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Comparing the EmbryoScope with conventional benchtop incubators: Laboratory and clinical outcomes

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INTRODUCTION:
Time-lapse incubation (TLI) was introduced over 5 years ago with the primary aim of improving blastocyst quality and ultimately increasing treatment success rates. Our Centre implemented the EmbryoScope (ES) TLI system, but after using it, primarily for patients undergoing intracytoplasmic sperm injection (ICSI) treatment, the question arose as to whether the ES had actually achieved better outcomes compared to the conventional Cook MINC benchtop incubators.

AIM:
To investigate blastocyst quality and ongoing pregnancy rates between the EmbryoScope and conventional MINC benchtop incubation systems.

MATERIALS AND METHODS:
Fresh embryo transfer (ET), delayed ET, preimplantation genetic screening cycles, as well as oocytes originating from fresh donor cycles were incubated in the ES. However, to avoid possible bias that might have arisen from euploid embryo transfers following PGS, clinical outcomes were analyzed from the fresh ET cycles only. Embryos were cultured in LifeGlobal Total medium under low oxygen at 37°C in both systems for a maximum of 6 days. Blastocyst development, biochemical and ongoing pregnancy rates (OPR) and implantation rate (IR) were analyzed retrospectively.

Study A: Comparing ES vs MINC (ICSI – IVF): This analysis involved 4886 embryos from 992 couples undergoing ICSI during April 2014 – April 2015. 3759 oocytes fertilized using ICSI were allocated to the ES incubators and 4798 oocytes inseminated by IVF were allocated to the MINCs.
Study B: Comparing ES vs MINC (ICSI – ICSI): This analysis involved 1180 ICSI-derived embryos from 128 couples treated during April-May 2015. A total of 543 oocytes have been cultured in the ES system and 637 in MINCs.

Statistical analysis used Student's *t*-test and Fisher's Exact Test (MedCalc, see www.medcalc.be).

RESULTS:
Study A showed no significant difference in fertilization rate between incubation systems (ES = 61.6% v MINC = 57.7%; $P<0.05$). While blastocyst development was higher in the MINCs (66.0% v 58.3%; $P<0.0005$), the positive ßhCG rate, IR and OPR were the same in both systems (ßhCG: ES 55% v MINC 56% ($P=1.0$); IR: ES = 29% v MINC =32.3% ($P=0.14$); OPR: ES=27.4% v MINC = 29.9% ($P=0.23$).
In ***Study B*** the ICSI fertilization rates were the same: ES = 69.61%, MINC = 68.6% ($P=0.79$); as was blastocyst development: ES = 68.8%, MINC = 63.6% ($P=0.35$) and positive ßhCG rate: ES = 65.1%, MINC = 66.7% ($P=0.10$), However a significant increase was seen for IR: ES = 34.7% vs MINC = 39.3% ($P=0.04$) and OPR: ES = 31.6% v MINC = 39.3% ($P=0.01$) when comparing the two incubation systems.

CONCLUSION/DISCUSSION:
Time-lapse incubation systems to improve embryo development were introduced on the basis of uninterrupted culture conditions and flexible evaluation times from recorded images. However, few studies have attempted to evaluate the true clinical benefit and cost-effectiveness of TLI systems for subfertile couples. Our primary focus for using TLI was not for the imaging per se, but rather seeking an overall improvement in embryo culture based on the ES being a closed incubation system. However, the findings obtained from the above investigations clearly show comparable results when analysing fertilization, blastocyst development, biochemical, implantation and ongoing pregnancy rates between the ES and MINC benchtop incubators. Unfortunately, in a busy laboratory a large

caseload results in the inability to maintain a stable culture environment within the ES due to the frequent need to open and close the incubation chamber (cases in, cases out, and removal of bubbles from culture microwells). Also, for a large caseload many ES units will be needed to accommodate all dishes over the 6–7 day culture period, representing a very high capital cost in addition to the substantial per patient cost of culture slides. Our experience has shown that the capital and ancillary costs of using the ES, with no significant benefit in outcome compared to the MINCs, means that patients do not benefit from this novel technology. It is vital that the “take-home baby rate” is always the main priority when assessing the clinical success of any new non-invasive technology, and therefore improved implantation and ongoing pregnancy rates should be the main focus for laboratory investigations of such technology.