THE CANADIAN FERTILITY AND ANDROLOGY SOCIETY'S 71ST ANNUAL MEETING

September 18 - 20, 2025
Centre des Congrès de Québec, Quebec City

#59 - Impact of Oxidative Stress on Oocyte Quality in Oncological vs. Elective Fertility Preservation: The OOXYD Prospective Cohort Study

IJ. KADOCH[1,2], J GALE[3], B. WOOLNOUGH[3], M. NAVARRO[1,2], M. CHOW-SHI-YEE[2], A. TADEVOSYAN[2], A. YUZPE[4]

1 Obstetrics and Gynecology, University of Montreal Health Centre (CHUM), Montreal

2 Clinique Ovo, Montreal

3 Department of Obstetrics and Gynecology, University of Ottawa, Ottawa

4 Olive Fertility Centre, Vancouver

INTRODUCTION

Oxidative stress is characterized by an imbalance between reactive oxygen species (ROS) production and antioxidant defenses. Excessive ROS can damage cellular structures, compromise DNA integrity, disrupt granulosa cell function and potentially impact oocyte quality. In oncological patients, cancer-related oxidative stress exacerbates these detrimental effects. In contrast, women undergoing elective fertility preservation are typically in good health and exhibit lower oxidative stress levels.

AIM

This study aimed to compare oxidative stress profiles and oocyte quality outcomes in women undergoing fertility preservation for oncological versus elective reasons.

METHOD

This prospective, multicenter cohort study included 171 women aged 18–37 years undergoing fertility preservation (117 elective, 54 oncological) across three Canadian fertility centers between June 2022 and June 2024. All participants received controlled ovarian stimulation using a standardized mixed Rekovelle® and Menopur® protocol, according to the 4 dosing regimens shown below. Oxidative stress was assessed through systemic oxidation-reduction potential (ORP) measured by MiOXSYS® analyzer. Oocyte quality was evaluated using the estradiol-per-oocyte ratio and the AI-based MAGENTA scoring system. A sensitivity analysis was performed after excluding patients taking an antioxidant. Statistical significance was set at $p < 0.05$.

Dosing regimen based on AMH–weight algorithm for RKV and adjusted MNP dose according to RKV regimen

	RKV (µg)	MNP (IU)
Regimen A	<6	75
Regimen B	6-8.66	150
Regimen C	9-11.66	225
Regimen D	12	300

DISCUSSION

Oncological patients exhibited elevated oxidative stress despite being younger, and this was associated with lower biological markers of oocyte quality. The absence of group differences in MAGENTA scores suggests that current AI-based morphology tools may not capture redox-associated subcellular damage.

RESULTS

Table 1. Baseline characteristics

	Overall n=171	Elective preservation n=117	Oncology preservation n=54	P-value
Age (Year)				<0.001
Mean ± SD	33.2 ± 3.8	34.5 ± 2.6	30.4 ± 4.5	
Median (IQR)	34.0 (31.6, 36.1)	34.7 (33.3, 36.4)	31.5 (27.8, 33.2)	
Weight (kg)				0.11
Mean ± SD	68.7 ± 16.1	67.1 ± 15.0	72.2 ± 18.0	
Median (IQR)	64.0 (57.6, 77.2)	63.5 (57.0, 72.5)	64.3 (59.0, 84.3)	
AMH (pmol/L)				0.93
Mean ± SD	23.2 ± 18.1	23.3 ± 18.8	23.0 ± 16.5	
Median (IQR)	18.3 (10.6, 32.0)	18.1 (10.6, 31.2)	19.2 (9.4, 34.8)	

Table 2. Number of mature oocytes and estradiol-per-oocyte ratio

	Overall n=171	Elective preservation n=117	Oncology preservation n=54	P-value
Number of MII				0.26
Mean ± SD	12.0 ± 7.6	12.5 ± 7.7	10.9 ± 7.4	
Median (IQR)	11.0 (6.0, 16.0)	12.0 (6.0, 16.0)	10.0 (5.0, 15.0)	
MII / retrieved oocytes ratio	2035/2737 (74.3%)	1445/1862 (77.6%)	590/875 (67.4%)	<0.001
Patients without MII	2 (1.2%)	0 (0.0%)	2 (3.7%)	0.10
E2 / retrieved oocytes	**n=138**	**n=114**	**n=24***	0.02
Mean ± SD	742.8 ± 439.9	761.3 ± 376.3	654.7 ± 668.7	
Median (IQR)	647.8 (469.9, 927.6)	667.2 (499.5, 953.9)	547.7 (275.4, 734.2)	

