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A Retrospective Study Comparing Vitrification Versus Slowfreezing For Cryopreservation Of Human Cleavage Stage Embryos

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Background: Embryo cryopreservation is considered a vital part of successful assisted reproduction technology (ART) treatment and improves the cumulative pregnancy rate per IVF (In Vitro Fertilization) cycle allowing additional chances of pregnancy without reexposure to exogenous gonadotropins and subsequent oocyte retrieval procedure. Slow freezing was the dominant method of cryopreservation in human assisted reproduction laboratory for many years. Recent studies have reported increasingly successful clinical results with vitrification. Vitrification is an ultra-rapid method of cooling cells into a glass-like state. In contrast to slow-freezing techniques, vitrification procedure requires an extremely high cooling rate and much higher concentrations of cryoprotectant. Compared with the traditional slow freezing method, embryo vitrification is relatively simple, inexpensive and potentially faster as the ultrarapid cooling technique requires no expensive programmable controlled-rate freezing equipment and avoiding damage to the cells or tissues.

Objective: To compare vitrification versus slow freezing cryopreservation outcome for cleavage stage day 2-3 embryos.

Materials and Methods: A retrospective study of 121 patients under IVF treatment with 323 cryopreserved embryos. Two basic techniques have been employed for the cryopreservation of human day 2-3 embryos: slow-freezing and vitrification. The patients parameters evaluated were age, pregnancy and abortion rate. The embryos parameter evaluated was survival rate according to embrionary quality. In our center we scored embryos quality according to Veeck (1999):

Grade 1 - embryo with blastomeres of equal size, no cytoplasmic fragments;

Grade 2 - embryo with blastomeres of equal size, cytoplasmic fragmentation less than 20%;

Grade 3 - embryo with blastomeres of distinctly unequal size; cytoplasmic fragmentation between 20-50%;

Grade 4 - embryo with blastomeres of equal or unequal size; cytoplasmic fragmentation above 50%.

Results: The patients average age of the slow freeze group was 36.2 years and the vitrification group was 37.1 years.

The embryo survival rate was stratified according to the embryo quality.

The survival rate of slow freeze group was: Grade 1= 97%, Grade 2= 76%, Grade 3= 70%, Grade 4= 50% and the vitrification group was: Grade 1= 96.1%, Grade 2= 92%, Grade 3= 86%, Grade 4= 100%.

The pregnancy rate in the slow freeze group was 35.1% and the vitrification group was 36.2%. Abortion rate was 11.5% and 11.7% respectively.

Conclusions: The vitrification method was more efficient than slow freezing for cryopreservation of human cleavage stage embryos in terms of post-warming survival rate. No significant difference in the pregnancy rate was observed between the cryopreservation methods. In conclusion, our study provides evidence that vitrification is more efficient than slow freezing cryopreservation in terms of survival rates of human cleavage embryos, specially when we have poor quality embryos. Regardless of cryoprotectants and their concentration, vitrification gives better embryo survival rate compared to slow-freezing. Even if no significant differences in pregnancy and abortation rate were observed between the cryopreservation methods studied, through a higher survival rate and quality of the embryos at warming, vitrification may improve the clinical outcome of IVF by maximizing the cumulative efficiency of the cycle.

High-quality randomized controlled trials should be pursued to find out which vitrification method is the best and when will be the time to completely abandon slow freeze embryo method.

Biography

Biomedic from the University Center Uni FMU (2003). Master degree-Medicine Department of Nephrology-Federal University of São Paulo-UNIFESP (2006). PhD by Ginecology Department-UNIFESP and Cleveland Clinic (2011). Pos -doc by Department of Gynecology-UNIFESP (in progress). Young Scientist Award in 2011 (14th World Congress on Controversies in Obstetrics, Gynecology and Infertility-Paris, France). Now, acting as embryologist and Researcher at the Federal University of São Paulo. She has experience in Biochemistry, with emphasis in Human Reproduction, mainly following themes: oxidative stress, antioxidants, superoxide, Endometriosis.

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