Artificial intelligence-driven prediction of blastocyst development: clinical validation using 12,940 oocyte images

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Study question

Can an artificial intelligence (AI) algorithm predict blastocyst development from a two-dimensional (2D) oocyte image acquired immediately post-ICSI?

Summary answer

The MAGENTA™ algorithm effectively predicted blastocyst development with an AUC of 0.67, performing consistently across all maternal ages and cycle types.

Study design, participants & methods

· **Design:** Retrospective multicenter study

· **Sample size:** 12,940 images MII oocytes from 1,438 patients (1,578 ICSI cycles)

· **Study period:** December 2019 – May 2023

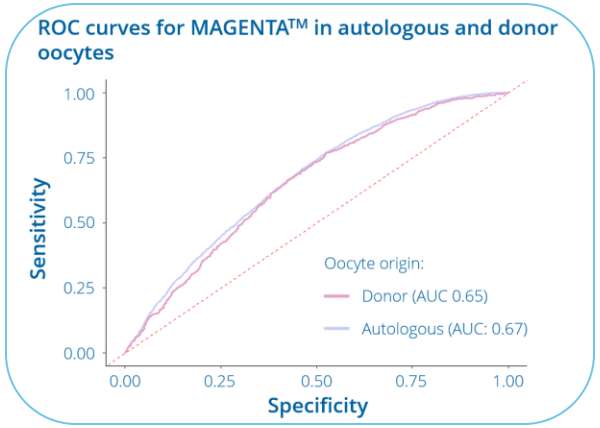
MAGENTA™ assigned a quality score for each oocyte (range: 0-10). ROC curves were generated to determine its predictive capacity of blastocyst development.

Main results

Autologous (n=1,219) and oocyte donation cycles (n=359) presented different maternal age (36.5 ±4.4 vs 26.6 ±4.2 years) **and blastocyst rate** (50% vs 65%)**, respectively.**

Model performance in the total dataset had an AUC=0.67, and it was comparable between autologous and donor oocytes:

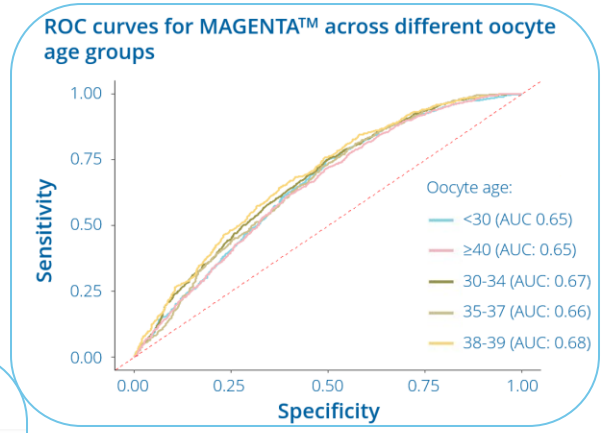
AUC: 0.67 vs 0.65 (p=0.1389, DeLong's test)

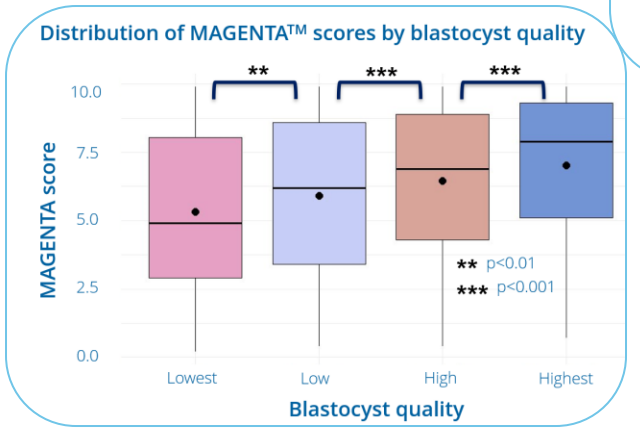


Main results (cont.)

MAGENTA™ maintained its predictive capacity across maternal age groups from <30 to 39 years. AUC range: 0.65-0.68 (p>0.05 for all groups, DeLong's test).

The prediction accuracy was reduced in patients ≥40 years: AUC: 0.65 (p=0.02)





MAGENTA™ scores were strongly correlated with blastocyst ICM and trophectoderm grades (according to Gardner system): 7.0 for AA, 6.4 for AB-BA-BB, 5.9 for grade C, 5.3 for grade D (p<0.01 for all group-to-group comparisons, ANOVA test).

Wider implications for the findings

The MAGENTA™ algorithm provides valuable insights into oocyte developmental outcomes, offering additional information at the time of ICSI insemination (day 0). By enabling earlier blastocyst predictions, this tool may support patient counseling, enhance expectations management, and contribute to more informed decision-making in both autologous and oocyte donation cycles.