Abstract Details

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Abstract title:

A universal algorithm is available in last generation time-lapse incubators: embryo score provided by the KIDScoreD5 is strongly correlated with chromosomal status and clinical outcomes.

Biography

Lorena Bori is PhD student under the direction of Dr. Marcos Meseguer in IVIRMA Valencia. She finished the Biology degree in 2016 and the Master degree in Biotechnology of Human Assisted Reproduction in 2018. Currently, she is colaborating in different projects performed in the IVF laboratory of IVIRMA Valencia, especially she is focusing on non-invasive embryo selection, the automatism and artificial intelligence.

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Study question:

Is the inbuilt software in EmbryoScope and EmbryoScopePlus systems useful to identify embryos with normal chromosomal status and high potential to achieve a live birth?

Summary answer:

The embryo score provided by KIDScoreD5 algorithm is highly different depending on chromosomal status and the likelihood of achieving a pregnancy and a live birth.

What is known already:

Time-lapse technology has allowed embryologists to develop selection algorithms with morphological and morphokinetic parameters. Numerous models have been described, but no one has yet been sufficiently consolidated for universal use. The EmbryoScope and EmbryoScopePlus systems include a selection method, KIDScoreD5, which classifies the embryos in categories based on cleavage time points and blastocyst appearance. The version 2 (v2) considers PN, t2, t3, t4, t5, tB and trophectoderm quality. Later, the Inner Cell Mass quality was added in version 3 (v3). To our knowledge, this is the first time that these newest versions are validated with such a large sample size.

Study design, size, duration:

This retrospective analysis including 22,461 embryos from 2017 to 2019 was performed in IVI Valencia. Embryos were cultured in the time-lapse systems EmbryoScope and EmbryoScopePlus and routinely evaluated by senior embryologists according to the ASEBIR criteria. The EmbryoViewer software automatically detected morphological and morphokinetic parameters. If some error occurred, it was manually modified. Then, embryos were graded using the KIDScoreD5 algorithm in different scores from low to high quality (1-9.9).

Participants/materials, setting, methods:

The KIDScoreD5 algorithm was tested with 7,857 embryos for v2 and 14,604 for v3. The embryo score was

compared with the morphological grade assigned by embryologists, from A to D and excluded embryos. The correlation between the score of 3,311 embryos that underwent preimplantation genetic testing with their normal or abnormal chromosomal status was also studied. Finally, the association between the embryo score and clinical outcomes was analyzed in 3,296 Known Implantation Data (KID) embryos.

Main results and the role of chance:

The comparison between the embryo score provided by the KIDScoreD5 and the category assigned by embryologists showed a direct association*. The means in V3 were 8.2 ± 1.2 for A; 5.7 ± 1.4 for B; 3.6 ± 1.2 for C, 2.2 ± 1.0 for D and 1.8 ± 0.7 for excluded embryos. Regarding the chromosomal status, embryos with normal content had significantly* higher score than abnormal ones. The score means and standard deviations for the newest version were 4.6 ± 1.8 for abnormal embryos and 5.3 ± 1.9 for normal ones. Embryos with higher marks achieved significantly* more implantation rate and live birth rate in both versions. Following results belong to V3 and are presented per quartiles of similar sample size. The implantation rates were 41.0% for score < 5.3, 54.2% for score 5.4-6.4, 59.3% for score 6.5-7.4 and 67.9% for score >7.5. The live birth rates were 20.2% for score < 5.3, 25.1% for score 5.4-6.4, 40.3% for score 6.5-7.4 and 48.6% for score >7.5. In addition, V3 was capable of distinguishing between implanted and non-implanted good quality blastocysts (A+B)*. The score means were 6.8 ± 1.5 for implanted good quality embryos and 6.4 ± 1.6 for non-implanted ones.

*p<.05

Limitations, reasons for caution:

This project is limited by its retrospective and single-center nature. Multicenter validation would be necessary to corroborate the universal use of the KIDScoreD5 algorithm included in last generation time-lapse incubators.

Wider implications of the findings:

This study showed the capability of the KIDScoreD5 in distinguishing between potential embryos with similar morphological characteristics. Therefore, embryo score could help embryologists to make decisions. Recently, time-lapse technology has taken a step forward towards automated annotations. The combination of universal selection models and automatism could improve the embryo selection.

Keywords:
Time-lapse
KIDScoreD5
chromosomal status
implantation
live birth