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Non-Invasive Pre-Implantation Genetic Assessment Using NGS in IVF Clinical Routine

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Abstract : Although non-invasive pre-implantation genetic testing for aneuploidy (NIPGT-A) is potentially appropriate to assess chromosomal ploidy of the embryo, practical application of it in a routine IVF center has not been started in the absence of a recommendation. We developed a comprehensive workflow for a clinically applicable strategy for NIPGT-A based on next-generation sequencing (NGS) technology. We performed MALBAC whole genome amplification and NGS on spent blastocyst culture media of Day 3 embryos fertilized with intra-cytoplasmic sperm injection (ICSI). Spent embryonic culture media of morphologically good quality score embryos were enrolled in further analysis with the blank culture media as background control. Chromosomal abnormalities were identified by an optimized bioinformatics pipeline applying a copy number variation (CNV) detecting algorithm. We demonstrate a comprehensive workflow covering both wet- and dry-lab procedures supporting a clinically applicable strategy for NIPGT-A. It can be carried out within 48 h which is critical for the same-cycle blastocyst transfer, but also suitable for “freeze all” and “elective frozen embryo” strategies. The described integrated approach of non-invasive evaluation of embryonic DNA content of the culture media can potentially supplement existing pre-implantation genetic screening methods.

Keywords : next generation sequencing, in vitro fertilization, embryo assessment, non-invasive pre-implantation genetic testing
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