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Title:

ENHANCING REPRODUCTIVE OPPORTUNITIES: THE BIOLOGIC POTENTIAL OF VITRIFIED IN-VITRO MATURED OOCYTES

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Objective:

Oocyte In-vitro maturation (IVM) is a technique aimed to maximize reproductive potential for patients undergoing fertility preservation. Patients who suffer from compromised ovarian reserve, poor oocyte quality, or low number of MII oocytes at retrieval may benefit from employing IVM prior to cryopreservation. Over the past decade, optimization of oocyte maturation and cryopreservation techniques has enhanced cellular survival rates. More recent studies have suggested clinical utility of vitrified/thawed IVM oocytes, but data remains limited within the literature regarding reproductive potential. This study aims to assess the reproductive potential and genomic composition of blastocysts derived from vitrified/thawed IVM oocytes.

Design:

Retrospective cohort analysis

Materials and Methods:

The study included all patients who underwent an elective oocyte vitrification cycle(s) with subsequent thawing and fertilization from 2010 and 2019. After oocyte retrieval, immature oocytes (Metaphase I and Germinal Vesicle stages) were cultured and were first assessed for maturity after 6 hours: Early-IVM (E-IVM). A second assessment was performed after 24 hours

in culture: Late-IVM (L-IVM) as described by Escrich L et al. Matured oocytes were vitrified/thawed, underwent ICSI, and cultured sequentially to blastocyst stage. Cohorts were segregated into 2 groups: E -IVM and L -IVM oocytes. Fertilization, blastulation, and euploid rates were compared among cohorts. Xi2, T-test, and logistic regression analyses were performed, significance was considered at (p=<0.05).

Results:

292 IVM oocytes obtained from 105 patients were thawed over the course of the study. 203 oocytes were E-IVM, while 89 oocytes were L-IVM. No differences were found in survival rates (81.2%, 80.8%, p=0.94), fertilization rate (53.9%, 56.9%, p=0.67), percentage of zygotes reaching cleavage stage (87.6%, 90.2%, p=0.93), and blastulation rate (49.4%, 40.2%, p=0.24). Utilizable blasts number was similar among groups (E-IVM: 38.6%, L-IVM: 37.9%, p=0.95), though a difference was found in the percentage of good quality blastocysts among groups: (70.5%, 9%, p=0.0004). Biopsied blasts per group (34%, 27.5%, p=0.56) and euploidy rates (25%, 37.5%, p=0.53) were similar among cohorts. After adjusting for age, BMI, AMH, and total number of eggs retrieved per cycle, no association was found between the time to maturation and the odds of aneuploidy (OR 0.6, CI95% 0.05-7.85, p=0.74) or the odds of developing a good quality embryo (OR 0.18, CI95% 0.02-1.4, p=0.11).

Conclusion:

Formerly, the culture of embryos derived from cryopreserved IVM oocytes was perceived as having low survival rates, suboptimal developmental potential, and limited clinical utility. Our study demonstrated that IVM oocytes can be successfully cultured to the blastocyst stage and detected as chromosomally balanced. By employing IVM, we can optimize the reproductive potential per oocyte retrieval. Moreover, implementation of IVM in ART centers may increase the total number of transferable euploid blastocysts and enhance patients' ability to build a healthy family.