

Beneficial Effect of Autologous Endometrial Stromal Cell Co-Culture on Day 3 Embryo Quality

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Abstract : One of the factors associated with poor success rates in human in vitro fertilization (IVF) is the suboptimal culture conditions in which fertilization and early embryonic growth occur. Co-culture systems with helper cell lines appear to enhance the in vitro conditions and allow embryos to demonstrate improved in vitro development. The co-culture of human embryos with monolayers of autologous endometrial stromal cell (EnSCs) results in increased blastocyst development with a larger number of blastomeres, lower incidence of fragmentation and higher pregnancy rates in patients with recurrent implantation failure (RIF). The aim of the study was to examine the influence of autologous endometrial stromal cell (EnSC) co-culture on day 3 embryo quality by comparing the morphological status of the embryos from the same patients undergoing consecutive IVF/Intracytoplasmic sperm injection (ICSI) cycles without and with EnSC co-culture. This retrospective randomized study (2015-2017) includes 20 couples and a total of 46 IVF/ICSI cycles. Each patient couple included had at least two IVF/ICSI procedures - one with and one without autologous EnSC co-culture. Embryo quality was assessed at 68 ± 1 hours in culture, according to Istanbul consensus criteria (2010). Day 3 embryos were classified into three groups: good - grade 1; fair - grade 2; poor - grade 3. Embryos from all cycles were divided into two groups (A - co-cultivated; B - not co-cultivated) and analyzed. Second, for each patient couple, embryos from matched IVF/ICSI cycles (with and without co-culture) were analyzed separately. When an analysis of co-cultivated day 3 embryos from all cycles was performed ($n=137$; group A), 43.1% of the embryos were graded as "good", which was not significantly different from the respective embryo quality rate of 42.2% ($p = NS$) in group B ($n=147$) with non-co-cultivated embryos. The proportions of fair and poor quality embryos in group A and group B were similar as well - 11.7% vs 10.2% and 45.2% vs 47.6% ($p=NS$), respectively. Nevertheless, the separate embryo analysis by matched cycles for each couple revealed that in 65% of the cases the proportion of morphologically better embryos was increased in cycles with co-culture in comparison with those without co-culture. A decrease in this proportion after endometrial stromal cell co-cultivation was found in 30% of the cases, whereas no difference was observed in only one couple. The results demonstrated that there is no marked difference in the overall morphological quality between co-cultured and non-co-cultured embryos on day 3. However, in significantly greater percentage of couples the process of autologous EnSC co-culture could increase the proportion of morphologically improved day 3 embryos. By mimicking the in vivo relationship between embryo and maternal environment, co-culture in autologous EnSC system represents a perspective approach to improve the quality of embryos in cases with elevated risk for development of embryos with impaired morphology.

Keywords : autologous endometrial stromal cells, co-culture, day 3 embryo, morphological quality

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