Abstract Details

Session title: Session 49: Intelligent automation in the embryology laboratory
Session type: Selected oral communications
Presentation number: O-171

Abstract title:

Embryo development detection by automated software vs. embryologist team.

Biography

PhD Student at IVI RMA Global

R. Del Gallego Bonilla[1], L. Alegre[1], L. Bori[2], T. Peura[3], S. Azaña[2], M. Meseguer[1].
[1]IVI Valencia- SL, IVF Laboratory, Valencia, Spain.
[2]IVI Valencia- SL, Research, Valencia, Spain.
[3]Genea, Research, Sydney, Australia.

Study question:

To compare outcomes and accuracy of embryo morphokinetic event annotations performed in a routine clinical practice to those performed by an automated embryo assessment software.

Summary answer:
High detection rate accordance was found between embryologist and embryo assessment software. This novel technology is a useful tool under a qualified embryologist supervision.

What is known already:
Time-lapse technology has helped to elucidate key events of embryo development. The relevance of this methodology has increased in the last years, since it reduces subjectivity and makes possible to perform deeper and more accurate analyses of embryo development. The use of deep learning algorithms to analyse developmental events automatically is a step towards implementation of artificial intelligence into embryo assessment, which is becoming a significant trend in the future.

Study design, size, duration:
This is a retrospective study with data collected between December 2017 and August 2018 in IVI Valencia clinic from embryos analysed manually by IVI team and automatically by GeriÒ Assess 2.0 automated annotation software for nine embryo development events. Percentage of events detected by either IVI team, the software or both was calculated, as well as the accuracy of event timings between the two.

Participants/materials, setting, methods:
A busy embryologist team at IVIRMA clinics annotated embryos for nine developmental events as per normal clinical practice using GeriÒ Assess 1.3 software. The same videos were then analysed retrospectively with a stand-alone GeriÒ Assess 2.0 software, applying the same pre-determined filtering time-ranges for the events as are incorporated in the full GeriÒ Assess 2.0 system. Finally, the event detection rates, and event timings as mean and standard deviation between the two were compared.

Main results and the role of chance:
From 12,618 possible developmental events, IVI detected 86% (10,857), GeriÒ Assess 2.0 software 81% (10,191), and both concurrently 75% (9,470).The mean and standard deviation of the event timings between manual and automated annotations were as follows (hrs): PN appearance 0.3 (±4.1), PN disappearance 0.6 (±1.1), 2-cell 0.6 (±1.3), 3-cell 0.5 (±2.1), 4-cell 0.7 (±4.1), 5-cell 1.1 (±4.3), 6-cell 0.1 (±4.4), morula 4.1 (±7.4) and early blastocyst 1.1 (±5.4). Time-ranges for filtering of automatic annotations were: PN disappearance 17-30 h, 2-cell 20-40 h, 3-cell 30-48 h, 4-cell 32-54 h, 5-cell 38-68 h, 6-cell 46-78 h, morula 64-100 h and early blastocyst 86-126 h. Thus excluded data points represented 12% of all

automatically annotated events.

The lowest accordance rates in detection were found in the more subjective events: PN disappearance, morula or expanded blastocyst stage, and especially after the events were filtered according to time-ranges. Differences in timings varied according to the event, the largest differences detected in the later events. However, in the great majority of the events, especially early cleavage divisions, the match rate was very high.

Limitations, reasons for caution:
Prospective validation is needed. Chaotic embryos with aberrant divisions and variability between annotators makes exact annotations difficult for both manual and automated annotations.

Wider implications of the findings:
Automated annotations ease the embryologists' workload and especially early events can be annotated with high accuracy. Furthermore, non-annotated events can still be annotated manually, increasing the accuracy of the data. Move into the use of automated annotations is a natural progression for a clinic utilising timelapse systems, such as ours.

Trial registration number:
Not applicable

Keywords:
Time-lapse technology
Machine learning
Automated embryo selection