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Previous infection with SARS-CoV-2 impacts embryo morphokinetics but not clinical outcomes of intracytoplasmic sperm injection cycles

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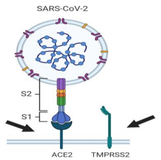
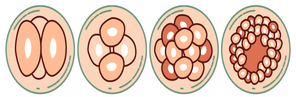
Introduction

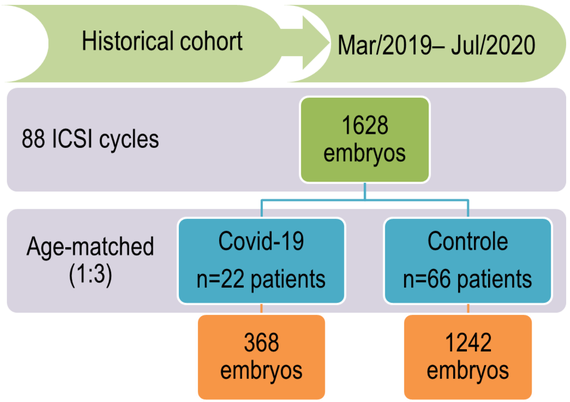
Coronavirus disease 2019 (COVID-19) is caused by a novel coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which may infect any cell type expressing ACE2 and TMPRSS2 receptors. ACE2 is expressed in several human ovarian compartments, and relatively highly expressed in oocytes. Therefore, the ovary and oocyte might be potential targets of SARS-CoV-2. Information concerning the susceptibility of the female reproductive systems to SARS-CoV-2 infection, and possible effects on embryo development remain inconsistent.

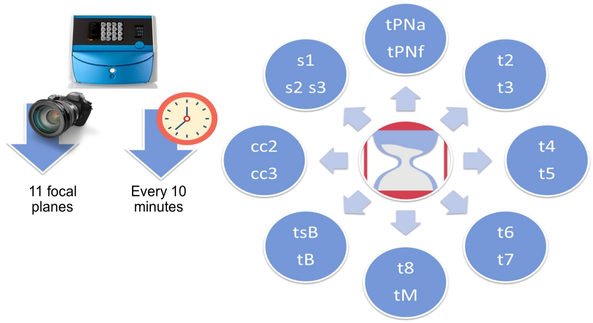


Time-lapse imaging (TLI) systems allow for the mapping of morphological changes or events with the exact time-point of occurrence. The aim of this study was to investigate the impact of SARS-CoV-2 infection on embryo morphokinetic development.



Methods





The impact of SARS-COV-2 on embryo morphokinetic events and ICSI outcomes was investigated considering clustering of data (multiple embryos per cycle), using generalized mixed models adjusted for potential confounders.

Results

	COVID-group (n=22)	Control-Group (n=66)	p value
Maternal age (y-old)	36.2 ± 2.7	36.2 ± 2.7	1.000
Paternal age (y-old)	40.7 ± 6.6	39.8 ± 5.3	0.515
BMI (kg/m2)	24.1 ± 2.4	24.4 ± 3.8	0.680
Follitropin delta (µg)	152.6 ± 34.7	148.9 ± 44.3	0.457
Oestradiol (pg/mL)	2323.7 ± 332.7	2450.4 ± 207.1	0.104
Aspirated follicles (n)	15.0 ± 3.5	17.3 ± 9.3	0.264
Retrieved oocytes (n)	12.6 ± 3.3	12.9 ± 5.8	0.841
Mature oocytes (n)	9.6 ± 2.0	10.6 ± 4.7	0.358
Fertilization rate (%)	86.1 ± 12.5	89.0 ± 11.2	0.353
Transferred embryos (n)	1.0 ± 0.9	1.5 ± 0.5	0.188
Endometrial thickness (mm)	9.8 ± 2.2	10.3 ± 3.9	0.469

Table 1: Patient and cycle characteristics for the COVID group and control group.

	COVID-group (n=22)	Control-Group (n=66)	p value
Pregnancy rate (%)	33.3	50.0	0.893
Implantation rate (%)	33.3 ± 49.2	25.0 ± 26.1	0.610
Miscarriage rate (%)	0	17.5	NA

Table 3. Intracytoplasmic sperm injection outcomes for patients in the COVID or control group

Morphokinetic data	COVID-group (n=386 embryos)	Control-Group (n=1242 embryos)	p value
tPNa	7.4 ± 0.26	6.71 ± 0.18	< 0.001
tPNf	24.503 ± 0.47	23.386 ± 0.336	0.003
t2	26.980 ± 0.489	26.001 ± 0.344.	0.032
t3	37.992 ± 0.659	36.146 ± 0.461	0.005
t4	41.027 ± 0.677	37.745 ± 0.471	< 0.001
t5	51.856 ± 1.067	48.636 ± 0.722	< 0.001
t6	52.264 ± 0.718	52.123 ± 1.094	0.900
t7	55.328 ± 0.696	54.341 ± 1.070	0.397
t8	59.575 ± 0.853	57.662 ± 1.304	0.174
tM	85.835 ±.459	84.210 ±.363	0.487
tB	109.122 ± 0.804	106.244 ± 1.429	0.028
cc2	10.917 ± 0.41	10,330 ± 0.16	0.190
cc3	14.187 ± 0.65	12.806 ± 0.25	0.049
s1	2.397 ± 0.895	2.732 ± 0.306	< 0.001
s2	3.073 ± 0.36	1.871 ± 0.146	0.002
s3	11.36 ± 0.40	9.16 ± 1.07	0.056
KIDScore D5	5.3 ± 0.3	6.3 ± 0.1	0.005

Table 2. Results from general linear models followed by Bonferroni post hoc analysis for the comparison of embryo morphokinetic data from patients with and without previous infection with SARS-CoV-2.

Conclusions

Previous SARS-CoV-2 maternal infection had significant impacts on embryo morphokinetic events and KIDScore rank. This first study evaluating the impact of SARS-CoV-2 infection on embryo development post-ICSI suggests that women who have recovered from COVID-19 infection should be aware of a possible detrimental effect of the infection on embryo development. Its impact on implantation potential in vivo is particularly important and should be investigated.

Funding: This study was funded by Ferring COVID-19 Investigational Grants.