**USE OF COMPREHENSIVE CHROMOSOMAL SCREENING FOR EMBRYO ASSESSMENT**

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Chromosome abnormalities are common among human oocytes and embryos and increase in incidence with advancing maternal age. By the age of 40, it is typical for more than half of the oocytes produced to be aneuploid. The high frequency of lethal chromosome abnormalities may explain why so many embryos transferred during IVF treatments fail to produce a child. Preimplantation genetic screening (PGS) has been proposed as a means of identifying chromosomally normal embryos for uterine transfer, with the hope of improving pregnancy rates. Until recently, most PGS strategies involved biopsy of blastomeres at the cleavage stage followed by a limited chromosomal assessment using fluorescent in situ hybridization (FISH). However, several studies have cast doubt on the efficacy of this approach.

This lecture will describe current strategies for preimplantation genetic screening, focusing on comprehensive analysis of all 23 pairs of chromosomes in trophectoderm cells biopsied from blastocysts (day-5/-6). We have already assessed a total of 1276 blastocysts derived from 195 patients using comparative genomic hybridization (CGH) or microarray-CGH (aCGH). The patients were of advanced maternal age (mean 38.2 years) and had an average of 2.0 previous unsuccessful IVF attempts. 65.5% of blastocysts were found to be aneuploid. Follow-up through to birth is now available for the first 93 patients. Seventy three patients became pregnant (78.5% per cycle; 88.0% per transfer). There were 3 biochemical pregnancies, 3 miscarriages and 2 ectopic pregnancies, ultimately leading to a birth rate per cycle of 69.9% (78.3% per transfer). The implantation rate was 75.0% per embryo.

The outcomes recorded during this study were excellent, especially considering the age and previous reproductive history of the patients involved. Although not randomised, a very well matched contemporary control group was available and displayed significantly lower implantation and birth rates (36% and 60% respectively). We conclude that the strategy described is a promising approach for selecting viable embryos for transfer during IVF cycles. Given the high implantation rates achieved, this method may be particularly valuable in elective single embryo transfer cycles. Recent follow-up data, during which embryos initially diagnosed with aCGH have been retested, have also produced encouraging data, indicating accuracy rates >95% regardless of the embryonic stage tested.

This lecture will also describe our experience with the application of CGH and microarray-CGH to cleavage stage (blastomere) biopsies and polar body biopsies. There has been particular interest in the use of polar body (PB) analysis to select viable oocytes. Microarray CGH applied to PBs has been the subject of a recent ESHRE sponsored technical study, looking into the validity of PB-based aneuploidy screening. Data from that study indicates a high degree of accuracy. Clinical data from the UK also provides support for this approach, revealing an increased pregnancy rate in patients of poor prognosis. The relative merits of screening at different preimplantation stages will be discussed during the course of the lecture.