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Study shows new PGS method can predict chromosomal abnormalities

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Scientists at the University of Bonn and at the SISMER centre in Bologna used a new micro-array technology that screens all chromosomes in one cell within 12 hours, allowing for fresh transfer of the egg into the female patient. They could identify the chromosomal status of the eggs in 89 % of all polar bodies analysed, Prof. Joep Geraedts told the 26th Annual Meeting of the European Society of Human Reproduction and Embryology today.

The researchers biopsied both polar bodies from a total of 226 zygotes (fertilised eggs) from 42 cycles in 41 couples with an average maternal age of 40 years. In 19 cycles all zygotes were aneuploid (having a chromosome number that is not an exact multiple of the haploid number), leading to a transfer of only 37 embryos in 23 cycles. 10 of these embryos implanted and resulted in 8 clinical pregnancy - a 27 % implantation rate per embryo transfer. Of the 177 analysed eggs, 34 were euploid and 122 aneuploid.

The results showed that in 140 combinations of polar bodies and eggs that were analysed 125 (89 %) polar body analyses confirmed the chromosomal status of the eggs and 15 (11 %) did not.

Numerical chromosomal abnormalities are presumed to be a major factor in causing low pregnancy rates in assisted reproduction. Different studies have shown that PGS, as it is currently practiced, does not improve live birth rates in patients of advanced maternal age, with recurrent implantation failure or repeated pregnancy loss and may even

be harmful.

In both centres all eggs from patients that were obtained after ovarian hyperstimulation, egg retrieval and fertilisation were biopsied for polar bodies 1 and 2. In those cases were aneuploidy (a type of chromosomal abnormality) was predicted, the egg was studied as well to confirm the findings. The Centre for Reproductive Medicine in Amsterdam analysed all data and provided the final results.

The analysis of polar body 1 already detected 72 % of all aneuploid eggs, but adding the analysis of the second polar body significantly improved the detection rate up to 89 %. "With chromosome errors being the predominant cause of non-viability of the embryo, we hope this approach will in future effectively improve results in assisted reproduction," said Professor Geraedts, past ESHRE chairman and coordinator of the PGS Task Force

24sure, the novel molecular technique developed by BlueGnome, is based on DNA amplification and microarray technology and is far more powerful that the method of fluorescent in situ hybridisation (FISH), which has been used so far. The downside of using FISH is that it is applied at the blastomere stage, which does not represent the rest of the embryo and is susceptible to chromosomal mosaicism in embryos during cell division, which can lead to the transfer of abnormal embryos.

"The pilot study was aimed at answering one of the most pressing questions in assisted reproduction: how can we improve the success rate of IVF treatments in women of advanced maternal age? We set out to answer the outstanding questions about PGS once and for all," said Professor Geraedts.

Overall polar body analysis offers many advantages. Apart from having more time to study the chromosomes, it is less manually intensive and

the results are clearer to interpret than in FISH. If the analysis is finished before the gametes can fuse, this method would also be allowed in countries with restricted laws such as Germany where the embryo is protected.

The Task Force aims to move the study from the pilot phase into the clinical validation phase in form of a randomised control trial using a much larger sample over the course of three years in six different countries, starting at the end of 2010 or early 2011. "Instead of obtaining an answer to the question 'what is the chance for an abnormal pregnancy', the question will change to 'what is the chance for a pregnancy," concluded Professor Geraedts.

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