TIME OF TRIGGER ADMINISTRATION FOR IN VITRO FERTILIZATION (IVF) CYCLES IMPACTS DAY OF BLASTULATION BUT NOT TOTAL NUMBER OF USEABLE BLASTOCYSTS

Haley Genovese MD[1], Jennifer Zhang MD[2], Stephanie Willson MD[1], Kassie Bollig MD[1], Marie Werner MD[1]
(1) IVI RMA New Jersey, Basking Ridge, NJ; (2) Robert Wood Johnson University Hospital, New Brunswick, NJ

Background: At high volume IVF centers, patients' assigned time of trigger administration can vary widely in order to accommodate all scheduled oocyte retrieval procedures. While there may be up to nine hours between the earliest and the latest retrieval times, laboratory protocols to monitor embryo growth and development do not account for this time difference.

Objective: To evaluate whether the time of ovulation trigger administration is associated with day of embryo blastulation.

Materials and Methods: This was a retrospective cohort study of patients at a university-affiliated in vitro fertilization (IVF) center undergoing their first IVF cycle with intracytoplasmic sperm injection (ICSI) between January 2017 and December 2023. Cycles with a 36-hour interval between ovulation trigger and oocyte retrieval were included; cycles with severe male factor or use of donor oocytes were excluded. Patients were categorized into four groups based on time of trigger administration for final oocyte maturation as follows; Group 1: 6:30pm-8:30pm, Group 2: 8:31pm-10:30pm, Group 3: 10:31pm-12:30am, Group 4: 12:31am-2:30am. The primary outcome was the percentage of fertilized zygotes that reached the blastocyst stage (blastulation rate, BR) on the morning of day 5, 6 or 7 of development. The secondary outcome was the percentage of cycles in which no useable blastocysts were obtained (no cryo rate). Data analyses were performed using multivariable linear and logistic regression analysis, adjusted for age, body mass index, and anti-mullerian hormone level at the time of retrieval.

Results: 10,416 patients were included and blastulation rates were calculated (Table 1). There was a significant difference in day of blastulation based on time of trigger administration, favoring earlier times. Compared to Group 1, the day 5 BR was 1.8% lower in Group 2 ($p<0.001$), 3.1% lower in Group 3 ($p<0.001$), and 5.8% lower in Group 4 ($p<0.001$); day 6 BR was 2.2% greater in Group 2 ($p<0.001$), 3.1% greater in Group 3 ($p<0.001$), and 4.9% greater in Group 4 ($p<0.001$); day 7 BR was not significantly different in Group 2 ($p=0.204$), but was 0.9% greater in Group 3 ($p=0.005$) and 1.9% greater in Group 4 ($p<0.001$). Total BR was not different when comparing Group 1 vs Group 2 ($p=0.226$), Group 1 vs Group 3 ($p=0.256$), or Group 1 vs Group 4 ($p=0.344$). The no cryo rate was also not different when Group 1 was compared to Group 2 ($p=0.133$), Group 3 ($p=0.216$) or Group 4 ($p=0.133$).

Table 1

Groups (N= 10,416)	Day 5 BR (%)	Day 6 BR (%)	Day 7 BR (%)	Total BR (%)	No Cryo Rate
1 (3,840)	16.7	32.5	4.4	53.5	7.8
2 (4,193)	14.8	34.8	4.7	54.3	6.9
3 (1,604)	13.2	35.5	5.4	54.1	7.2
4 (779)	10.7	37.4	6.3	54.5	6.4

Conclusions: Patients with an earlier trigger time had significantly more embryos reach the blastocyst stage on day 5 of development. Thus, trigger timing may consequently impact prioritization of embryos selected for transfer. However, variations in the time of trigger do not impact the total number of useable blastocysts that are available for embryo transfer.

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