THE IMPACT OF A NON-INVASIVE ARTIFICIAL INTELLIGENCE (AI) OOCYTE SCORING SYSTEM ON SUBSEQUENT EMBRYO DEVELOPMENT IN GROUP CULTURE

Nesvadbová A (1), Hynečková E (1), Halatová M (1), Hoduláková V (1), Wiemer K (2,3)

(1) IVF Clinic, Olomouc, Czech Republic (2) Future Life, Prague, Czech Republic (3) Global Premier Fertility

Introduction

There is no objective assessment of oocyte quality in practice today despite the critical impact of oocyte morphology on embryo development. Current morphological assessment is highly subjective and does not correlate with reproductive outcomes. At present, there is no way to predict developmental potential of oocytes prior to fertilization. Group culture has shown to have a positive effect on embryo development and has become a standard in many IVF labs [1-4]. Group cultured embryos may engage in paracrine crosstalk, eliciting improved blastocyst yield. Future Fertility Oocyte Software (FFOS) is a non-invasive AI tool that assesses 2-D images of denuded MII oocytes to predict their potential to develop into a blastocyst stage embryo through a Magenta score (scale of 0-10). The AI tool assesses the whole oocyte down to a pixel level, considering granular details the human eye cannot visually process. Previous studies have validated the correlation of a higher Magenta score with a higher chance of blastocyst development [5,6]. In this prospective pilot study, a Magenta score was assigned to oocytes prior to ICSI. Oocytes were cultured post-ICSI in groups based upon score to potentially increase blastocyst development within each group.

Objective

The purpose of this study was to evaluate the impact of assigning a Magenta score to oocytes on blastocyst development in a group culture setting.

In partnership with FutureFertility™

Material and Methods

1,029 mature oocytes from 138 IVF patients undergoing ICSI procedure were included. Immediately prior to ICSI, images of individual mature denuded oocytes were taken and uploaded for analysis by the FFOS to produce a Magenta score. The mature oocytes were then cultured according to their Magenta score in four distinct groups (A: 0-2.5; B: 2.6-5.0; C: 5.1-7.5, and D: 7.6-10); representing oocytes from lowest to highest quality. Blastocyst development was determined according to the Gardner grading system and assessed within each Magenta score group. The blastocyst development rate between sequential Magenta score groups were compared by a Two Proportion Z-test.

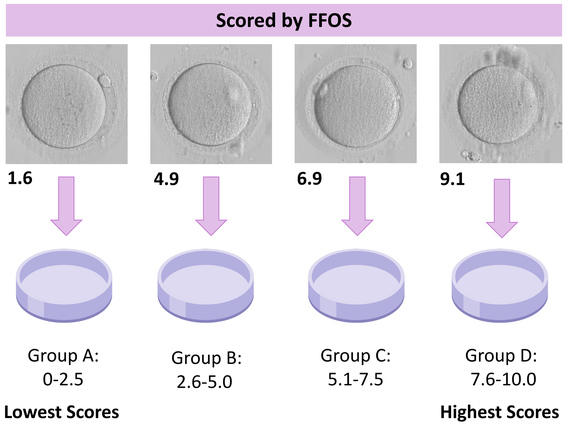


Figure 1. Each oocyte was analyzed by FFOS and assigned a score between 0 and 10.0. Oocytes from a patient's cohort was group cultured by which score range it fell under.

Results

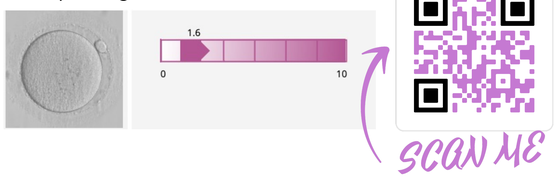
Blastocyst rates increased stepwise from lowest to highest Magenta score group (Table 1 & Figure 1), with significant difference observed between groups A and B ($p< 0.05$) and groups B and C ($p<0.01$). Although blastocyst rates between groups C and D were not significantly different, group D (highest oocyte quality) demonstrated the most efficient rate of blastocyst development. As such, blastocyst development was most greatly impacted by oocyte quality between the lowest and highest groups, A and D ($p<0.001$), respectively.

Table 1. Proportion of blastocysts per Magenta score group.

Magenta Score Range	Group A: 0-2.5	Group B: 2.6-5.0	Group C: 5.1-7.5	Group D: 7.6-10.0
Sample Size (N)	460	298	214	57
Blastocyst Proportion	43%	50%	62%	68%
P-value	Baseline	<0.05[1]	<0.01[2]	0.2361[3] <0.001[4]

Two Proportion Z-test p-value: Group A vs Group B[1], Group B vs Group C[2], Group C vs Group D[3], Group A vs Group D[4]

Example Magenta Score:



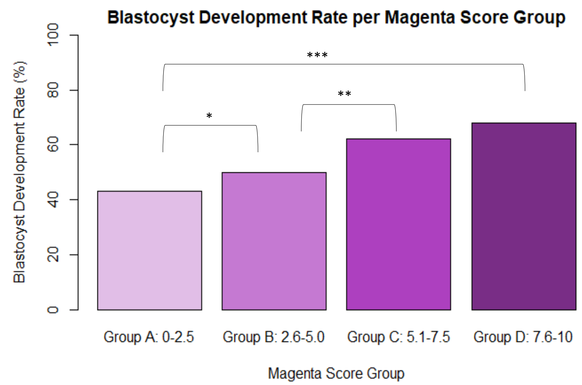


Figure 2. The blastocyst development rates are significantly different between Group A (n=460) and B (n=298) (*$p<0.05$), Group B and C (n=214) (**$p<0.01$), and Group A and D (n=57) (***$p<0.001$).

Conclusions

A real-time AI software image analysis tool, Magenta, can prospectively sort higher quality oocytes from lower quality oocytes. The ability to sort oocytes by quality prior to group culture may allow for increased developmental outcomes, such as greater cumulative blastocyst development or euploidy rates. Oocyte sorting has been shown to be successful and practical in current lab workflows; further studies are required to show clinical improvement in patient outcomes.

Corresponding Author

Klaus Wiemer
Email: kewiemer@outlook.com
Phone: 1-704-9079714