

Do embryo morphology or the day of cryopreservation matter when transferring a single euploid embryo? A national study.

BACKGROUND: Morphological grade is used to aid in the selection of the highest quality embryos for transfer to maximize pregnancy rates. However, morphological grading schemes can vary from clinic to clinic and include subjective criteria. Despite attempts to standardize morphology assessment, morphology alone poorly predicts embryonic aneuploidy (1). Day of cryopreservation has also been used to triage embryos for transfer with evidence suggesting that day 5 blastocysts are more likely to be euploid than day 6 blastocysts (2). Amongst euploid embryos, there is data suggesting that day of cryopreservation and embryo morphology may be even less meaningful (3).

OBJECTIVE: To evaluate live birth by day of blastocyst cryopreservation and embryo morphology among patients undergoing single thawed euploid blastocyst transfer. We hypothesize that day of cryopreservation and embryo morphology are not associated with live birth per transfer among PGT-A-tested embryos.

MATERIALS AND METHODS: We conducted a retrospective cohort study using the Society for Assisted Reproductive Technology Clinical Outcomes Reporting System (SART CORS) data base from 2017-2019. Patients aged 21-44 undergoing autologous single frozen euploid blastocyst transfer were included. Patients undergoing genetic testing other than preimplantation genetic testing for aneuploidy (PGT-A), with incomplete PGT testing and/or unknown PGT status, using thawed oocytes, using a gestational carrier, or undergoing a thaw/biopsy/refreeze cycle were excluded. Embryos were graded according to their inner cell mass and trophectoderm grading using Gardner criteria. Generalized estimated equation models with binomial distribution and logit link, to account for multiple transfers per patient, were used to evaluate the association between live birth and day of blastocyst cryopreservation, embryo morphology, and their interactions. Models were adjusted for age at retrieval, race, ethnicity, body mass index, reporting year, number oocytes retrieved, infertility diagnosis, nulliparity, and smoking status.

RESULTS: In total, 12,624 retrieval cycles and 15,092 subsequent linked frozen embryo transfers were included in the analysis. The live birth rate was significantly higher with day-5 embryos as compared with day-6 or day-7 embryos, regardless of morphology (Table). After adjusting for covariates, day 5 embryos were associated with higher odds of live birth when compared to day 6 (OR 1.39; 95% CI 1.27, 1.49) or day 7 (OR 4; 95% CI 3.03, 5.26). There was no significant association between embryo morphology and live birth among embryos cryopreserved on day 5. Among day 6 embryos, however, the odds of a live birth were higher among embryos with better morphology: good vs fair (OR 1.56; 95% CI 1.35, 1.79) and good vs poor (OR 2.04; 95% CI 1.59, 2.63).

CONCLUSIONS: In this large national cohort of euploid single blastocyst transfers, day 5 embryos (good, poor, or unknown morphology) were associated with higher odds of live birth compared to any day 6 or day 7 embryo, regardless of morphology. When selecting a euploid embryo for transfer, the day of cryopreservation should be prioritized over embryo morphology.

Table: Live Birth Rates by Day of Cryopreservation and Embryo Morphology

	Good	Fair	Poor	Unknown	Total
Day 5	3669/6158 (60%) 0.596	618/1154 (54%)	206/351 (59%)	689/1093 (63%)	5182/8756 (59%)

Day 6	1966/3802 (52%)	445/1086 (41%)	101/300 (34%)	383/748 (51%)	2895/5936 (49%)
Day 7	59/222 (27%)	21/106 (20%)	3/26 (12%)	8/46 (17%)	91/400 (23%)
Total	5694/10182 (56%)	1084/2346 (46%)	310/677 (46%)	1080/1887 (57%)	8168/15092 (54%)

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