

Letter to Editor

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Correlation between human embryo morphokinetics and pregnancy outcomes on Asian infertility women: A retrospective cohort study

Hop Vu Dinh^{1,2✉}, Cuong An Manh¹, Anh Phi Thi Tu¹, Huong Nguyen Thi Lien¹, Hoang Le¹, Hanh Nguyen Van³

¹Assisted Reproductive Technology Centre, Tam Anh General Hospital, Hanoi, Vietnam

²Graduate University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam

³Institute of Biotechnology, Vietnam Academy of Science and Technology, Hanoi, Vietnam

Selecting the embryo with the highest implantation potential is a top priority in *in-vitro* fertilization (IVF) centers. Few studies have explored the relationship between day 5 blastocyst morphokinetics and implantation outcomes[1]. Despite numerous time-lapse studies, the findings often conflict due to differences in patient demographics, lab conditions, and protocols, such as oxygen concentration[2]. Thus, there is ongoing debate regarding which parameters are most predictive of implantation.

Data on the association between blastocyst morphokinetics and pregnancy outcomes in Asian populations, particularly in Vietnam, remain limited. To address this, we conducted a retrospective cohort study to assess the relationship between blastocyst morphokinetics and pregnancy outcomes following single vitrified-warmed blastocyst transfer. This may provide further evidence to improve embryo selection.

This study included infertile patients previously reported in a 2024 publication[3]. The same methods and procedures were applied. Blastocyst morphokinetics recorded included: the time of first evidence of compaction (tSC), completion of compaction process (tM), initiation of blastulation (tSB), blastocoel filling half of the volume of the blastocyst (tBL2), and blastocoel filling full blastocyst (tB) were observed (Figure 1). We examined the associations between these parameters and clinical outcomes such as implantation and ongoing pregnancy rates.

Statistical analysis was performed using the Statistical Package for the Social Sciences 26 (SPSS Inc.). Patient characteristics and clinical outcomes were analyzed using descriptive statistics. To describe the data, descriptive statistics frequency analysis and percentage analysis were used for categorical variables, and the mean and standard deviation (mean±SD) or median and quartiles (Q1, Q3) were used for continuous variables. The study evaluated the differences in parameters between the implantation and non-implantation groups, ongoing pregnancy and non-ongoing

pregnancy groups using Mann-Whitney *U*-Test, a *P*-value of 0.05 or less was considered statistically significant.

Ethical approval was granted by the Internal Ethics Committee of Tam Anh General Hospital, Hanoi, Vietnam (IRB.TAHN.055, April 15, 2021). All participants provided informed written consent.

We analyzed 511 single vitrified-warmed blastocyst transfer cycles. The mean maternal age and body mass index (BMI) were (30.36±4.33) years and (21.07±2.54) kg/m², respectively. The results showed that there were significant differences in the blastocyst morphokinetic parameters including tSC, tSB, tBL2, and tB between two groups of implantation and non-implantation (*P*<0.05) and there were significant differences in the blastocyst morphokinetic parameters: tSC, tM, tSB, tBL2, and tB between two groups of ongoing pregnancy and non-ongoing pregnancy (*P*<0.05) (Table 1).

Our findings are consistent with previous studies that identified parameters including tSC, tM, tSB and tB as predictors of pregnancy outcomes[4]. These parameters were statistically significant differences between implanted and non-implanted embryos[4]. A multicenter study in 2019 showed that tM was outlined as predictor of live birth rate after euploidy blastocyst transfer[5]. Specifically,

