Determining the Predictive Value of Day 3 Embryonic Morphology and Cell Stage on Ultimate Embryo Quality

KM Silverberg, H Werland, T Turner, R Fields, C Crowl, LJ Hansard, TC Vaughn. Texas Fertility Center, Austin IVF, Austin, TX

Objective
Although blastocyst transfer has been demonstrated to offer higher implantation rates than Day 3 embryo transfer (ET), few programs offer blastocyst transfer exclusively. Due to significant in vitro embryonic attrition between Days 3 and 5, optimal embryo selection is of paramount importance for patients undergoing Day 3 ET. Few data exist, however, regarding the predictive value of Day 3 embryo morphology and cell stage on ultimate (Day 5 or 6) embryo quality. This study was designed to assess the predictive value - if any - of both Day 3 embryo morphology and cell stage on ultimate in vitro embryo quality.

Materials & Methods
Oocytes were inseminated in Sage fertilization medium with 0.5% HSA and cultured to Day 3 in Sage cleavage media with 10% SPS. Embryonic appearance and cell stage on the morning of Day 3 were noted and embryos were then transferred into Sage blastocyst media with 10% SPS. The morphologically best blastocysts were transferred on Day 5, while other good quality blastocysts were cryopreserved on either Day 5 or 6. For purposes of data analysis, embryos that were transferred or cryopreserved were considered good quality (Group 1), whereas embryos that stalled or failed to become good quality blastocysts were considered poor quality (Group 2). Statistical analysis was performed using t-test and linear regression analysis.

Design
Prospective analysis of all patients undergoing IVF with a Day 5 embryo transfer in 2005 in a large private infertility practice.

103 patients underwent IVF with Day 5 ET in our program in 2005. All 1448 embryos resulting from these cycles were included in this study. 202 blastocysts were transferred (14%), 265 were cryopreserved (18.3%), 439 embryos stalled (30.3%), and 544 embryos made poor quality blastocysts (37.6%). 81% of these patients achieved pregnancy, with 71% ongoing or delivered as of this time. Statistical analysis identified 3 cell stage and morphologic subgroups based on Day 3 embryonic appearance: Embryos having favorable characteristics produced significantly more Grade 1 embryos than did Embryos having unfavorable characteristics (> 48 vs. < 32%, p < 0.05)

Fate of Day 3 Embryos on Day 5 & Day 6

Results

Day 3 Embryo Subgroup Criteria
Favorable: > 10C, 10C-G2, 9C-G1, 9C-G2, 8C-G1, 8C-G2, 7C-G1
Intermediate: Morula, 10C-G1, 7C-G2
Unfavorable: 10C-G2.5/3/4, 9C-G2.5/3/4, 8C-G2.5/3/4, 7C-G2.5/3/4, less than or equal to 6C-all grades

Embryo Grading

Day 3 embryonic morphology and cell stage afford significant information regarding ultimate in vitro embryonic quality. Regardless of morphologic grade, it appears as though embryos must achieve at least the 7 cell stage in order to have a better prognosis. Once this cell stage has been achieved, morphologic grade appears to be diagnostic, as higher degrees of fragmentation and cellular irregularity portend a poorer prognosis. The use of these criteria may enable embryologists to better select the appropriate embryos for Day 3 ET.

Conclusion