MAXIMIZING THE IDEAL TIME FUNCTION IN MIRI TL VIEWER SOFTWARE

Abstract

Selecting the most viable embryo has significantly improved with the use of IVF incubators equipped with time-lapse imaging. With the increasing number of data gathered and publications released with regards to implantation potential based on morphokinetic variables, a variety of selection models, or algorithms, are being developed. The Miri TL Viewer Software is adaptive with its Ideal Time function fully customizable to match the clinic’s requirement. There are several models or cleavage timings published, e.g. Meseguer et al. (2011), Campbell et al. (2013) that can be used as predictor of embryo implantation. However, despite the number of morphokinetic embryo selection models now published, such models may not be directly transferrable to another clinical setting.

Introduction

For most IVF clinics, methods of embryo evaluation mainly rely on static observation of the embryos’ morphology by making observations restricted to specific times. Considering that the development of an embryo is a dynamic process, several critical stages in between observations may be left unnoticed. The method often employed is subjective and varies among embryologists, which in turn, affect the outcome. The introduction of time-lapse technology enables the uninterrupted monitoring of embryo development through image acquisition at certain time interval. This technology provides comprehensive information on both the morphology and kinetics of the embryo’s development, and these together have been defined as ‘morphokinetic’ variables.¹

Morphokinetic Timing as an Embryo Selection-Deselection Criteria

Time-lapse observation presents an opportunity for optimizing embryo selection based on morphological grading as well as providing a novel kinetic parameter, which may further improve the accurate selection of viable embryos.² An increasing number of publications using time-lapse imaging provides prognostic markers for embryo viability and implantation potential based on morphokinetic variables.

As this technology becomes available to more clinics, a variety of selection models or algorithms, is being developed.³ These models vary based on several confounding factors that affects the morphokinetics of embryo development such as age, ploidy, ovarian reserve, gas composition and concentration during in vitro culture, infertility indication, ovarian response to stimulation, culture

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¹ (Ciray, et al., 2014)
² (Meseguer, et al., 2011)
³ (Fishel & Campbell, 2015)
media, embryo biopsy, differences in fertilization procedure, methods of sperm cryopreservation, female BMI and smoking habits of the female.\(^4\)

Strong correlations between the embryo’s morphokinetics and viability for implantation has been established in various studies.\(^5\) Meseguer et al. were among the first to publish a time-lapse model based on a quite large number of retrospective time-lapse data. The publication presented optimal values of the tx variables (t2, t3, t4 and t5) combined with derivative variables of the primary tx variables called cc2 (t3-t2) and s2 (t4-t3) for embryos that did implant and embryos that did not.

Later on, other studies into patient groups revealed a detectable change in morphokinetics between different patient groups. One we would like to emphasize here is the study by Fréour et al. 2012 between smoking and non-smoking women. The study revealed a statistically significant difference of the kinetics of the two groups with the embryos of smoking women developing slower than the embryos of non-smoking women.\(^7\)

Another study worth highlighting is of Rubio et al. 2012 which was done as a multicenter study where the group set out to investigate implantation success of embryos that had blastomeres cleaving into three cells instead of two (also referred to as DC2-3). It is interesting to highlight based on retrospective analysis that embryos having blastomeres cleaving to three cells in less than 5 hours have statistically significantly lower implantation potential than embryos with a normal cell cycle length.\(^8\)

Campbell et al. 2013 and 2014 focuses on two morphokinetic variables tsB (time from insemination to the start of blastulation) and tB (time from insemination to the formation of a full blastocyst) to evaluate the ploidy status of the embryo. The study compared ploidy status (from PGS) with time-lapse data. From only two variables they were able to create an Aneuploidy risk classification model.

With the increasing numbers of time-lapse models being published, IVF clinics have to proceed with caution when using a model/ models for selection-deselection criteria. Yalçinkaya et al. deduced that the outcomes of the embryos based on the dynamic score do not comply with the results of the preconstructed model. Hence, they suggested that each IVF laboratory should have their criteria for embryo selection based on its own data rather than using a preconstructed model.

**Miri TL Viewer Software: Ideal Time Tool**

The Miri TL Viewer Software has an Ideal Time function as part of the software’s annotation tools. It is user-defined and allows users to input event timings lifted either from a published model or from their own data. The tool, once selected, will have a circular colored band shown on the outside ring of the round revolver (see Figure 1) indicating the ideal timings for certain events. Visual comparison of the actual cleavage time to the ideal timings provides some immediate reference to the embryologists annotating the embryo. Also for easy comparison, the colored bands outside the ring and the annotations on the left for specific time events has the same color.

\(^4\) (Ciray, et al., 2014)  
\(^5\) (Ciray, et al., 2014)  
\(^7\) (Freour, Dessolle, Lammers, Lattes, & Barriere, 2012)  
\(^8\) (Rubio, et al., 2012)
The color is also user-defined. To match the clinic’s requirements, the parameter settings can be changed by going to the **Annotation Settings** menu as seen in Figure 2. An upper and lower limit can be set to make an easy visual evaluation of the morphokinetics in the “timeline view” (figure a) and on the “deviation bar” (figure b) view (both found under the **Summary** button in the annotation page).
Conclusion

Several selection models based on morphokinetics has, and are now, being published throughout the community, we would like to emphasize that such models may not be directly transferrable to another clinical setting as confounding factors may differ between different clinical setups. Each IVF laboratory is unique based on its practice. Therefore, we would like to suggest that each IVF laboratory in time should determine its own embryo selection criteria based on their own clinically-gathered data.

References


