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[Title]

The autologous mitochondrial transfer into mature oocytes is an attractive option in patients who produce poor quality embryos.

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[Study question]

The aim of this study is to investigate the effect of autologous mitochondrial transfer into mature oocytes on human embryonic development.

[Summary answer]

The present study suggested that autologous mitochondrial transfer into mature oocytes improved embryonic development from the women with previously poor quality eggs.

[What is known already]

It has been shown that mitochondrial function in mature oocytes plays an important role for the development after fertilization in mammals. Autologous germ line mitochondrial transfer into mature oocytes is a method to inject mitochondria retrieved from own egg precursor cells into oocytes. However, there are not enough reports on the effects of this treatment regarding embryonic development.

[Study design, size, duration]

A total of 85 oocytes retrieved from 13 patients (29 cycles) who underwent IVF treatment with mitochondria transfer into mature oocytes were included in the analysis. The study period was between February and November 2016.

[Participants/materials, setting, methods]

All participants had history of failed IVF. Their previous IVF data showed the problems of poor quality in their oocytes and/or embryos. The developmental competences of the Day3 embryos were

compared between the group A (IVF treatment with mitochondria transfer into mature oocytes) and group B (their previous IVF data). Embryos were evaluated as eligible when they reached to at least 5 cells cleavage stage and being grade 1 to 3 on Veeck's classification.

[Main results and the role of chance]

The average age of the patients was  $37.8 \pm 5.4$  years old, ranging from 31 to 46 years old. Seven patients were in the 30s, and 6 patients were in the 40s.

The rate of all eligible embryos was  $64.5 \pm 20.9\%$  in group A and  $42.1 \pm 30.2\%$  in group B, and the difference was significant ( $p < 0.05$ ). The rate of eligible embryos in patients in their thirties was  $66.5 \pm 22.0\%$  in group A and  $31.3 \pm 24.8\%$  in group B, and the difference was significant ( $p < 0.05$ ). However, the rate of eligible embryos in patients in their forties was  $62.2 \pm 21.3\%$  in group A and  $54.8 \pm 33.1\%$  in group B, and the difference was no significant.

[Limitations, reasons for caution]

This is a study with limited number of patients. It possibly includes the difference in the patients' background.

[Wider implications of the findings]

The study indicated that autologous mitochondrial transfer into mature oocytes could be an effective treatment to improve the quality of the embryos derived from the women with poor quality oocytes or embryos in their previous IVF cycles. This treatment would be more effectively indicated for younger age patients.

[Study funding/competing interest(s)]

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[Trial registration number]

None