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P-017 Cumulus cells revolutionize sperm selection: a game-changer for reducing DNA fragmentation

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Study question: Does sperm selection using cumulus cells reduce sperm DNA fragmentation?

Summary answer: Sperm selection using cumulus cells significantly reduces DNA fragmentation in sperm samples.

What is known already: Sperm selection plays a critical role in the success of IVF procedures. IVF laboratories typically use conventional techniques such as density gradients or swim-up; however, patients with sperm DNA fragmentation require more specialised approaches, such as microfluidics or magnetic-activated cell sorting (MACS). Recent studies highlight the role of cumulus cells in these advanced methods, enabling the selection of spermatozoa with no DNA fragmentation. Additionally, these strategies allow for the selection of sperm with better motility, morphology, maturity, and even higher fertilisation and blastocyst formation rates.

Study design, size, duration: This prospective study was conducted between August and October 2024. Six semen samples were collected from six different sperm donors, while cumulus cells were obtained from six different oocyte donors on the same day.

Participants/materials, setting, methods: For sperm selection, we used "Supersperm" ICSI dish (Oosafe® ICSI Dish with Sperm Selection Channels, CE mark pending) featuring two channels. A fresh, non-capacitated semen sample was added to both channels: spermatozoa in the upper channel passed through cumulus cells, while those in the lower channel did not. After 1-hour incubation, 3µl drops were collected, placed on poly-lysine-treated slides, and DNA fragmentation was assessed using the TUNEL assay. Statistical analysis was performed using R (v4.4.2).

Main results and the role of chance: After paired analysis of the samples, statistically significant differences in DNA fragmentation levels were observed. The untreated control samples showed a mean DNA fragmentation of

6.67%, while the samples filtered through cumulus cells had a reduced fragmentation rate of 1.75% ($p = 0.001$). Although these were high-quality donor sperm samples, the cumulus cell selection significantly reduced DNA fragmentation. This finding is notable as the selection occurs in the same dish where ICSI is performed, streamlining the laboratory workflow and eliminating the need for additional selection techniques before ICSI. Furthermore, using the raw sample reduces the need for further manipulation.

Limitations, reasons for caution: The study was conducted using donor samples. To draw more significant and robust conclusions, future research should include patient samples with high DNA fragmentation and a larger sample size. Furthermore, additional laboratory and clinical studies are needed to further validate these findings.

Wider implications of the findings: This result highlights the advantages of using cumulus cells for selecting spermatozoa with minimal DNA fragmentation. It offers a simple, reliable, and efficient one-step method for sperm selection using the “Supersperm” ICSI dish. Patients with elevated DNA fragmentation, who require additional selection techniques, may particularly benefit from this approach.

Trial registration number: No