

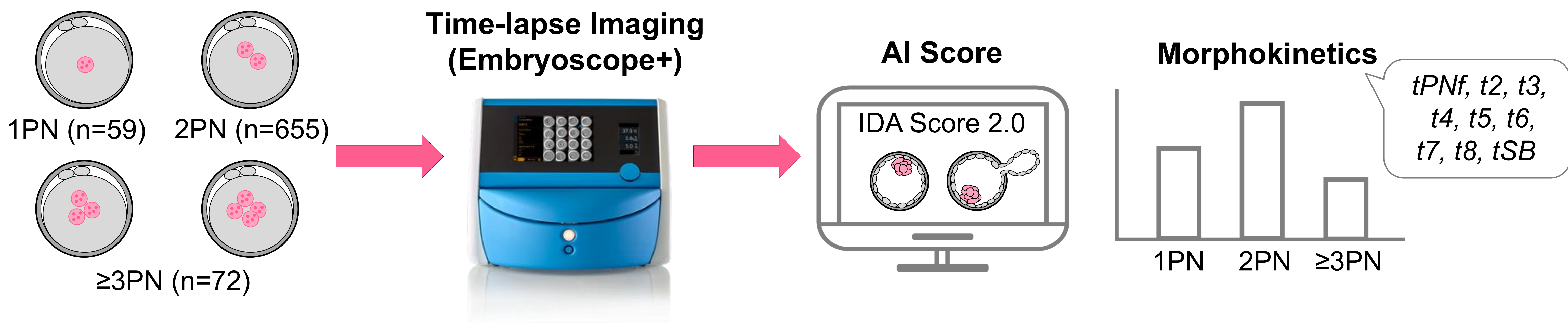
INTRODUCTION

Abnormally fertilized (1PN and ≥3PN) embryos are typically excluded from transfer as they are considered genetically abnormal. However, these embryos can occasionally develop to the blastocyst stage and lead to live births (Bartolacci et al., 2025; Bredbacka et al., 2023).

This study aimed to compare the morphokinetic patterns and artificial intelligence (AI) scores of embryos from normally fertilized (2PN) and abnormally fertilized embryos originating from sibling oocytes.

METHOD

Sibling oocytes from patients producing both normally (2PN) and abnormally (1PN or ≥3PN) fertilized embryos were analyzed. Statistical comparisons were performed on morphokinetic timings and AI scores between the groups.



RESULTS

1PN embryos showed slower development at tPNf, t2, t4, t6, t8 and tSB (delay: 1.1-4.1h, $p < 0.05$) (Table 1).

≥3PN embryos were delayed during tPNf-t8 (1.1-6.2h slower, $p < 0.05$ to $p < 0.0001$) but had comparable tSB (Table 1).

1PN vs ≥3PN: ≥3PN embryos were slower at t5 and t8, while 1PN embryos were slower at tSB (Table 1).

IDA scores: ≥3PN embryos significantly lower than 1PN and 2PN. No significant difference between 1PN and 2PN (Figure 1).

