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Popular Article

Time-Lapse Technology

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Introduction

Time lapse technology means the photographic technique of taking a sequence of frames at set intervals to record changes that takes place slowly over time in IVF embryos. When the frames are shown at normal speed the action seem much faster. Unlike conventional single daily observations time lapse technology provides hundreds of images, which allows pinpointing of key events in the embryo's in vitro development as well as the detection of brief but significant critical changes. Embryos can be monitored without removing them from the incubator. This type of monitoring allows for the collection of much more information on the timing of the cleavages and the dynamics of the morphologic changes.

Various time-lapse systems are currently used. Two of the most widely used technologies, the Primo Vision (Vitrolife) and Embryoscope (Fertilitech) systems, both use bright field technology, whereas the EEVA (Early Embryonic Viability Assessment, Auxogyn) system uses dark field technology. All systems incorporate a digital inverted microscope that takes a picture of the embryos at 5-20 minutes intervals. The images are processed by custom image acquisition and then displayed on a computer screen. The pictures taken at pre-set intervals are then connected into short films that can be rewound and fast forwarded for detailed analysis.

Advantages

The new generation of systems that combine microscope and incubator offer the possibility to describe morphological characteristics without removing the embryos from the optimal conditions of gas and temperature. In contrast to the daily evaluations routinely performed in the IVF laboratory, the image-analysis systems offer a series of benefits that include not only the precise determination of cell divisions, but a closer monitoring of mor-

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phological events, such as irregular divisions, the formation and reabsorption of fragments, the initiation of compaction, and the appearance of the blastocoele cavity, among others.

Disadvantages

Currently the high expenses of time lapse technology. Although there are different algorithms for selection of best embryo but other factors like type of insemination, culture condition, type of ovarian stimulation and intrinsic factor of female animal could play a role. It does not allow rolling of the embryos, which causes limited visual observations, especially when a high level of fragmentation exists or blastomeres overlapping other blastomeres.

Morpho kinetic parameters taken into consideration for evaluation of embryo quality

Early cleavage

The timing of the first cleavage has been proposed as a marker for embryo selection, and several studies agree that transferring early-cleaving embryos leads to higher implantation rates.

Fragmentation

It is particularly useful in embryology to study the level of fragmentation, the appearance of which is common in early embryonic development. Estimation of the percentage and size of fragments during the early stages of embryo development forms part of almost all schemes of embryo classification.

Multinucleation

The assessment of multinucleation represents another parameter strongly established in the IVF laboratory. The presence of multinucleation has been correlated with the incidence of chromosomal abnormalities, increased fragmentation, impaired cleavage and lower implantation rates.

Synchrony

Synchronic cell divisions as well as synchronic nuclei appearance after the first cleavage have been associated with higher implantation rates in human embryos.

There are also many other morpho kinetics parameters of embryos to interpret the quality of embryos.

Conclusions

Time-lapse technology is a powerful technology for the study of early embryo development. The growing appreciation of Time-lapse technology in both basic embryology research and clinical assisted reproduction is reflected in the increasing number of time lapse studies published in recent years. When practiced with precautions, Time-lapse technology does not appear to cause any observable, detrimental effect in embryo development, and thus can be used safely in the clinic as a tool to select the best embryo for transfer. Using Time-lapse technology, a range of morphological and dynamic parameters can be extracted from individual embryos and potentially used as predictive markers for healthy embryo development.

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