*Patients treated with letrozole (Femara®) were excluded

- The oncological group was significantly younger than the elective group with a mean of 30.4 vs. 34.5 years ($p < 0.05$).
- Number of MII tended to be higher in the elective group, with a median of 12.0 [6.0-16.0], compared to the oncology group, with a median of 10.0 [5.0-15.0].
- The oncology group had a lower ratio of mature to retrieved oocytes (67.4% vs. 77.6% $p < 0.05$) and a lower estradiol-per-oocyte ratio (median of 547.7 [275.4.–734.2] vs. 667.2 [499.5–953.9] pmol/L, $p < 0.05$).
- Systemic ORP levels were consistently higher in the oncological group both at stimulation start (median of 105.9 [89.7–12.3] vs 94.7 [82.3–111] mV) and before ovulation trigger (median of 107.1 [92.–127] vs 97.7 [85.8–117.4] mV; both $p < 0.05$), suggesting greater oxidative stress.
- Despite differences in biological markers, AI-based oocyte quality assessments were similar between groups (MAGENTA score: median of 5.4 [4.3-6.8] vs 5.3 [4.4-6.6], $p > 0.05$; Euploidy probability score: median of 0.30 [0.28-0.33] in both groups, $p > 0.05$).
- Results remained consistent in the sensitivity analysis after excluding patients reporting antioxidant supplementation (CoQ10, LQ, ubiquinol; n = 20, with 19 in the elective group and 1 in the oncology group).

Table 3. ORP levels at the beginning of stimulation and before triggering

	Overall n=171	Elective preservation n=117	Oncology preservation n=54	P-value
ORP (mV) at Visit 2				0.01
Mean ± SD	111.5 ± 54.7	107.4 ± 54.4	120.2 ± 54.8	
Median (IQR)	99.3 (84.7, 117.6)	94.7 (82.3, 111.0)	105.9 (89.7, 125.3)	
ORP (mV) at Visit 4				0.03
Mean ± SD	111.7 ± 46.2	110.7 ± 51.0	114.1 ± 33.1	
Median (IQR)	99.7 (88.2, 122.9)	97.7 (85.8, 117.4)	107.1 (92.0, 127.0)	

Table 4. AI-based oocyte quality

	Overall	Elective preservation n=116	Oncology preservation n=52	P-value
MAGENTA score				0.92
Mean ± SD	5.4 ± 1.6	5.4 ± 1.6	5.4 ± 1.6	
Median (IQR)	5.4 (4.3, 6.7)	5.4 (4.3, 6.8)	5.3 (4.4, 6.6)	
Euploidy probability score				0.50
Mean ± SD	0.30 ± 0.05	0.30 ± 0.04	0.29 ± 0.06	
Median (IQR)	0.30 (0.28, 0.33)	0.30 (0.28, 0.33)	0.30 (0.28, 0.33)	

CONCLUSIONS

This study highlights the distinct oxidative profiles of women undergoing fertility preservation for medical versus elective reasons and supports the potential role of oxidative stress in impairing oocyte quality. ORP may offer a useful marker for identifying patients at risk. When clinically appropriate, antioxidant interventions could be explored—particularly in patients with elevated ORP levels—as a strategy to optimize oocyte quality and improve reproductive outcomes.

REFERENCES

Singh, A. K., Chattopadhyay, R., Chakravarty, B., & Chaudhury, K. (2013). Markers of oxidative stress in follicular fluid of women with endometriosis and tubal infertility undergoing IVF. Reproductive toxicology, 42, 116-124.Prasad et al., 2016, Journal of Biomedical Science;

Klaunig, J. E. (2018). Oxidative stress and cancer. Current pharmaceutical design, 24(40), 4771-4778.Cao et al., 2022, Cells;

Bedaiwy, M. A., Elnashar, S. A., Goldberg, J. M., Sharma, R., Mascha, E. J., Arrigain, S., ... & Falcone, T. (2012). Effect of follicular fluid oxidative stress parameters on intracytoplasmic sperm injection outcome. Gynecological endocrinology, 28(1), 51-55.

Vassalle, C., Maltinti, M., & Sabatino, L. (2020). Targeting oxidative stress for disease prevention and therapy: where do we stand, and where do we go from here. Molecules, 25(11), 2653.

Hayes, J. D., Dinkova-Kostova, A. T., & Tew, K. D. (2020). Oxidative stress in cancer. Cancer cell, 38(2), 167-197.

ACKNOWLEDGEMENTS

We thank Ferring Pharmaceuticals for the financial support of the study.

CONTACT INFORMATION

Dr Kadoch: j.kadoch@cliniqueovo.com