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(Title) Patient age-related differences in mitochondrial morphology of human pronuclear stage oocytes

(Authors)

H. Matsumoto¹, S. Hashimoto², M. Yamanaka², S. Mizuno¹, M. Ida³, A. Fukuda³, Y. Morimoto⁴

(Department 1) Division of Reproductive Technology, (Institute 1) IVF Osaka Clinic, (Country 1) Japan, (Department 2) Division of Research, (Institute 2) IVF Namba Clinic, (Country 2) Japan, (Department 3) Division of Doctor, (Institute 3) IVF Osaka Clinic, (Country 3) Japan, (Department 4) Division of Doctor, (Institute 4) IVF Japan, (Country 4) Japan

Objective

Mitochondria are dynamic organelles which produce ATP and their association with age-related deterioration in oocyte quality have been widely discussed. Previous studies demonstrate the shape of mitochondria in preimplantation embryos alters from rounded into elongated as the development proceeds. The purpose of the present study is to investigate if patient age-related differences in mitochondrial morphology of human pronuclear stage oocytes (2PNs) are detectable at the ultrastructural level.

Materials and Methods

A total of 20 donated frozen-thawed 2PNs, 10 from females under 34 years (younger patient group) and 10 from females over 40 years (older patient group), were analyzed by transmission electron microscopy. Morphology of 100 mitochondria from each oocyte was assessed by measuring sectional area, length of a major axis and circularity. Their averages were compared between younger and older patient groups.

Results

Average sectional area, length of major axis and circularity of younger vs. older patient group were $0.151 \pm 0.108 \mu\text{m}^2$ vs. $0.148 \pm 0.125 \mu\text{m}^2$, $0.524 \pm 0.188 \mu\text{m}$ vs. $0.489 \pm 0.207 \mu\text{m}$ ($p < 0.01$), and 0.857 ± 0.091 vs. 0.900 ± 0.089 ($p < 0.01$), respectively.

Conclusion

The major axis of mitochondria in 2PNs from younger females was significantly longer than older females. But, no significant difference was confirmed in sectional area. Mitochondria in 2PNs from older females were circular compared to oval in younger females. The present study may suggest more rounded mitochondria in 2PNs from older females represent a slower morphological change of mitochondria occurred along with the development. Mitochondrial morphometrics could be used for evaluation of embryonic quality.