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Time-lapse embryo evaluation as a training tool: day 3 versus day 5 selection for transfer

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INTRODUCTION:
Embryo development is a dynamic process which requires morphological assessments in order to select the top embryo for *in vitro* fertilization (IVF) transfer. Static time-based evaluation can be restrictive towards embryo selection within a cohort. This study presents a training model to practice, improve and standardize embryo selection from an individual to a team.

AIM:
To assess embryo selection between a junior (E_1) and a senior (E_2) embryologist using static (SE) and time-lapse (TL video-stream) evaluations, and to compare embryo selection for transfer between day 3 vs day 5 of culture.

MATERIALS AND METHODS:
Analysis of embryo development (n=23, all with blastocyst transfer) was performed on the TL database (Vitrolife Embryoscope® time-lapse system). Embryo images were evaluated by two evaluators (E_1 and E_2 with two and six years of IVF experience, respectively) at 69 and 117 hours (D3 and D5) of culture. Evaluation was performed (SE and TL); two embryos were selected independently by the embryologists. Training assessment was performed whereby E_1 and E_2 blindly predicted blastocyst development of D3 embryos (n=115) and further anticipated D5 blastocysts to be selected for cryopreservation.

RESULTS:
Outcomes were categorized into three sections:
(i) the same two embryos (100% similarity),
(ii) one of two embryos (50% agreement) and
(iii) completely different embryos (0% similarity) selected for transfer.
1. Results are provided in the latter mentioned categories for:
   Static evaluation: E_1 vs. E_2 D3: 26%, 47% and 26%. D5: 44%, 35% and 21.7%;
   TL evaluation: D3: 39%, 44% and 17%. D5: 35%, 44% and 22%.
2. A retrospective evaluation was performed of the **D3 to the D5 embryos selected for transfer** within a cycle:
D3 vs D5 (TL): E_1: 26%, 57% and 17%. E_2: 35%, 44% and 22%.
D3 vs D5 (SE): E_1: 17%, 57% and 26%. E_2: 26%, 48% and 26%.
The likelihood for E_1 to select at least one embryo similar to E_2 for D3 and D5 evaluations: (SE) 74%, 78%, and (TL) 83%, 78%, respectively.
3. In evaluating TL as a quality control and training tool, a similarity of 75% (sensitivity= 84% and specificity= 31%) was obtained for E_1 and E_2 for **D3 prediction of blastocyst development**; with a 52% similarity (sensitivity= 78%, specificity= 71%) for **D5 cryopreservation selection**.

CONCLUSION/DISCUSSION:
- One of the key benefits of the TL system is the opportunity of monitoring embryo development continuously, also to audit a trainee's progress in embryo evaluation and transfer/cryopreservation selection in a remote or real-time setting.
- D3 embryo selection was easier to grade and select for E_1 using the TL (82.6% similarity), with a slight difference for D5 evaluation (78.3%).

Video streaming of embryo development offers a safe simulation, which can be used for training purposes.