Pregnancy outcome following in vitro fertilization-embryo transfer according to the percentage of metaphase II oocytes retrieved

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Summary

Purpose: To determine if the presence of a lower percentage of metaphase II eggs during oocyte retrieval leads to a lower fertilization rate of these metaphase II eggs since they may be more likely to be not quite fully mature, and to determine if transfer of embryos made from these eggs leads to lower pregnancy and implantation rates. *Methods:* Fertilization and pregnancy rates determined according to deciles of percent of metaphase II eggs beginning with < 30%. *Results:* Though there was no difference in fertilization rates when comparing those with < 60% metaphase II eggs vs ≥ 60%, there were significantly higher clinical and live delivered pregnancy rates and implantation rates when there were ≥ 60% of the eggs retrieved that were metaphase II. *Conclusions:* An inferior pregnancy outcome with a lower percentage of metaphase II eggs despite similar fertilization rates is consistent with the hypothesis that subtle full maturation defects may result in pregnancy failure despite embryo transfer.

Key words: Metaphase II; Pregnancy rates; In vitro fertilization embryo transfer.

Introduction

One theoretical cause of infertility is the possibility of oocyte retrieval before the final process of maturation has occurred despite the presence of what appears to be metaphase II eggs. The possibility exists that when the total percentage of metaphase II eggs retrieved is lower, then the greater the chances are that the eggs are not fully mature as compared to women with a larger percentage of metaphase II eggs.

During stimulated in vitro fertilization (IVF) cycles, careful monitoring is needed to ensure maximum numbers of mature oocytes at collection. Despite following protocols, variability in number of mature metaphase II oocytes retrieved does occur [1]. Fewer mature oocytes adversely affects pregnancy rates in two ways: 1) there may be fewer embryos formed because of less metaphase II eggs and thus less top embryos to choose from for transfer, and 2) affecting cytoplasmic maturation by not synchronizing with nuclear maturity, compromising those oocytes that have achieved the metaphase II stage [2].

The present study was conducted to determine if there exists a metaphase II egg percentage number which can detect lower pregnancy rates.

Materials and Methods

A retrospective cohort analysis was conducted on all IVF-embryo-transfer cycles where there were at least five eggs retrieved and at least two embryos transferred. Women were all aged ≤ 39. Donor egg recipients and gestational carriers were excluded.

Pregnancy and implantation rates were sorted into deciles of % metaphase II oocytes, beginning with < 30%.

Results

Pregnancy and implantation rates based on percentage of mature eggs retrieved are given in Table 1. The clinical pregnancy rate (ultrasound evidence of pregnancy at 8 weeks) for < 60% metaphase II eggs was 31.8% (77/242) as compared to 46.2% (915/1979) when there was ≥ 60% metaphase II eggs ($p < 0.001$).

The live/delivered pregnancy rate for < 60% was 28.5% (69/242) versus 41.6% (824/1979) for ≥ 60% ($p < 0.001$).

Implantation rates were also significantly lower with lower percentage of metaphase II eggs (16.5%, 119/722 vs 22.9%, 1438/6275) ($p < 0.001$).

Discussion

A lower percentage of mature eggs does not lead to a lower fertilization rate. A lower percentage of mature eggs does adversely affect both pregnancy and implantation rates.

The stimulation protocols were combined in the study. However, when separately examining agonist and antagonist protocols, it was found that only 9% of the agonist cycles produced less than 60% metaphase II oocytes as compared to 14% of the antagonist cycles.

These lower pregnancy and implantation rates are hypothesized to be related to a subtle defect in full maturation of apparent metaphase II eggs that are likely to be present in a higher percentage when the percentage of metaphase II eggs out of the total retrieved is < 60%.

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Table 1. — *Pregnancy outcome according to the percentage of the eggs retrieved that were at the metaphase II stage of meiosis.*

	% Mature eggs retrieved							
	< 30	30-39	40-49	50-59	60-69	70-79	80-89	≥ 90
# transfers ≥ 2ET	19	27	52	144	259	343	576	801
Average age	34.2	34.0	33.4	33.5	33.6	33.4	33.6	33.6
# eggs retrieved	358	426	1257	3273	5900	9280	12058	15751
# M retrieved	53	146	556	1793	3840	6941	10199	15180
% fertilized	63.7	66.3	62.0	60.9	66.3	63.8	63.8	68.6
# clinical preg.	6	13	13	45	115	147	271	382
% clinical preg./trans.	31.6	48.1	25.0	31.3	44.4	42.9	47.0	47.7
# viable	5	11	13	40	101	140	238	345
% viable/trans.	26.3	40.7	25.0	27.8	39.0	40.8	41.3	43.1
Implantation rate (%)	11.3	23.3	12.9	17.1	22.5	20.1	23.5	23.8

ET: embryos transferred; M: mature eggs.

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