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Title: Time- lapse technology integrated in a new automated analysis method for embryo selection. Clinical validation.

Objective: Time- lapse technology has helped to elucidate key events of embryo development but nevertheless, not all apparently good quality embryos manage to implant. In order to achieve the first goal for IVF treatments, implantation success, we need to be able to select the best embryo to transfer. We pretend to evaluate whether an automated embryo assessment can classify embryos in regards to their implantation potential as compared to standard morphology or manual annotations.

Design: After a retrospective survey in which 3,781 embryos were assessed, a secondary analysis from an ongoing prospective multicenter trial was performed. A total of 274 fresh cycles from infertile couples undergoing oocyte donation were included.

Materials and methods: Embryo development in terms on cleavage timings and cell cycle lengths were registered automatically by the analysis software (DANA). To this end, morphokinetic parameters were positioned in 2D-plots and the average distances were compared with a KID (known implantation data) embryo's data cloud, followed by the generation of quality ranking system based on implantation potential. The ranking uses UAD values (unit average distance) for the result of each embryo. A total of 389 embryos were transferred (KID embryos).

Results: Statistically significant differences between KID analyzed embryos were found when UAD averages results were compared: KID+ embryos (0.96 UAD) vs. KID- (1.53 UAD) sig. <0.05. It was noted that non implanted embryos were farthest from the data cloud center. The 80% of KID+ showed ≤ 0.99 UAD while only the 20% of them exceeded this value. A classification according to Dana values and implantation rate was established: HIGH (≤ 0.447 UAD), MEDIUM (0.447-0.998 UAD) and LOW (>0.998 UAD). The implantation rate for each group was 55%, 45% and 23%, respectively (sig. <0.001). Regarding the ongoing pregnancy rate, it was higher in cases where at least one of the embryos transferred (single or double transfer) was ranked as HIGH: 50% vs. 39%. The results were comparable with Basile et al. 2015 algorithm and ASEBIR morphologic classification of embryo development

Conclusions: The application of automated DANA classification has been shown to be a useful tool for assessing the implantation potential of each embryo just before the transfer in a noninvasive way. An increased chance of success in each embryotransfer is achieved.