Should You Test Embryos Created after IVF for Chromosomal Abnormalities?

Many of the embryos created after IVF carry abnormal chromosomes. Normal embryo cells carry 46 chromosomes. The most common abnormalities are extra chromosome e.g. +21 (47 chromosomes) or missing a chromosome e.g. -X (45 chromosomes). By far, abnormalities in the egg is the source of abnormal chromosome number.

PGD: Testing of embryo chromosomes

Finding a ‘normal’ embryo is clearly advantages as it will theoretically lead to 1. The transfer of a single embryo instead of many embryos and 2. can produce higher pregnancy rate than an embryo selected based on morphology (looks)
The process of embryo testing for the purpose of improving pregnancy rate is, however, not simple in relation to the accuracy of testing and many other issues.

Preimplantation genetic screening for chromosomal abnormalities (PGS)

PGS requires two steps: 1. Biopsy: obtaining a cell or a group of cells from the embryo and 2. genetic testing of the cells for chromosomes ideally in 1-2 days to obtain results and allow fresh transfer.

Biopsy
blastocyst

Obtained by removing a. a single cell of a day 3 embryo or  b. group of cells from the trophoectoderm (the outer part of the embryo that makes the placenta) of a day 5 embryo (blastocyst). Removal of cells nowadays uses a laser beam. Cells are fixed on a glass slide and sent for analysis.

Genetic Analysis of Embryos

In the past old technologies (FISH) was limited in its ability to test all chromosomes. Multiple studies in the past few years proved that PGD using FISH actually reduce the chance for pregnancy in many IVF populations and should not be used. Two newer technologies can test all the chromosomes in an embryo: cGH (comparative genomic hybridization) array and SNP (single nucleotide polymorphism) array. Some of these methods can report the results in 3 days allowing for delayed fresh transfer (day 6) and others require about a month for accurate testing, necessitating embryo freezing and transfer in frozen-thaw cycle. Labs offering these methods claim accuracy of 95 to 97%. There are more advanced methods e.g genome screening, that can test embryo chromosomes in as short as 6 hours. The ultimate method for testing is still evolving.

Should women test their embryos before transfer to the uterus?

My short answer is no, not routinely. The pros of testing embryos could be transferring less embryos , improving IVF outcomes (pregnancy rates) and avoiding pregnancy with a baby carrying chromosomnal abnormalities. The cons are these aims are still not proven facts due to

1. The biopsy may hurt the embryo, reducing its ability to implant

2. The assumption that one cell represent the whole embryo may
not be true (mosiacism); the cell may be abnormal while the rest of embryo is normal or vice versa

3. The methods of testing was not validated by independent large studies from multiple centers and maybe less accurate than claimed

4. Delay in transferring the embryo in the fresh cycle may reduce its implantation potential

5. Cost associated with biopsy and testing the embryo is approximately $5500 to $8000

6. Testing of an embryo will not improve the ‘pregnancy’ potential of that embryo. It will just tell you if the embryo is ‘normal’ or not. The potential from all the embryos obtained from IVF after an egg retrieval is not changed by testing. Assuming a very accurate test and an excellent freezing program, tested embryo transfer should yield similar outcome as transferring untested embryo(s) in multiple cycles. That is the most important point to consider. If you are willing to be patient and transfer one or few embryos resulting from one ovarian stimulation successively in the fresh cycle then frozen cycles, the cumulative pregnancy and delivery rate should be the same at the end. For example in young women transferring one embryo, approximately 30-40% of them will just achieve pregnancy in the fresh cycle. In the first frozen-thaw transfer another 30% or so will get pregnant. Frozen cycles are not as demanding as fresh IVF. Many women can have the embryo transferred in a natural cycle with no medications and minimal monitoring.

Embryo testing may help younger women, producing a large number of embryos and want to transfer only one. An alternative approach is to transfer one embryo at a time as their pregnancy rate is high even with a single untested embryo.

Testing of embryos from older women (40 or older) producing
few embryos (<6) is of little value as the alternative is to transfer 5 or so untested embryos in that age group because of the very high rate of chromosomal abnormalities in the embryos.

Testing may be helpful for older women (40 or older) producing a very large number of embryos (e.g. >10 embryos) to eliminate the need for multiple transfers to get to the healthy embryo. This category (older women and very large number of eggs / embryos) is rare in IVF population.

Women contemplating testing of their embryos after IVF should consider many issues including age, number of embryos, history of unsuccessful fertility treatment if any, cost and sometimes tolerance for multiple pregnancy and fetal reduction. Moreover women should consider all these factors and be ready to modify their decision during the cycle depending on the number of available embryos.

All this does not apply to women testing the embryos for chromosome translocation, a specific genetic disease or sex.