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Analysis of the Blastocysts Chromosomal Set Obtained after the Use of Donor Oocyte Cytoplasmic Transfer Technology

Authors : Julia Gontar, Natalia Buderatskaya, Igor Ilyin, Olga Parnitskaya, Sergey Lavrynenko, Eduard Kapustin, Ekaterina Ilyina, Yana Lakhno

Abstract : Introduction: It is well known that oocytes obtained from older reproductive women have accumulated mitochondrial DNA mutations, which negatively affects the morphology of a developing embryo and may lead to the birth of a child with mitochondrial disease. Special techniques have been developed to allow a donor oocyte cytoplasmic transfer with the parents' biological nuclear DNA retention. At the same time, it is important to understand whether the procedure affects the future embryonic chromosome sets as the nuclear DNA is the transfer subject in this new complex procedure. Material and Methods: From July 2015 to July 2016, the investigation was carried out in the Medical Centre IGR. 34 donor oocytes (group A) were used for the manipulation with the aim of donating cytoplasm: 21 oocytes were used for zygotes pronuclear transfer and oocytes 13 – for the spindle transfer. The mean age of the oocyte donors was 28.4±2.9 years. The procedure was performed using Nikon Ti Eclipse inverted microscope equipped with the micromanipulators Narishige system (Japan), Saturn 3 laser console (UK), Oosight imaging systems (USA). For the preimplantation genetic screening (PGS) blastocyst biopsy was performed, trophectoderm samples were diagnosed using fluorescent in situ hybridization on chromosomes 9, 13, 15, 16, 17, 18, 21, 22, X, Y. For comparison of morphological characteristics and euploidy, was chosen a group of embryos (group B) with the amount of 121 blastocysts obtained from 213 oocytes, which were gotten from the donor programs of assisted reproductive technologies (ART). Group B was not subjected to donor oocyte cytoplasmic transfer procedure and studied on the above mentioned chromosomes. Statistical analysis was carried out using the criteria t, x^2 at a significance levels $p<0.05$, $p<0.01$, $p<0.001$. Results: After the donor cytoplasm transfer process the amount of the third day developing embryos was 27 (79.4%). In this stage, the group B consisted of 189 (88.7%) developing embryos, and there was no statistically significant difference (SSD) between the two groups ($p>0.05$). After a comparative analysis of the morphological characteristics of the embryos on the fifth day, we also found no SSD among the studied groups ($p>0.05$): from 34 oocytes exposed to manipulation, 14 (41.2%) blastocysts was obtained, while the group B blastocyst yield was 56.8% (n=121) from 213 oocytes. The following results were obtained after PGS performing: in group A euploidy in studied chromosomes were 28.6%(n=4) blastocysts, whereas in group B this rate was 40.5%(n=49), 28.6%(n=4) and 21.5%(n=26) of mosaic embryos and 42.8%(n=6) and 38.0%(n=46) aneuploid blastocysts respectively were identified. None of these specified parameters had an SSD ($p>0.05$). But attention was drawn by the blastocysts in group A with identified mosaicism, which was chaotic without any cell having euploid chromosomal set, in contrast to the mosaic embryos in group B where identified chaotic mosaicism was only 2.5%(n=3). Conclusions: According to the obtained results, there is no direct procedural effect on the chromosome in embryos obtained following donor oocyte cytoplasmic transfer. Thus, the technology introduction will enhance the infertility treating effectiveness as well as avoiding having a child with mitochondrial disease.

Keywords : donor oocyte cytoplasmic transfer, embryos' chromosome set, oocyte spindle transfer, pronuclear transfer
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