization. Nevertheless, blastocysts derived from abnormal fertilized oocytes have been referred to have potential to develop into normal chromosomal status and produce a healthy baby.

Study design, size, duration

A retrospective cohort study was conducted at Stork Fertility Center, between January 2017 to December 2017. Total 1155 cycles were included in the study and divided into oocytes recipient (N= 458) and infertility (N= 697) groups. Total 14615 mature oocytes (MII) were collected from recipient (n= 7603) and infertility (n= 7012) groups. The further analysis including pronuclear types and embryo development were evaluated only against the MII fertilized by ICSI.

	Recipient		Infertility	
	Frozen-thawed	Fresh	Frozen-thawed	Fresh
Cycle	292	166	128	569
Age	24.42	23.86	36.80	36.36
No. of ICSI MII	4,582	2,031	1,007	4,008

Participants/materials, setting, methods

The recipient and infertility groups were subsequently categorized into two subgroups: fresh (N= 166 and 569, respectively) and frozen-thawed oocytes (N= 292 and 128, respectively) inseminated cycles. Moreover, all frozen-thawed oocytes were preserved by vitrification in this study. Total 6039 fresh and 5589 frozen-thawed oocytes were performed by ICSI, and the proportion of pronuclear types and following embryo development were observed.

Main results and the role of chance

In the recipient group, the mean age of the fresh and frozen-thawed subgroups were 23.86 and 24.42 years old, and 2031 and 4582 MII were performed ICSI respectively; the fertilization rate (FR), good embryo rate (GER) and good blastocyst rate (GBR) of the fresh and the frozen-thawed subgroups were 82.32% vs. 77.48%, 62.14% vs. 55.80%, and 63.10% vs. 54.33%. In the infertility group, the mean age of the fresh and frozen-thawed subgroups were 36.36 and 36.80 years old, and 4008 and 1007 MII were performed ICSI respectively; the FR, GER and GBR of the fresh and the frozen-thawed subgroups were 79.89% vs. 70.04%, 64.08% vs. 55.52%, and 57.87% vs. 42.63%. The different proportion of pronuclear types was found between fresh and frozen-thawed oocytes. The 1PN rate in frozen-thawed was significant higher than the fresh oocytes, which was showed in both recipient (10.83% vs. 5.61%, $p<0.01$) and infertility (12.1% vs. 5.39%, $p<0.01$) groups. This phenomenon might be a clue to explore the effect of frozen-thawed process and fertilization mechanism.

Limitations, reasons for caution

The difference between fresh and frozen-thawed oocytes such as spindle structure, protein expression profile, chromosomal constitution, mitochondria activity and cytoskeleton conformation should be distinguished to illuminate the causes of the different distribution of pronuclear formation. This phenomenon is restricted to ICSI since frozen-thawed oocytes could not be performed conventional IVF.