Impact of Microfluidic Sperm Sorting on Embryo Quality and Comprehensive Chromosome Screening Outcomes of Couples with Repeated Implantation Failure

Emre Pabuccu [1], Recai Pabuccu [1,2], Semra Sertyel [2], Dogus Demirkıran [2], Huseyin Gunes [2], Sadik Dogan [2], A. Hakan Haliloglu [3], Ozgur Sahin [1]

1: Ufuk University School of Medicine, Dept. of Obstetrics and Gynecology, Ankara-Turkey
2: Centrum Clinic ART Center, Ankara-Turkey
3: Ufuk University School of Medicine, Dept. of Urology, Ankara-Turkey

What is the impact of the microfluidic sperm selection technique for IVF/ICSI on embryo quality and euploidy rates in couples with Repeated Implantation Failure (RIF)?

When microfluid chip-sorted spermatozoa is used for IVF/ICSI, a higher number of top quality blastocysts and better euploidy rates were observed compared to standard selection.

Study design, size, duration:

This was a retrospective analysis performed at the Centrum Clinic IVF Center located in Ankara, Turkey between 2016 and 2017. In total, data from 171 patients were obtained for the analysis that accounts for 491 embryos. In group 1 (STANDARD), a total of 127 cycles and 366 embryos, in group 2 (CHIP) 44 cycles and 125 embryos were evaluated in terms of embryology data and euploidy rates.

Participants/materials, setting, methods:

Only patients with complete patient records on clinical, IVF/ICSI cycle characteristics, and PGS (Next Generation Sequencing) analysis could be included in the retrospective analysis. Main indication for PGS was RIF history of couples. Women with age > 43, BMI > 35, with documented uterine abnormalities, trombophilia and azoospermic males were excluded. In CHIP group, microfluid sorted spermatozoas were obtained for IVF/ICSI. On the day of biopsy, 5–10 trophectoderm cells were sent to the laboratory.

	STANDARD (N=127 cycles, 366 embryos)	CHIP (N=44 cycles, 125 embryos)	p value
female age (years)	37.3±4.8	37.4±4.9	NS
AMH (ng/ml)	1.69±1.4	1.8±1.6	NS
FSH (mIU/mL)	8.8±4	7.8±2	NS
TSH (IU/mL)	2.06±0.9	2.1±1.2	NS
sperm concentration (mil./ml)	22 (1-130)	29 (1-120)	0.03
total motility (A+B+C) %	46.8±19	48.5±17	NS
DFI % (TUNNEL Assay)	23.5±14	17.1±7.9	NS
total duration (days)	11.2±2	11.3±1	NS
M2 oocytes (n)	4±2.7	5.4±6.5	NS
2PN (n)	3.7±2.6	4.3±3.5	NS
No of cleavage embryos	3.6±2.4	4.1±3.1	NS
No of blastocysts	3.0±2.1	3.5±2.7	NS
No of top quality blastocysts (5AA, 5AB, 5BA, 4AA)	0.8±1.4	1.6±2.7	0.04
Euploid blastocyt %	7	23	<0.001
mosaic embryos %	2.7	4	NS
cost USD (excluding IVF/ICSI, including PGS and/or chip-sorting)	864.5±557	1436±645	<0.001

According to the univariate linear regression analysis;

-female age (β: 0.09, p=0.24), sperm concentration (β: 0.09, p=0.23), collected oocytes (β: 0.2, p=0.008), top quality blastocyst formation (β: 0.2, p=0.001), microfluidic chip sorting (β: 0.35, p<0.001) were found to influence (p<0.25) embryo euplodiy (%, dependent variable).

Limitations, reasons for caution:

Major limitations are retrospective design, limited patient number, lack of DFI data following chip sorting and pregnancy outcomes of the groups. Chip-sorting is not a routine in our center and offered to those with RIF history only, because it comes with a significant cost. Moreover, literature data is very limited.

Wider implications of the findings:

Successful euploid-blastocyst formation is the consequence of a perfect fertilization and mitosis. When comparable women age and number of oocytes are considered, chip sorted spermatozoas may influence results in terms of better blastocyst formation and euploidy when DFI is relatively high (>15% in both groups). Cost should be considered.