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An equal rate of abnormal mitosis in zygotes with 2 pronuclei occurs for conventional IVF and ICSI

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Background and aims: Using time-lapse cinematography, abnormal mitosis, in which a cell divides into three or more cells, is often observed in morphologically good embryos and causes chromosomal aberrations. In this study, we observed abnormal mitosis in zygotes with 2 and 3 pronuclei (PN) by confocal live cell imaging with fluorescent staining and investigated the incidence of abnormal mitosis by conventional in vitro fertilization (cIVF) and intracytoplasmic sperm injection (ICSI).

Methods: Eighty frozen-thawed pronuclear zygotes intended for disposal were used, after obtaining the informed consent of each patient and ethics committee approval. A mixture of mRNAs encoding EGFP-tubulin and H2B-MRFP1 was injected into the cytoplasm of PN zygotes. These zygotes were cultured in KSOM<sup>AA</sup> medium under 5% O<sub>2</sub>, 5% CO<sub>2</sub>, and 90% N<sub>2</sub> atmospheric conditions, with time-lapse images captured at 15-min intervals for 5 days using a confocal microscope.

Results: All of the 11 zygotes with 3PN derived from cIVF had abnormal mitosis. Abnormal mitosis of 2PN zygotes occurred in 26.9% (7/26) of cases for cIVF and 27.9% (12/43) for ICSI. There was no significant difference between the two fertilization methods for 2PN zygotes. All embryos with abnormal mitosis had multinuclear blastomeres.

Conclusions: Two sperm centrosomes resulted in abnormal mitosis in 3PN zygotes derived from cIVF. The same incidence of abnormal mitosis was observed in 2PN zygotes from cIVF and ICSI. These results suggested that ICSI does not increase the rate of abnormal mitosis due to dysfunction of sperm centrosomes.