✉ To whom correspondence may be addressed. E-mail: hopvd@tamanhospital.vn

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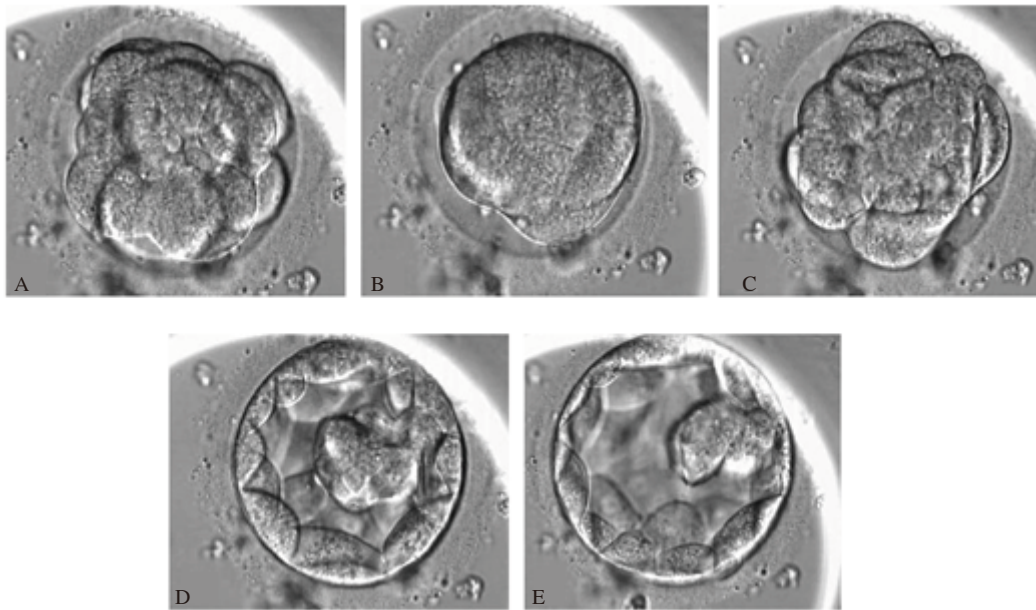


Figure 1. Embryo morphology. A: Start of compaction, B: Morula, C: Start of blastulation, D: The blastocoel filling half of the volume of the blastocyst, E: Full blastocyst.

Table 1. Morphokinetic parameters of implantation and non-implantation; of ongoing pregnancy and non-ongoing pregnancy.

Parameters	Implantation (n=343)	Non-implantation (n=168)	P value	Ongoing pregnancy (n=254)	Non-ongoing pregnancy (n=257)	P value
tSC	67.00 (60.00, 75.10)	68.88 (60.55, 79.39)	0.040	66.50 (59.49, 74.32)	68.55 (61.03, 78.10)	0.023
tM	82.35 (72.25, 88.00)	84.00 (77.59, 102.35)	0.062	82.00 (76.23, 87.39)	83.35 (78.28, 90.53)	0.008
tSB	95.15 (91.00, 95.15)	97.12 (93.19, 102.35)	<0.001	95.05 (90.25, 98.43)	96.40 (93.00, 101.30)	<0.001
tBL2	101.35 (97.30, 106.00)	103.08 (98.48, 109.21)	0.003	101.05 (96.89, 106.00)	102.45 (98.45, 108.30)	0.005
tB	105.00 (100.30, 110.05)	106.3 (102.11, 113.08)	0.006	104.38 (100.24, 110.21)	106.25 (102.00, 112.28)	0.001

Continuous data are expressed as median and quartiles (Q1-Q3), and Mann-Whitney U-Test is used for comparison. tSC: time to start of compaction; tM: time to morula; tSB: time to start of blastulation; tBL2: time to the blastocoel filling more than half of the volume of the blastocyst; tB: time to full blastocyst.

euploid blastocysts with tM <80 hours achieved a live birth rate of 55.2% (n=37/67), while the live birth rate was only 25.5% (n=13/51) in embryos with tM ≥80 hours[8]. Similarly, the study in 2022 reported that morphokinetics of blastocyst such as tM, tSB, and time to expanded blastocyst (tEB) might allow an improved prediction of implantation potential[6].

On the other hand, the study in 2024 showed that there were no statistically significant differences in morphokinetic parameters including tM, tSB, tB in embryos with implantation *versus* those with implantation failure[7].

In conclusion, morphokinetic parameters are associated with pregnancy outcomes and can be considered as predictors of embryo quality. Our study suggests that morphokinetic parameters may play a role in the success of single vitrified-warmed blastocyst transfer procedures. Further research with larger sample sizes and controlled study designs is necessary to validate and expand upon these finding.

Conflict of interest statement

The authors declare that there is no conflict of interest.

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Authors' contributions

Hop Vu Dinh, Huong Nguyen Thi Lien, Hanh Nguyen Van, and Hoang Le conceived, designed, interpreted the data, and coordinated the work. Hop Vu Dinh wrote the manuscript. Cuong An Manh and Anh Phi Thi Tu collected, double checked the data, and participated

in interpreting the data. Huong Nguyen Thi Lien, Hanh Nguyen Van, and Hoang Le reviewed the manuscript. All authors jointly contributed to the final version of the manuscript.

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