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Embryo biopsy: cleavage or blastocyst stage? Comparison of ploidy rates and clinical outcomes

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INTRODUCTION:
Conceptually, screening preimplantation embryos for chromosomal abnormalities and replacing only those found to be euploid should result in improved clinical outcomes and healthy births compared to the transfer of non-genetically-selected embryos.

AIM:
To investigate whether extended culture to the blastocyst stage, trophectoderm biopsy, and the transfer of cryopreserved (vitrified) euploid embryos was a more efficient preimplantation genetic screening (PGS) strategy than Day 3 blastomere biopsy with fresh Day 5 embryo transfer.

MATERIALS AND METHODS:
Data were collected retrospectively for infertile patients enrolled at our Centre for PGS treatment between August 2013 and April 2015 (female age 37.0 ± 4.0 years). Cycles were divided into two groups: Day 3 cleavage stage embryos undergoing single blastomere biopsy with euploid blastocysts transferred fresh on Day 5 ("BB", n=72), and blastocyst stage embryos that underwent trophectoderm biopsy of 3–8 cells and vitrification on Days 5/6 with euploid blastocysts being transferred in a subsequent medicated cycle ("TB", n=84). All embryos were zona-drilled for biopsy using a Saturn 5 Active laser system (Research Instruments, Falmouth, UK), and biopsied samples were amplified at Genesis Genetics South Africa (Sandton, Gauteng) using the 24Sure array v3 platform (BlueGnome, Cambridge, UK). Differences in ploidy rates and clinical outcomes between the two groups were analysed using MedCalc software (www.medcalc.be).

RESULTS:
Blastocysts had a significantly higher chance of being euploid than cleavage stage embryos: 39.6% (110/278) v 18.4% (68/370; $P<0.0001$), with significantly more overall aneuploidy seen in blastomere biopsies compared to trophectoderm biopsies (72.4% v 47.5%; $P<0.0001$). The implantation rate (IR) for euploid blastocysts transferred post-vitrification was 4% above that of the fresh transfer blastocysts (35% n=56 v 31% n=37; $P=0.76$) with Day 5 blastocysts having a higher IR than Day 6 embryos (37.3% v 23.1%; $P=0.53$). Although the ongoing pregnancy rate (OPR) in the TB group was slightly lower than in the BB group (39.3% v 43.2%; $P=0.87$), only half as many embryos were transferred in the TB group (1±0.5 v 2±0.6; $P<0.0001$). As early trophectoderm biopsy experience increased, trends for improved outcomes were seen (IR 31% => 48%; pregnancy rate 44% => 63%), but these were non-significant due to low case numbers.

CONCLUSION/DISCUSSION:
While there appeared to be a learning curve changing from blastomere to trophectoderm biopsy, culturing to the blastocyst stage increased the proportion of euploid embryos. Vitrification did not adversely affect embryo potential, and together these technologies provided improved clinical outcomes for PGS patients, including the routine use of single embryo transfer for vitrified biopsied blastocysts without compromising the ongoing pregnancy rate.