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CAN IMMATURE OOCYTES 'CATCH-UP'? EMBRYO DEVELOPMENT AND REPRODUCTIVE POTENTIAL OF LATE-MATURED CRYOPRESERVED OOCYTES

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OBJECTIVE:

Oocytes that reach the metaphase II (MII) stage of development are cryopreserved for fertility preservation. Oocytes initially noted to be at the germinal vesicle (GV) or meiosis I (MI) stage following vaginal oocyte retrieval (VOR) often mature in vitro to the MII stage. While these late mature MII oocytes can be cryopreserved, there is a lack of data on their reproductive potential when thawed for future use. This study assesses the embryo quality and pregnancy outcomes after thaw and fertilization of late mature oocytes compared to oocytes that were mature at first assessment.

MATERIALS AND METHODS:

This retrospective cohort study analyzed autologous oocyte cryopreservation cycles with at least one frozen late mature oocyte that underwent subsequent thaw for IVF from January 2016 – February 2024. Each cycle included MIIs and late mature MIIs. Group 1included oocytes that were initially immature (MI or GV) that matured at least 4 hours later the same day ("late mature MII") and Group 2 included all MII oocytes mature on first assessment 1 hour following VOR ("MII"). Cryopreservation day, embryo expansion, and modified Gardner morphology grading for inner cell mass (ICM) and trophectoderm (TE) were compared. Univariate analyses were performed using Wilcoxon Ranks and chi-square. Logistic regression fitted with GEE controlling for oocyte age, BMI, year of oocyte cryopreservation, and year of oocyte thaw/embryo cryopreservation was performed to determine the odds of the cryopreserved blastocyst being high quality (ICM and/or TE grade A). A sub-analysis of euploidy and ongoing pregnancy/live birth rate was performed.

RESULTS:

A total of 442 blastocysts met criteria for cryopreservation after oocyte thaw, fertilization and culture to day 5, 6, or 7. Group 1 included 39 blastocysts from late mature MIIs and Group

2included 403 blastocysts from MIIs. There was no significant difference in day 5, 6, 7 blastocysts between groups, with 28.2% of Group 1 embryos frozen on day 5 and 25.3% of Group 2 embryos frozen on day 5 (p=0.77). There was a significant difference in extent of embryo expansion, with majority of embryos in Group 1 at expansion 5 (53.8%) and majority of embryos in Group 2 at expansion 4 (52.1%) (p=0.004). There was no difference in ICM or TE grading between groups. On adjusted analysis, there was no difference in high quality blastocysts between Group 1 (25.6%) and Group 2 (38.5%) (OR 0.54 CI 0.24-1.22, p=0.14). There was no difference in rate of euploidy(p=0.10), and in the 47 SEETs performed, the ongoing pregnancy/live birth rate was similar (p=0.75).

CONCLUSIONS:

Blastocysts derived from cryopreserved late mature MIIs develop at a similar pace to early MIIs. Overall, embryo morphology grades were similar, albeit there was a trend towards more high-quality blasts in early MIIs. Patients can be assured that late mature MIIs that reach blastulation have high reproductive potential. As more patients return to use their cryopreserved late mature MIIs, embryo quality and pregnancy outcomes should continue to be analyzed.

IMPACT STATEMENT:

Blastocysts derived from cryopreserved late mature MII oocytes can provide an opportunity for live birth to patients who return to utilize their frozen oocytes.

REFERENCES:

N/A