Fertilization and development potential of immature oocytes (MI) in hyperstimulated ovarian cycles subjected to intracytoplasmic sperm injection (ICSI).

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OBJECTIVE

To evaluate the fertilization and development potential of immature oocytes (MI) and oocytes with late spontaneous maturation (MI/MII) obtained from controlled hyperstimulated ovarian cycles of patients undergoing intracytoplasmic sperm injection (ICSI).

METHODOLOGY

A retrospective analysis of the embryonic development potential of immature oocytes (MI) and in vitro spontaneously matured oocytes (MI/MII) from fertilization to blastocyst stage was performed in 220 ovarian cycles between June 2022 and June 2023. The meiotic maturation of oocytes was assessed after cumulus removal by observing the presence or absence of the polar body, indicating the oocyte meiotic stage. The classification and separation of oocytes based on their maturity were performed, considering oocytes in metaphase I (MI) as immature ones - those that did not show polar body extrusion. However, during the ICSI procedure, MI oocytes were reanalyzed, and those that spontaneously showed late polar body extrusion were reclassified as MI/MII and all were injected.

Cycles involving oocyte vitrification, ICSI cycles containing only completely mature metaphase II (MII) oocytes, or cycles with immature oocytes in the prophase stage (germinal vesicle - GV) were excluded from the study.

RESULTS

Out of 2,228 oocytes obtained from a total of 220 retrieval cycles, 1,553 were MII oocytes, and 326 were excluded due to incompatible maturation with the study. Among the remaining oocytes, 252 (11.31%) were classified as immature oocytes (MI), and 97 (4.35%) were in vitro spontaneously matured oocytes (MI/MII). The fertilization rate for the total injected MI oocytes was 48.41% (122), and for MI/MII oocytes, it was 26.8% (26). Analyzing the embryonic development, MI oocytes achieved a blastocyst rate of 5.73% (7) with 42.85% (3) viable blastocysts, and the rate for MI/MII oocytes was 50% (13), of which 61.53% (8) completed in vitro development as viable embryos.

CONCLUSION

The study supports the reassessment of oocyte maturation initially considered immature during the ICSI procedure, highlighting the occurrence of this process after retrieval. The relatively low fertilization and blastocyst rates are related to the cytoplasmic immaturity of the oocytes, which may influence embryonic development. Better fertilization rates were observed in oocytes that remained MI until the ICSI procedure, but the best blastocyst rate was seen in oocytes that completed their maturation. Maintaining the ICSI procedure on immature oocytes is important to expand the pool of injectable oocytes available. This approach aims to increase the success chances of the technique, the oocyte's reproductive potential, and provide new perspectives to improve outcomes for patients facing conception challenges, especially those with low ovarian reserve. Further studies and research are needed to understand the underlying mechanisms of oocyte maturation and its effects on fertilization and embryonic development.

Keywords: oocyte maturation, ICSI, immature oocyte, fertilization, embryonic development, late maturation