Mini-Symposium: Biomarkers for Embryo Quality

Preface

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Identification of embryos with high viability is pivotal to achieve success in assisted reproductive technology (ART). If the accuracy of the selection were assured, it would be possible to improve the take-home baby rate as well as to reduce multiple pregnancies, which have been recognized as one of the major criticisms of ART, by the strict regulation of the number of embryos transferred.

Morphology under the microscope has been the sole method of evaluating embryo quality since ART began. However, it is apparent that the morphologically good-looking does not always promise the best quality embryo. In order to assist the morphological assessment, extended culture of embryos has been widely employed. The development of sequential media has enabled us to culture embryos until the day-5 blastocyst stage and to choose a good-quality embryo for transfer by sequential assessment of individually cultured embryos. However, the latest meta-analysis has revealed that the routine application of blastocyst transfer has brought only a small benefit to ART outcomes, while increase in the cancellation rate and decrease in the number of frozen embryos are significant (Fig. 1).

Recent advances in engineering science have made it possible to measure very small amounts of molecules derived from a live, single cell. Thus, research on biomarkers for embryo quality has just started and is in the process of development. To make better use of biomarkers along with morphological evaluation in ART programs, biomarkers have to satisfy the following conditions: be non-invasive for embryos, be fast in assessment, require inexpensive and easy-to-use equipment, have less inter- or intra-observer variability, as well as high predictive value for the treatment outcome (Table 1).

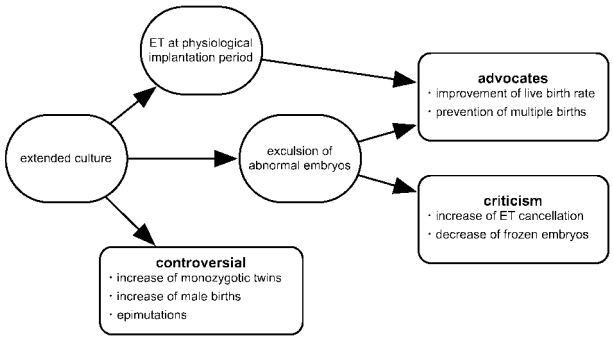

Fig. 1. The present status of extended culture.

This mini-symposium highlights the following four biomarkers: respiration activity measured by scanning electrochemical microscopy, the elasticity of zona pelucida measured by a micro-tactile sensor, soluble HLA-G (sHLA-G) protein in embryo culture supernatants, and metabolites in embryo culture supernatants. It is regrettable that the method to measure sHLA-G, which is expressed in trophoblasts to facilitate implantation by an immunological mechanism, has not been established yet, and that the usefulness of sHLA-G for biomarkers is uncertain at present.

Single embryo transfer (SET) has been a worldwide trend in ART. In February 2008, the Japanese Society of Obstetrics Gynecology announced its recommendation to promote SET in routine ART programs. To cope with this trend, it is indispensable to establish a reliable biomarker for embryo quality. We hope that this mini-symposium will help clinicians and embryologists to deal with this issue.

Table 1. Prerequisites for biomarkers of embryo

・ be non-invasive for embryos
・ be fast in assessment
・ require inexpensive and easy-to-use equipment
・ have less inter- or intra-observer variability
・ have high predictive value for the treatment outcome