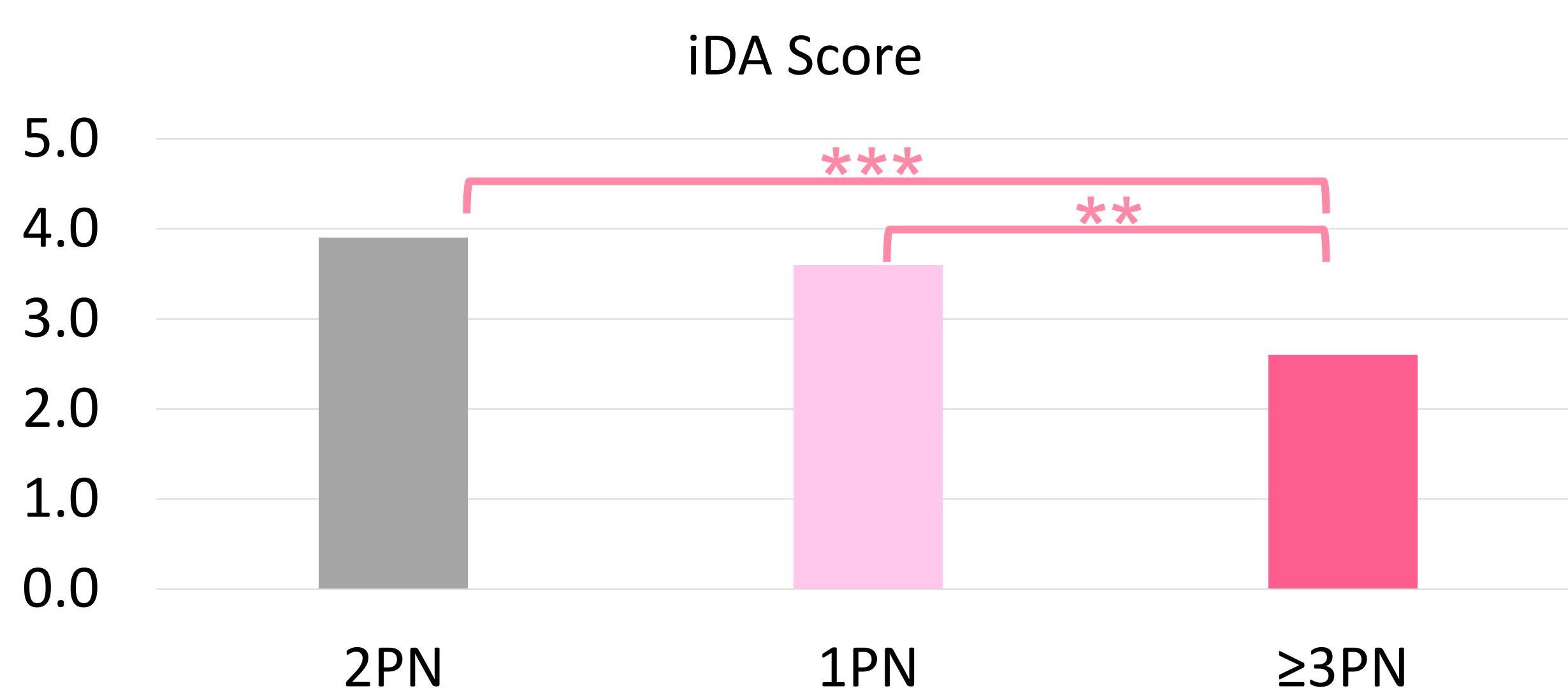


Figure 1. Comparison of AI Scores between 2PN, 1PN and ≥3PN embryos
** $p < 0.01$, *** $p < 0.001$

Table 1. Morphokinetics of 1PN, 2PN and ≥3PN embryos

	2PN	1PN	≥3PN
tPNf (h)	24.2 ± 0.1	25.3 ± 0.5	25.3 ± 0.4
t2 (h)	26.8 ± 0.1	28.1 ± 0.5	27.9 ± 0.4
t3 (h)	38.0 ± 0.2	39.0 ± 0.7	40.0 ± 0.6
t4 (h)	39.1 ± 0.2	41.0 ± 0.8	41.3 ± 0.6
t5 (h)	50.3 ± 0.3	51.9 ± 1.0	55.0 ± 1.1
t6(h)	52.3 ± 0.2	55.1 ± 1.1	57.7 ± 1.1
t7 (h)	54.9 ± 0.3	56.7 ± 1.1	61.7 ± 1.2
t8 (h)	58.7 ± 0.4	62.0 ± 1.2	64.9 ± 1.5
tSB (h)	100.9 ± 0.4	105.0 ± 1.4	99.9 ± 1.2

Values are presented as mean ± SEM.

$p < 0.05$

$p < 0.01$

$p < 0.001$

CONCLUSION

Abnormally fertilized embryos demonstrated stage-specific delays compared with normally fertilized embryos. 1PN embryos show slower progression from cleavage through blastulation, while ≥3PN embryos experience more pronounced delays during cleavage but reach blastulation at a similar pace.

Differences in AI scores between 2PN and ≥3PN, and between 1PN and ≥3PN embryos further highlight altered developmental dynamics.

REFERENCES

1. Bartolacci A, Pavone V, Barbagallo BM, Cecchele A, Papaleo E, Pagliardini L. Reconsidering the clinical value of 1PN-derived embryos: a systematic review and meta-analysis. J Assist Reprod Genet. 2025 Aug 22. doi: 10.1007/s10815-025-03631-1. Epub ahead of print. PMID: 40844726.
2. Bredbacka P, Capalbo A, Kananen K, Picchetta L, Tomás C. Healthy live birth following embryo transfer of a blastocyst of tetrapronuclear (4PN) origin: a case report. Hum Reprod. 2023 Sep 5;38(9):1700-1704. doi: 10.1093/humrep/dead151. PMID: 37528053.