

CASE REPORT

Oocyte exhibiting dark centrally located granular cytoplasm and its association to embryo development and pregnancy outcome

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Abstract

Objective

To report a rare case of centrally located granulated cytoplasm (CLGC) in oocytes and its effect on embryo development and pregnancy.

Case Description

A couple presented for assisted reproduction treatment at our fertility unit. 24 oocytes were collected. Ten oocytes were selected for intracytoplasmic sperm injection (ICSI) while the remaining 14 oocytes of which 6 were immature were inseminated by conventional in vitro fertilization (cIVF). All 10 ICSI denuded-oocytes and 14 cIVF oocytes showed the presence of dark and severely granulated cytoplasm at the center of oocyte. Fertilized oocytes cleaved and developed to good quality embryos (grade A and B). Two day 3 embryos were ET-ed. Remaining 8 embryos were vitrified-stored on day 4 while the remaining 4 leftover embryos of lower quality developed to blastocysts on Day 7 but were of poor quality (Grade D). The patient became pregnant with a twin pregnancy from both the grade A embryos transferred on Day 3, and proceeded to normal term delivery with birth of a boy and a girl.

Discussion

The present findings suggest the presence of CLGC is not necessarily an evidence of abnormality. The authors concede conclusions cannot be made on the basis of a case study. The type of granulation had no effect on fertilization rate and embryo development up to the blastocyst stage. The authors speculate that these granulations may be beneficial. A larger compilation of data from previous studies from different centers would demonstrate the actual potential of oocytes with CLGC.

Conclusion

The present findings suggest the dark, large, granular and centrally localized cytoplasm is not necessarily an evidence of poor quality or abnormality. It is speculated the granulations may be indicative of good rather than poor quality. This assumption was due to the ubiquitous presence of oocyte granulation but this remains to be proven.

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Introduction

It is well recognized oocyte quality is a useful predictor and prognostic factor of its viability. Consequently, the assessment of oocyte morphology and selection of apparently normal oocytes for ICSI insemination is critical for the generation of embryos with the potential for

implantation, healthy pregnancy and delivery (Serhal et al., 1997; Ebner et al., 2008a,b).

About 60 to 70% of denuded oocytes exhibit abnormal morphology (Veeck, 1998). In general most oocytes exhibit granulation with about 50%

(Fancovits et al., 2012) to 62% (Rienzi et al., 2008) of oocytes supposedly has abnormal cytoplasmic texture. In fact, Fancovits et al., (Fancovits et al., 2012) noted only 5% of oocytes were devoid of cytoplasmic granules which suggests the presence of cytoplasmic granules is ubiquitous, which raises the question whether a common feature present in almost all oocytes be considered abnormal? Centrally located granulation was reported earlier in 1997 and is often characterized by a dark central granulation with a clear border within the oocyte (Serhal et al., 1997). Oocyte cytoplasmic granulation may be homogenously spread or centrally localized in the oocyte. If centrally localized, they present as large, dark mass with a spongy texture (Kahraman, 2000). Centrally located granular cytoplasm is a rare occurrence.

Case Report

A couple presented for assisted reproduction treatment at the University of Malaya Medical Center (UMMC) Fertility Unit. 24 oocytes were collected. 10 oocytes with good and healthy cumulus were selected for intracytoplasmic sperm injection (ICSI) while the remaining 14 oocytes of which 6 were immature were inseminated by conventional in vitro fertilization (cIVF). All 10 ICSI denuded-oocytes showed the presence of dark and severely granulated cytoplasm at the center of oocyte.

Results

At fertilization check, the granular cytoplasm of all ICSI-ed oocytes was still present and appeared to mask the presence of 2 pronuclei (2PN). All 14 oocytes subjected to cIVF also showed identical features after denuding. In total, all useable oocytes (16/16) fertilized, excluding 2 post-mature (denuded for ICSI) and 6 immature oocytes. All fertilized oocytes cleaved and developed to good quality embryos (grade A and B). 2 Day 3 embryos were ET-ed. Remaining 8 embryos that developed to compacted morulae stage on Day 4 were frozen-stored while the remaining 4 leftover embryos of lower quality developed to blastocysts on Day 7 but were of poor quality (Grade D) which were not frozen. The patient became pregnant with a twin pregnancy from the 2 grade A embryos transferred on Day 3.

The pregnancy proceeded to normal term delivery with birth of a boy and a girl.

Discussion

The present findings suggest that the dark, large, granular and centrally localised cytoplasm is not necessarily an evidence of poor quality or abnormality. According to two groups of workers (Serhal et al., 1997; Kahraman et al., 2000), patients whose eggs exhibit centrally located granular cytoplasm were considered abnormal. In their study they noted normal fertilization and development in oocytes with centrally located however the pregnancy rate was poor.

Indeed, Kahraman et al. suggested that patients should be informed of poor ongoing pregnancy rates in spite of good fertilization and embryo development (Kahrman et al., 2000) if the oocytes had centrally located granulation. The latter compared the fertilization rate, embryo quality and pregnancy rate between oocytes with or without granulation, there were no significant differences but the implantation rate were lower in granular cytoplasm oocytes.

The factors involved in cytoplasmic granulation are not known and are poorly understood (Rosario et al., 2016). Fancovits et al. (2012) reported that occurrence of cytoplasmic granularity was influenced by the patient's age and may be dependent on type of ovarian stimulation. The type of granulation had no effect on fertilisation rate and zygote morphology but some type of granulation resulted in a lower cleavage rate and more fragmented embryos. In the present case study, contrary to previous cautionary report (Kahraman et al., 2000) and due to a large measure, the ubiquitous presence of oocyte granular cytoplasm, we are tempted to speculate that these granulations may well be beneficial, instead of harmful, to the oocyte, and its subsequent embryo development.

We question whether the centrally located granular cytoplasm is a probable indication of abundant ribosomes in the endoplasmic reticulum resulting in a darker central cytoplasm suggesting higher protein synthesis? If so this may be associated with good embryo development, quality and viability. However the authors concede conclusions cannot be made

on the basis of a case study. A larger combined compilation of data from previous studies from different centers would demonstrate the actual potential of oocytes with CLGC.

Conclusion

The present findings suggest that the dark, large, granular and centrally localized cytoplasm is not necessarily an evidence of poor quality or abnormality. It is speculated the granulations may be indicative of good rather than poor quality. This assumption was due to the ubiquitous presence of oocyte granulation but this remains to be proven.

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