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Towards a better understanding: How PCOS affects early human embryonic development and IVF outcomes

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Polycystic Ovary Syndrome (PCOS) has a high prevalence worldwide with an increased risk of reproductive, metabolic, and psychological features. It is characterized by a clustering of hyperandrogenism, hyperinsulinemia, hypersecretion of LH, menstrual dysfunction, hirsutism, infertility and pregnancy and neonatal complications including ectopic pregnancy and early pregnancy loss (EPL) which have been estimated to be greater than women of similar demographics. According to the Rotterdam Consensus Criteria (ASRM/ESHRE Consensus Working Group on PCOS, 2004), the diagnosis of PCOS was based on the presence of at least two of three following criteria: oligomenorrhoea/ amenorrhoea, hyperandrogenaemia and/ or hyperandrogenism and polycystic ovaries. Due to the polycystic nature of the ovaries in women with PCOS, they are at moderate risk of ovarian hyperstimulation syndrome (OHSS). Reported OHSS rates in the literature for women with PCOS who conceive after IVF are up to 7.5% compared to women without PCOS being in the order of 2.7%. Despite the increased oocytes retrieved during an IVF cycle, the oocytes are often of a poorer quality, and these cycles are characterized by lower fertilization, cleavage and implantation rates and a higher miscarriage rate and incidence of embryo transfer cancellations due to failed fertilization or OHSS. However, live birth rates per cycle are similar to women with normal ovaries. It was postulated that alteration of many extra and intra-ovarian factors may directly or indirectly impair the competence of maturing oocytes through endocrine and local paracrine/autocrine actions, resulting in a lower pregnancy rate in patients with PCOS. The extra-ovarian factors identified included gonadotrophins, hyperandrogenemia and hyperinsulinemia, although intra-ovarian factors included members of the epidermal, fibroblast, insulin-like and neurotrophin families of growth factors, as well as the cytokines. These abnormalities either have a direct influence on GC–oocyte interactions and oocyte meiotic maturation, fertilization, embryonic development and pregnancy, or the influences are through circulating endocrine and local paracrine/autocrine mechanisms, which requires further clarification. Mature oocytes from PCOS patients may have an altered gene expression profile, especially for genes involved in chromosome alignment and segregation during meiosis and mitosis, cell-cycle checkpoints, genes containing putative androgen receptor binding sites (Wood et al., 2007) and genes of primary follicle recruitment (Teixeira Filho et al., 2002; Wei et al., 2011), indicating abnormal follicle recruitment, oocyte maturation and potentially impaired development for a large proportion of PCOS oocytes. Despite this, a meta-analysis (Heijnen et al., 2006) found that PCOS patients had the same pregnancy rate as other patients undergoing IVF, indicating that PCOS patients can produce competent oocytes. Regarding kinetics and embryonic development patterns, Wissing et al, 2014 found a significant delay in time of some cellular events in embryos from hyperandrogenic PCOS women compared with embryos from healthy, regularly cycling women which collectively indicates that these embryos had developed slower from fertilization to the 8-cell stage with higher proportion of multi-nucleated cells at the 2-cell. The clinical impact of the embryo delay was unknown. However, the live birth rates were comparable between the PCOS and non-PCOS patients.

Treatment and possible alternatives: Systematic screening for key intra-ovarian factors which are related to PCOS (such as AMH, Hcy, growth factors and cytokines) together with proper treatment for each PCOS phenotype are essential issues in achieving success for PCOS patients undergoing assisted reproduction, to effectively improve oocyte maturation and developmental competence. It has been shown that treatment with the insulin sensitizer metformin, a synthetically derived biguanide, which leads to a reduction in serum insulin concentrations, may improve the features of PCOS. Many studies, including our unpublished data, concluded that In Vitro maturation (IVM) and freeze all policy are of a great benefit for patients with PCOS undergoing assisted reproductive technology treatment to achieve best success results and to avoid ovarian hyperstimulation syndrome (OHSS).

Biography

An honest, ethical and diligent individual, committed to producing timely, cost effective and outstanding results. Seventeen years work experience in the field of Assisted Reproductive Technologies with success in managing all aspects of that specialized type of work. Now seeking a substantial and challenging work and research position where my entrepreneurial abilities will assist in the successful and profitable development of the work. Faculty of science – cairo university – Egypt, he registered for doctor of Philosophy degree (PhD) – Embryology and Comparative Anatomy – 2017 and many more.

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