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Comparison of Clinical Outcomes Between Biphasic Capacitation In Vitro Maturation (CAPA-IVM) and Conventional In Vitro Maturation (C-IVM)

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### **Study question**

Does biphasic capacitation IVM (CAPA-IVM) of immature oocytes improve clinical outcomes compared to conventional in vitro maturation (C-IVM) in patients undergoing in vitro maturation?

### **Summary answer**

CAPA-IVM demonstrated significantly higher oocyte maturation, fertilization, and clinical pregnancy rates compared to C-IVM, indicating an enhanced developmental competence of immature oocytes.

### **What is known already**

While C-IVM offers advantages of fewer clinic visits and OHSS prevention, its lower pregnancy rates remain a challenge. CAPA-IVM, a novel approach utilizing CNP and estradiol during pre-maturation culture, has shown promising results globally. This system synchronizes nuclear and cytoplasmic maturation, enhancing oocyte developmental competence. Although clinical evidence demonstrates improved pregnancy rates in various countries, this study represents one of the first comprehensive evaluations of CAPA-IVM outcomes in Japan, contributing valuable data to assess its effectiveness in the Japanese population. This technique shows promise as an alternative IVM approach, with ongoing clinical implementation and evaluation at specialized centers worldwide.

### **Study design, size, duration**

This retrospective study compared 39 patients (43 CAPA-IVM cycles, July 2023-November 2024) with 49 patients (54 cIVM cycles, July 2015-September 2023). Inclusion criteria: age <39 years, PCO diagnosis or OHSS risk. Following informed consent, patients underwent either blastocyst-stage (day 5-6) or cleavage-stage (day 2-3) embryo transfer. The study received institutional ethics committee approval.

### **Participants/materials, setting, methods**

This single-center study assessed and compared the number of oocytes retrieved, maturation rate, normal fertilization rate, blastocyst development rate, and clinical pregnancy rate between the CAPA-IVM and C-IVM groups. Additionally, in CAPA-IVM cycles, cumulus-oocyte complexes (COCs) were categorized based on their post-retrieval conditions, and a comparative analysis of their maturation rates was performed.

### **Main results and the role of chance**

Patient characteristics were comparable between the groups (CAPA-IVM: 32.8±3.5 years; C-IVM: 32.3±3.5 years). The mean number of retrieved oocytes was 11.9±7.6 for CAPA-IVM and 12.5±6.4 for C-IVM (P=0.49). The CAPA-IVM demonstrated significantly higher maturation rates (58.4% vs. 48.2%, p<0.05) and normal fertilization rates (73.8% vs. 65.6%, p=0.03) compared to C-IVM. Blastocyst development rates were 41.2% for CAPA-IVM and 36.0% for C-IVM (p=0.62). Clinical pregnancy rates were significantly higher in CAPA-IVM (48.1% vs. 25.0%, p<0.05). There was no difference in clinical pregnancy rates for single blastocyst embryo transfers between CAPA-IVM and C-IVM (52.2% vs. 37.5%). In CAPA-IVM cycles, good-quality COCs had significantly higher maturation rates than poor-quality COCs (63.0% vs. 9.3%, p<0.05). Statistical analysis was performed using t-tests for age and oocyte numbers, and chi-square tests for developmental parameters.

### **Limitations, reasons for caution**

Although the clinical pregnancy rate was significantly higher in the CAPA-IVM group, single blastocyst transfer pregnancy rates did not show a significant difference, potentially due to case number bias. The retrospective, single-center design of the study may introduce selection bias.

### **Wider implications of the findings**

This study demonstrates the potential of CAPA-IVM in enhancing oocyte quality during IVM cycles. The findings emphasize that the quality of COCs is a crucial factor influencing maturation success, highlighting the need for careful management of COC conditions throughout the process to achieve optimal outcomes.

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No conflict of interest

Keywords

CAPA-IVM

biphasic capacitation