

Shared donor oocyte system to determine if top embryos can be derived from oocyte factors or more likely from an oocyte/sperm interaction

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Summary

Purpose: To determine if top embryos require an unusual, and possibly fortuitous, combination of excellent oocyte quality and sperm, or whether some oocyte property alone leads to the formation of superior quality embryos on day 3.

Methods: The embryo quality of donor oocyte recipient cycles was evaluated to find a woman who made 100% top embryos. After finding such an individual, the quality of the recipient's embryos was also evaluated. The shared donor oocyte recipient cycles were also evaluated for pregnancy outcome.

Results: All 15 embryos were graded top. The six embryos transferred to the donor and recipient resulted in two sets of triplets. One of the fetuses of the recipient aborted related to trisomy 21.

Conclusion: The data indicates that the formation of an extremely high percentage (100%) of top embryos can be related to an oocyte factor. It is extremely unlikely to find two male partners who produce sperm with a unique property that makes superior morphologic embryos implant.

Key words: Shared oocytes; Donor recipient; Embryo quality; Pregnancy outcome.

Introduction

It is unusual to find a woman who produces all her embryos with very little (< 10%) fragmentation and has at least six blastomeres per embryo (top embryos) when evaluated on day 3. Data from the sharing of donated oocytes can provide insight into the etiologic factors that are associated with infertility [1]. These data demonstrate that sperm can be the etiological reason for the consistently poor quality of embryos [2]. The question thus arises as to what is responsible for those women who make a higher percentage of embryos with excellent quality (top embryos) as determined by six to eight blastomeres on day 3 with no fragmentation. It is possible that since sperm can cause highly fragmented embryos, it may also be responsible for the high percentage rate of top embryos. However, the possibility exists that the oocyte factor is etiologic in forming top embryos or that some combination of male and female factors are needed. It is speculated that the shared oocyte system may provide insight into the etiology of how some women can make consistently top embryos.

Materials and Methods

The embryo quality was evaluated in donor oocyte recipient cycles to find a couple who made 100% top embryos and a minimum of at least ten formed embryos. A top embryo was defined as having a minimum of six blastomeres on day 3 with

no fragmentation. The embryo quality was then evaluated in the woman receiving the other half of the oocytes. The pregnancy outcome following embryo transfer (ET) was then evaluated.

Results

An infertile donor aged 35 was found where all seven embryos formed were top embryos. The oocyte recipient had eight embryos, all of which were graded as top embryos. The oocyte donor transferred three 8-cell embryos and conceived and delivered triplets. The recipient transferred three embryos, one 9-cell and two 8-cell, and also conceived triplets which were viable at eight weeks. However, the recipient lost one of the three fetuses but still successfully delivered twins. A chromosomal analysis was performed on the aborted fetus, which showed trisomy 21. The donor cryopreserved four embryos (8, 8, 7, and 6-cells). The recipient cryopreserved one 9-cell and four 8-cell embryos. There was no evidence of fragmentation in any of the embryos prior to cryopreservation.

Discussion

The fact that both the donor and the recipient had 100% of their embryos labeled top and that six of six embryos transferred implanted, suggests that an oocyte factor alone may be responsible for a much larger percentage than normal of high quality embryos since two different semen specimens were used to fertilize the eggs. Some studies have suggested that there is a loose association

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between embryo quality and normal chromosomal constitution, but the genome is generally determined after the 8-cell stage and is not maternally oocyte driven. This is consistent with the miscarriage of the fetus with trisomy 21 that was considered a top embryo. Further research will be conducted to look for circumstances where at least one couple, sharing a pool of oocytes, produces all top embryos to see if during the majority of other times the other couple will also produce top embryos. There are some data suggesting that there may be a cytoplasmic factor which may be genetically provided that favors producing embryos much more likely to implant and may be responsible for some women not only conceiving extremely easily and resulting in a large number of children, but a factor that allows successful pregnancies even in women > 45 years of age [3].

References

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