Abstract citation ID: deae108.149
O-130 The spatial conformational features of blastocysts can serve as a new basis for selection

B. Huang¹, M. Binxing¹, J. Lei¹

¹Huazhong University of Science and Technology, Tongji Hospital- Tongji Medicine College, Wuhan- Hubei, China

Study question: Can spatial conformational features become a new basis for blastocyst selection?

Summary answer: The spatial conformational features of blastocysts can be associated with clinical outcomes, which is a new basis for blastocyst selection.

What is known already: At present, the quality evaluation of blastocysts is two-dimensional, and there are relatively few evaluation indicators. There are now methods for exploring three-dimensional reconstruction of blastocysts, including fluorescence staining to obtain three-dimensional structures or artificial rotation to obtain images and restore three-dimensional conformations. However, one drawback of these methods is that they are far from true clinical applications. There are no reports on the reconstruction techniques that can be used in clinical blastocyst selection techniques, and there are no reports on the spatial conformational features related to them.

Study design, size, duration: This study included 2,141 frozen thaw single blastocyst transfer cycles at Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology from 2020 to 2021. Simultaneously collect multi-focal plane (11) image data for each blastocyst (EmbryoScope+). The inclusion criteria for patients are those under 40 years old, with an endometrial thickness of 7-16mm, and a history of embryo transfer failure of less than or equal to 1 time.

Participants/materials, setting, methods: This study iteratively interpolated the 11 focal planes using a multi focal plane generation network model. The contour and spatial information of blastocyst TE and ICM were obtained through deep-learning and segmentation networks. Texture information was extracted using depth estimation and image fusion and mapped to a 3D model to obtain a complete blastocyst spatial model. Then calculate a series of new spatial conformational features of the blastocyst and analyze their correlation with clinical outcomes.

Main results and the role of chance: We validated the model using the fluorescence reconstruction of human blastocysts as the gold standard (key indicator accuracy >90%). The obtained spatial conformational parameters of blastocysts include: Blastocyst: overall volume (BOV), cystic cavity volume (BCV), surface area (BSA); ICM: volume (IV), surface area (ISA), spatial aspect ratio (ISAr), surface sphericity (ISS), relative distance from ICM to TE (IRD), contact area with TE (ICA); TE cells: number (TN), density (TD), distribution difference (TDD), TE cell roundness (TR), circumference (TC), area (TA) and variance, TE cell aspect ratio (TMM) and variance. The BOV, BCV, and BSA of the blastocyst were positively correlated with clinical pregnancy rate (CPR). The quartile results showed significant differences in CPR when the values were >179 w·m⁻³, 165 w·m⁻³, and 25.8 w·m⁻³, respectively. In terms of ICM, there was no significant difference in CPR among the IV, ISA, IRD, and ICA. However, we found ISAr and ISS had higher CPR in the range of 0.715-0.912 and 0.920-0.943, respectively. In terms of TE, TN is positively correlated with CPR. TD, TDD, TR were not significantly associated with CPR. The pleasing finding is that TC, TA, TMM, and their variances are significantly correlated with CPR.

Limitations, reasons for caution: The overall quality of blastocysts is relatively good, which is related to the priority thawing of the best blastocysts. Some blastocysts may appear partially out of view, leading to data unavailability and potentially affecting 3D reconstruction. Further exploration and discovery are needed for the spatial conformational features of blastocysts.

Wider implications of the findings: This work provides a 3D reconstruction system for blastocysts that is closer to clinical applications and discovers new spatial features that are related to clinical outcomes. This enables the study of more dimensional biological characteristics of blastocysts, and our research further promotes the development of embryo reconstruction technology.

Trial registration number: not applicable