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CENTRIFUGATION-FREE SPERM SEPARATION DEVICE SURPASSES CONVENTIONAL DENSITY-GRADIENT CENTRIFUGATION IN ICSI CYCLES: HIGHER BLASTULATION, EUPLOIDY, AND LOWER MOSAIC RATES

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Background and Aims

Conventional sperm separation using centrifugation in ART faces criticism for potential sperm harm, leading to the development of alternatives like LensHooke® CA0 (Bonraybio, Taiwan) (Figure 1). CA0, a centrifugation-free device, selects self-propelling spermatozoa within a microenvironment created by a microporous filter membrane. Studies indicate CA0 improves sperm DNA fragmentation, motility, and normal morphology (Wang et al., 2023). This study compares laboratory outcomes between CA0 and conventional density-gradient centrifugation (DGC) in ICSI cycles.

Figure 1: LensHooke® CA0 (Bonraybio, Taiwan)

Methods

This retrospective study analysed 9603 oocytes (30-45 years old) that underwent PIEZO-ICSI from January 2022 to September 2023, with 5156 using CA0-prepared semen samples and 4447 using the DGC method. Blastocysts on Day 5/6/7 with a Gardner's score of BB or higher were either vitrified or subjected to trophectoderm biopsy for PGT-A using next generation sequencing before vitrification. Laboratory outcomes, including fertilisation, abnormal fertilisation, blastulation, blastocyst utilisation, euploidy, and mosaic rates, were compared between the two methods. Patients who used frozen gametes, surgically retrieved sperm, or donor gametes were excluded. Statistical significance for laboratory outcomes was determined using chi-square contingency tables (Table 1 & Table 2).

Results

Table 1: Comparative analysis of fertilisation, abnormal fertilisation, blastulation, and blastocyst utilisation rates between LensHooke® CA0 and DGC. CA0 showed significantly increased blastulation rates compared to DGC.

	LensHooke® CA0	Density-gradient Centrifugation (DGC)	P value
No. of oocytes injected	5156	4447	
Mean maternal age	35.9	35.9	
Mean paternal age	38.2	38.2	
No. of oocytes fertilised (2PN)	4148 (80.45%)	3552 (79.87%)	0.49
No. of oocytes with abnormal PN (>2PN)	149 (2.89%)	106 (2.38%)	0.13
No. of blastocysts formed/ 2PN	**3196 (77.05%)**	2630 (74.04%)	**0.0024**
No. of blastocysts utilised/ 2PN	2296 (55.35%)	1980 (55.74%)	0.75

Table 2: Comparative analysis of euploidy and mosaic rates between LensHooke® CA0 and DGC. Euploidy rates were significantly higher in CA0 compared to DGC. Additionally, the mosaic rate was significantly lower in CA0.

	LensHooke® CA0	Density-gradient Centrifugation (DGC)	P value
No. of blastocysts biopsied	1565	1178	
Mean maternal age	36.2	36.4	
Mean paternal age	38.5	38.4	
No. of euploids	**671 (42.88%)**	402 (34.13%)	**<0.0001**
No. of mosaics	**277 (17.70%)**	288 (24.45%)	**<0.0001**

Conclusions

Our study demonstrates that sperm preparation with CA0 outperforms DGC in blastulation, euploidy, and mosaic rates, which are critical factors in successful ART. Further research can explore blastocyst gradings and clinical outcomes to evaluate CA0's advantages over DGC.

References:

1. Wang, T.E., Hsu, C.T., Lin, F.S., Wang, F.Z., Chang, H.C., Chang, T.A., Lee, C.I., Huang, C.C., Lee, M.S. and Agarwal, A., 2023. P-029 Centrifugation-free sperm separation device offers an efficient and standardized protocol to select high quality spermatozoa. *Human Reproduction*, *38*(Supplement_1), pp.dead093-396.