

COMPROMISED DEVELOPMENTAL COMPETENCE OF OOCYTES MATURED FOLLOWING RESCUE IN VITRO MATURATION

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Background: Rescue in vitro maturation (IVM) is an experimental procedure used to maximize the number of usable oocytes for fertilization in circumstances of low oocyte maturation rates at the time of retrieval (1). There is limited evidence of its efficacy and long-term safety data (2). The use of heterogeneous techniques in executing rescue IVM further complicates our understanding of outcomes related to IVM-matured oocytes.

Objective: We aim to evaluate the developmental competence of oocytes matured following rescue IVM.

Materials and Methods: We performed a retrospective cohort study of retrieval cycles that resulted in any immature oocytes that underwent rescue IVM between 01/2022-12/2024. Immature oocytes were cultured overnight and maturity was checked the following morning. Oocytes that matured in-vitro were fertilized using intracytoplasmic sperm injection. Cycles that utilized embryos from multiple retrieval cycles, or embryos from both in vivo- and IVM-matured oocytes were excluded. Fertilization and transfer outcomes of embryos using IVM-matured oocytes were compared to those of embryos using sibling in vivo-matured oocytes. Paired t-test analyses were performed.

Results: 995 retrieval cycles were included. Most patients were White (43.4%), ≥40 years (41.4%) with normal body mass index (61.0%). Most patients had an infertility diagnosis of diminished ovarian reserve (60.5%) followed by male factor (17.7%). Of 9920 oocytes retrieved, 5748 were in vivo-matured (Table 1). Rescue IVM was attempted on 3780 oocytes, resulting in 1790 IVM-matured oocytes. Similar mean proportions of in vivo-matured and IVM-matured oocytes fertilized with the presence of two pronuclei (55.4% vs 53.0%, $P=0.2$). The blastulation rate of in vivo-matured oocytes was higher than that of IVM-matured oocytes (45.5% vs 16.0%, $P < 0.0001$); the differences in blastulation rate remained when stratifying by age <40 (50.2% vs 17.6%, $P < 0.0001$) and ≥40 years (38.5% vs 13.2%, $P < 0.0001$). Euploid rates were comparable. 421 embryo transfers occurred in this cohort, of which 227 were fresh embryo transfers (206 in in-vivo group, 21 in IVM group) and 194 were frozen embryo transfers (184 in in-vivo group, 10 in IVM group). Among the fresh transfers, 89.8% of the in-vivo group and 100% of the IVM group involved transfer of a day 3 embryo. The live birth rate per transfer was 18.4% (38/206) in the in-vivo group and 0% (0/21) in the IVM group. Among the frozen transfers, 98.1% of the in-vivo group and 100.0% of the IVM group involved transfer of a blastocyst. The live birth rate per transfer was 38.0% (70/184) in the in-vivo group and 30% (3/10) in IVM group.

Conclusions: Our study demonstrated poor blastulation rates despite preserved fertilization rates of oocytes matured following rescue IVM compared to sibling in vivo-matured oocytes. Though fewer embryo transfers were performed using embryos developed from IVM-matured oocytes, live birth rates remained similar after frozen blastocyst transfer. The compromised developmental competence of IVM-matured oocytes does not support routine use of rescue IVM, though it may be a reasonable option for those lacking availability of in vivo-matured oocytes at the time of retrieval.

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Maturation and Fertilization Outcomes			
<i>Mean proportion per cycle</i>			
	In vivo-matured oocytes Mean proportion \pm SD	In vitro-matured oocytes Mean proportion \pm SD	<i>P</i>
% Mature oocytes	55.5 \pm 20.8	55.2 \pm 36.7	0.8
% 2PN	55.4 \pm 32.4	53.0 \pm 52.4	0.2
% Blast	45.5 \pm 40.3	16.0 \pm 31.6	<0.0001
<40 years	50.2 \pm 39.9	17.6 \pm 32.2	<0.0001
\geq 40 years	38.5 \pm 40.1	13.2 \pm 30.6	<0.0001
% Euploid	31.8 \pm 36.8	24.0 \pm 38.3	0.3

References:

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