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Relationship between the pregnancy and the size of arrested blastomere derived from abnormal cytokinesis in blastocyst transfer cycles.

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Objective: From observation continual morphological changes, about 25% of normally-fertilized ova shows abnormal cytokinesis at 1st mitosis (AC). The abnormal cytokinesis is a marker to be eliminated from transfer due to chromosomal aberration and low developmental competence. However, it has been shown that a few AC embryos develop to morphologically-good blastocysts, showing implantation potential comparable to blastocysts derived from normally-cleaved embryos. Chromosome abnormality of blastocysts derived from AC-embryos is equivalent to that of blastocysts derived from normally-cleaved embryo. Some of infertility couples have only morphologically-good blastocysts developed from AC embryos. There is an urgent task to distinguish embryo with implantation potential from morphologically-good blastocysts which showed abnormal cytokinesis at 1st mitosis.

Design: clinical research

Materials and Methods: Retrospective study of single blastocyst transfer (vitrified-warmed 415 blastocysts) between February 2018 and January 2019 were conducted.

Blastocysts were separated three groups: embryos which underwent normal cytokinesis at both 1st and 2ndmitoses (control, n=262), normal cytokinesis at only 1stmitosis (1N, n=45), and abnormal cytokinesis at 1stmitosis (1A, n=108). Blastocysts developed from AC embryos were classified according to the diameter of arrested blastomere (30 and greater than 30 μm: SAB and over 30 μm: LAB). Morphological changes of embryos has been recorded using a commercial time-lapse incubator (CCM-iBIS, ASTEC). Cleavage patterns and the diameter of arrested blastomeres were determined by time-lapse data analyzing. Blastocyst quality were scored by blastocyst quality

score (BQS) according to the Gardner grading system. Clinical pregnancy and miscarriage rates were compared. Tukey-Kramer, t- and chi-squared tests were used for statistical analysis.

Results: There was no significant deference in pregnancy rates (control: 50.4%, 1N: 57.8%, 1A: 44.4%) after single blastocyst transfer and miscarriage rates (control: 22.7%, 1N: 11.5%, 1A: 22.9%) among 3 groups. The BQS (26) of control blastocysts was significantly higher than 1N (18) and 1A (19, $P<0.05$). Pregnancy rates of SAB in 1N was significantly higher than that of LAB (64.9% vs. 25.0%, $P<0.05$). Pregnancy rates of SAB in 1A was significantly higher than that of LAB (50.0% vs. 12.5%, $P<0.05$). Miscarriage rates of SAB in 1N was significantly lower than that of LAB (4.2% vs. 100%, $P<0.05$). Miscarriage rates of SAB in 1A was significantly lower than that of LAB (19.6% vs. 100%, $P<0.05$).

Conclusions: In blastocysts developed from embryos showing abnormal cytokinesis, the pregnancy rate decreased when the diameter of the arrested fragment-like blastomere was larger than 30 μm at 1st mitosis. In some of embryos which underwent abnormal cytokinesis at1st mitosis, abnormal cytokinesis might be occurred by fragmentation and their chromosomes normally separated. In this case, if embryos lost large volume of cytoplasm as fragmentation, their pregnancy potential would be decreased. Observing the size of arrested blastomere can predict pregnancy non-invasively in the case of morphologically-good blastocyst transfer developed from AC embryos.