IMPACT OF LEAD FOLLICLE SIZE AT TRIGGER ON OOCYTE AND EMBRYO QUALITY IN IVF CYCLES

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OBJECTIVE

To compare the impact of lead follicle size at trigger (<20mm vs. ≥20mm) on fertilization rates, high-quality blastocyst (HQB) development, and fresh embryo transfer pregnancy rates.

Materials and Methods

Design: Retrospective cohort study.

Setting: Academic fertility center.

Subjects: 907 IVF cycles
- 466 cycles with lead follicle ≥20mm at trigger.

Intervention: Triggering cycles when the lead follicle size is either <20mm or ≥20mm in diameter.
- The institutional trigger criterion required at least three dominant follicles >16mm.

Outcomes:
- Fertilization rate: Ratio of 2-pronuclei (2PN) to metaphase II (MII) oocytes.
- High-quality blastocyst (HQB) rate: Proportion of 2PN that developed into high-quality blastocysts.
- Clinical pregnancy rate: Proportion of fresh embryo transfers resulting in pregnancy.

Statistical Analysis:
- Parametric and non-parametric tests were used, along with linear and logistic regression models adjusted for oocyte age, anti-Müllerian hormone (AMH) levels, body mass index (BMI), peak estradiol (E2), oocyte yield, and infertility diagnosis.

BACKGROUND

A primary factor in determining the optimal time to trigger ovulation for egg retrieval during IVF is the size of the lead follicle(s) during ovarian stimulation. Historically, the timing of the trigger has been based largely on retrospective data focused on maximizing the number of mature oocytes retrieved. However, while this metric is essential, it may not fully capture the quality of the oocytes, which ultimately influences embryo development and pregnancy outcomes. Larger follicles may yield mature oocytes, but the quality of these oocytes—and their potential to fertilize, develop into high-quality blastocysts, and result in clinical pregnancy—has not been thoroughly evaluated.

RESULTS

A total of 907 IVF cycles were analyzed, with 466 cycles triggered when the lead follicle measured ≥20mm. Of these, 159 cycles underwent conventional insemination, and 748 used ICSI. There were no clinically significant differences in baseline characteristics between the <20mm and ≥20mm groups.

Table 1: Baseline characteristics, cycle yields and fertilization. [(Mean (SD)]

	Total			Conventional Insemination			ICSI		
	<20 (n=441)	>20 (n=466)	p-value	<20 (n=76)	>20 (n=83)	p-value	<20 (n=365)	>20 (n=383)	p-value
Oocyte age	37.2 (3.8)	36.5 (4.0)	0.011	36.5 (4.0)	35.5 (3.7)	0.044	37.3 (3.7)	36.7 (4.0)	0.023
AMH	2.4 (2.4)	2.6 (2.4)	0.232	3.0 (2.7)	3.4 (3.5)	0.252	2.3 (2.4)	2.4 (2.1)	0.492
BMI	25.9 (5.3)	27.1 (5.8)	0.001	26.1 (5.3)	27.3 (6.0)	0.196	25.8 (5.3)	27.0 (5.7)	0.003
Peak E2	2193.5 (1185.3)	2211.5 (1176.9)	0.819	2370.1 (1316.4)	2333.2 (1254.8)	0.857	2156.5 (1154.6)	2185.0 (1159.4)	0.737
# Oocytes	12.1 (8.3)	11.7 (7.5)	0.540	13.5 (8.8)	13.6 (8.8)	0.963	11.8 (8.1)	11.3 (7.1)	0.457
MII	9.1 (6.4)	8.6 (5.7)	0.153	10.7 (7.1)	10.4 (6.9)	0.832	8.8 (6.2)	8.2 (5.4)	0.120
MII%	76.8% (20%)	74.2% (21.5%)	0.052	81.6% (19.1%)	78.9% (21.9%)	0.410	75.9% (20.1%)	73.2% (21.3%)	0.073
2PN	6.9 (5.3)	6.4 (4.8)	0.134	7.3 (5.3)	7.1 (5.4)	0.809	6.8 (5.4)	6.2 (4.7)	0.118
Fert rate	74.5% (22.9%)	73.7% (24.7%)	0.291	68.1% (23.7%)	67.1% (23.1%)	0.799	75.9% (22.6%)	75.0% (24.9%)	0.623

The fertilization rates were similar, with 74.5% in the <20mm group compared to 73.7% in the ≥20mm group (p=0.291). This remained consistent regardless of fertilization method, with conventional insemination achieving 68.1% versus 67.1% (p=0.799) and ICSI achieving 75.9% versus 75.0% (p=0.623) for the <20mm and ≥20mm groups, respectively.

Table 2: Fertilization rates, linear regression model with reference group lead follicle <20mm. [Beta (95% CI); p-value]

	Total	Conventional	ICSI
Unadjusted	-0.9% (-4%, 2.3%) 0.582	-1.0% (-8.4%, 6.5%) 0.799	-0.9% (-4.3%, 2.6%) 0.623
Adjusted*	-1.8% (-5.1%, 1.5%) 0.323	-3.6% (-11.6%, 4.3%) 0.368	-1.7% (-5.3%, 1.9%) 0.361

*Adjusted for; oocyte age, AMH, BMI, peak E2, oocyte #, infertility diagnosis

RESULTS

The rate of HQB formation was also comparable between groups, with 44.5% in the <20mm group versus 47.9% in the ≥20mm group (p=0.105).

Table 3. High quality blastocyst rates, linear regression model with reference group lead follicle <20mm. [Beta (95% CI); p-value]

	Unadjusted	Adjusted*
Day 5 HQB rate	3.0% (-0.6%, 6.7%); 0.102	2.3% (-1.4%, 6.1%); 0.219
Day 6 HQB rate	0.4% (-2.5%, 3.3%); 0.785	0.0% (-3.0%, 3.1%); 0.983
Total HQB rate	3.5% (-0.7%, 7.6%); 0.105	2.4% (-1.9%, 6.6%); 0.272

Clinical pregnancy rates among 190 patients who underwent fresh embryo transfers were similar, with 53.9% in the <20mm group compared to 52.3% in the ≥20mm group (p=0.695). These findings remained non-significant after statistical adjustments.

Table 4. Pregnancy rates when lead follicle is <20mm and >20mm in size, linear regression model with reference group lead follicle <20mm. [Beta (95% CI); p-value]

	<20 (n=280)	>20 (n=266)	p-value
Pregnancy	151 (53.9%)	139 (52.3%)	0.695

OR (95% CI); p-value	Unadjusted	Adjusted*
Pregnancy	0.935 (0.668, 1.309) 0.695	0.916 (0.628, 1.335) 0.648

*Adjusted for; oocyte age, AMH, BMI, peak E2, oocyte #, infertility diagnosis

CONCLUSIONS

Triggering oocyte retrieval with a lead follicle ≥20mm does not negatively impact fertilization rates, blastocyst development, or clinical pregnancy outcomes.

References

Contact