PREIMPLANTATION GENETIC SCREENING MARKEDLY IMPROVES LIVE BIRTH RATES AND LOWERS MISCARRIAGE AND TWIN RATES FOR ALL AGE GROUPS UNDERGOING FROZEN EMBRYO TRANSFER

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Background:

Preimplantation genetic testing for aneuploidy (PGTa), utilizing Next Generation Sequencing, improves reproductive outcomes by selecting for euploid embryos, deemed “euploid” or “mosaic”. Numerous studies have concluded that PGTa with frozen embryo transfer (FET) of euploid embryos, enhances live birth rate (LBR) and reduces the miscarriage rate (MR) and twin rate (TR) among patients >35. The benefits are less certain for patients <35, while the utilization of “mosaic” embryos presents a novel area of study.

Objective:

To evaluate the impact of PGTa on reproductive outcomes by age group and by euploid versus mosaic assignment. We aim to assess whether PGTa increases LBR and lowers MR and TR in FET cycles. Additionally, we will compare these outcomes for untested, mosaic, and euploid embryos.

Materials and Methods:

This single-institution study included all embryos from FET cycles transferred between 03/2015 and 11/2023. No cycles were excluded. No aneuploid embryos were transferred. We assessed the effect of PGTa on clinical intrauterine pregnancy (CIUP), MR, TR, LBR per cycle (LBR/c), and per embryo (LBR/e). Outcomes are compared between PGTa and untested groups by age (<35, 35-37, 38-40, and >40 years). The primary outcome was LBR/e. Embryos were deemed euploid when all whole or partial chromosomal segments had less than a 20% risk of either monosomy or trisomy, while mosaicism included partial or whole chromosome monosomy or trisomy ranging from 20% to 60%. The tested group is larger than the mosaic and euploid groups combined, as SART did not collect data on mosaics prior to 2020. Chi-square analysis including Yate’s correction as needed was used to calculate per cycle data between the tested and untested groups and between the mosaic, euploid, and untested groups. “Tested” includes all biopsied embryos whether labeled euploid, mosaic, or no result.

Results:

Tested (T) vs. Untested (UT)

Age Groups	MR (T)	MR (UT)	MR P	LB/c (T)	LB/c (UT)	LB/c P	TR (T)	TR (UT)	TR P	LB/e (T)	LB/e (UT)	LB/e P
< 35	23/252 (9%)	8/64 (13%)	NS	229/396 (58%)	52/109 (48%)	NS	6/229 (3%)	9/52 (17%)	< 0.001	235/413 (57%)	61/141 (43%)	0.005
35 - 37	14/180 (8%)	6/31 (19%)	0.042	166/324 (51%)	24/52 (46%)	NS	5/166 (3%)	2/24 (8%)	NS	171/349 (49%)	26/78 (33%)	0.012
38 - 40	15/159 (9%)	4/17 (24%)	0.17 (NS)	144/280 (51%)	13/42 (31%)	0.013	7/144 (5%)	0/13 (0%)	NS	151/301 (50%)	13/65 (20%)	<0.001
> 40	7/69 (10%)	2/10 (20%)	NS	62/123 (50%)	8/40 (20%)	0.001	2/62 (3%)	1/8 (13%)	NS	64/131 (49%)	9/58 (16%)	<0.001
Total	**59/660 (9%)**	**20/122 (16%)**	**0.012**	**601/1123 (54%)**	**97/243 (40%)**	**< 0.001**	**20/601 (3%)**	**12/97 (12%)**	**< 0.001**	**621/1194 (52%)**	**109/342 (32%)**	**< 0.001**

Biochemical rate was 180/840 (21%) in the tested group and 29/151 (19%) in the untested group.

Mosaic (M) vs. Euploid (E) vs. Untested (UT)

Age Groups	MR (M)	MR (E)	MR (UT)	MR P	LB/c (M)	LB/c (E)	LB/c (UT)	LB/c P	TR (M)	TR (E)	TR (UT)	TR P	LB/e (M)	LB/e (E)	LB/e (UT)	LB/e P
< 35	0/8 (0%)	12/163 (7%)	8/64 (13%)	NS	8/12 (67%)	150/269 (56%)	52/109 (48%)	NS	1/8 (13%)	3/150 (2%)	9/52 (17%)	<0.001	9/15 (60%)	153/278 (55%)	61/141 (43%)	0.059 NS
35 - 37	0/6 (0%)	7/118 (6%)	6/31 (19%)	0.013	6/11 (55%)	108/220 (49%)	24/52 (46%)	0.007	0/6 (0%)	3/108 (3%)	2/24 (8%)	NS	6/12 (50%)	111/228 (49%)	26/78 (33%)	0.017
38 - 40	2/10 (20%)	10/109 (9%)	4/17 (24%)	0.020	6/19 (32%)	99/207 (48%)	13/42 (31%)	0.021	1/6 (17%)	2/99 (2%)	0/13 (0%)	0.021	7/20 (35%)	101/214 (47%)	13/65 (20%)	<0.001
> 40	0/5 (0%)	5/49 (10%)	2/10 (20%)	0.22 NS	4/10 (40%)	43/82 (52%)	8/40 (20%)	<0.001	1/4 (25%)	0/43 (0%)	1/8 (13%)	0.003	5/12 (42%)	43/82 (52%)	9/58 (16%)	<0.001
Total	**2/29 (7%)**	**34/439 (8%)**	**20/122 (16%)**	**0.013**	**24/52 (46%)**	**400/778 (51%)**	**97/243 (40%)**	**0.007**	**3/24 (13%)**	**8/400 (2%)**	**12/97 (12%)**	**<0.001**	**27/59 (46%)**	**408/802 (51%)**	**109/342 (32%)**	**<0.001**

Biochemical rate was 12/41 29% in the mosaic group, 134/573 23% in the euploid group, and 29/151 (19%) in the untested group.

Among patients ≥35, PGTa testing lowered the MR from 21% (12/67) to 9% (36/408), p=0.005; improved the LBR/c from 34% (45/134) to 51% (371/727) p<0.001; and improved our primary outcome of LBR/e from 32% (109/342) to 52% (408/802), p<0.001. CIUP was significantly increased from 43% (58/134) for untested to 56% (408/727) in tested, p=0.006.

Conclusion:

PGTa, whether utilizing euploid, mosaic, or undiagnosed embryos, significantly improves LBR, while reducing miscarriages and nearly eliminating twin pregnancies when compared to FET with unbiopsied embryos.

For patients <35 undergoing PGTa, the LBR/e was significantly increased from 43% to 57%, a 25% increase; while the risk of a twin birth was reduced by over by over 82.4%, from 17% to 3%.

For patients ≥35 our data reconfirms that PGTa vastly improves the LBR and significantly reduces miscarriages.

Our data suggests that mosaic embryos yield comparable reproductive outcomes to euploid embryos in all age groups, however the higher utilization of DET among mosaics led to TR equivalent to untested embryos.

Combining PGTa with eSET in all age groups would markedly improve LBR, allow for minimal MR and nearly eliminate the TR.