Morphokinetic embryo behavior in low-prognosis patients according to the POSEIDON criteria: an analysis of 3326 injected oocytes

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DISCLOSURE

- I declare that I have no commercial or financial interests pertaining to the subject of this presentation or its content.

Introduction

INTRODUCTION

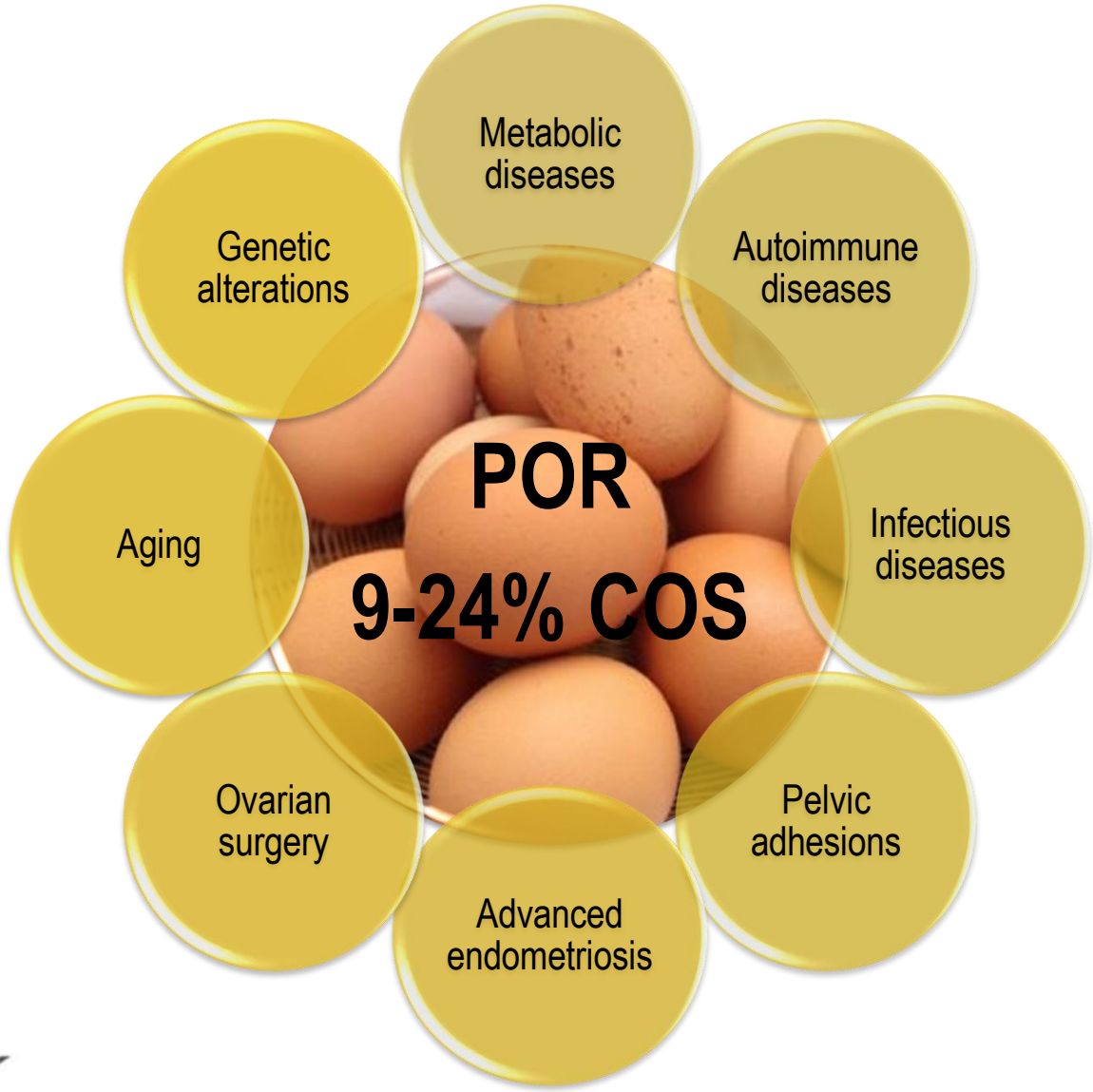
OBJECTIVE

MATERIAL AND METHODS

RESULTS

CONCLUSION

Poor ovarian response (POR)



FERTILITY

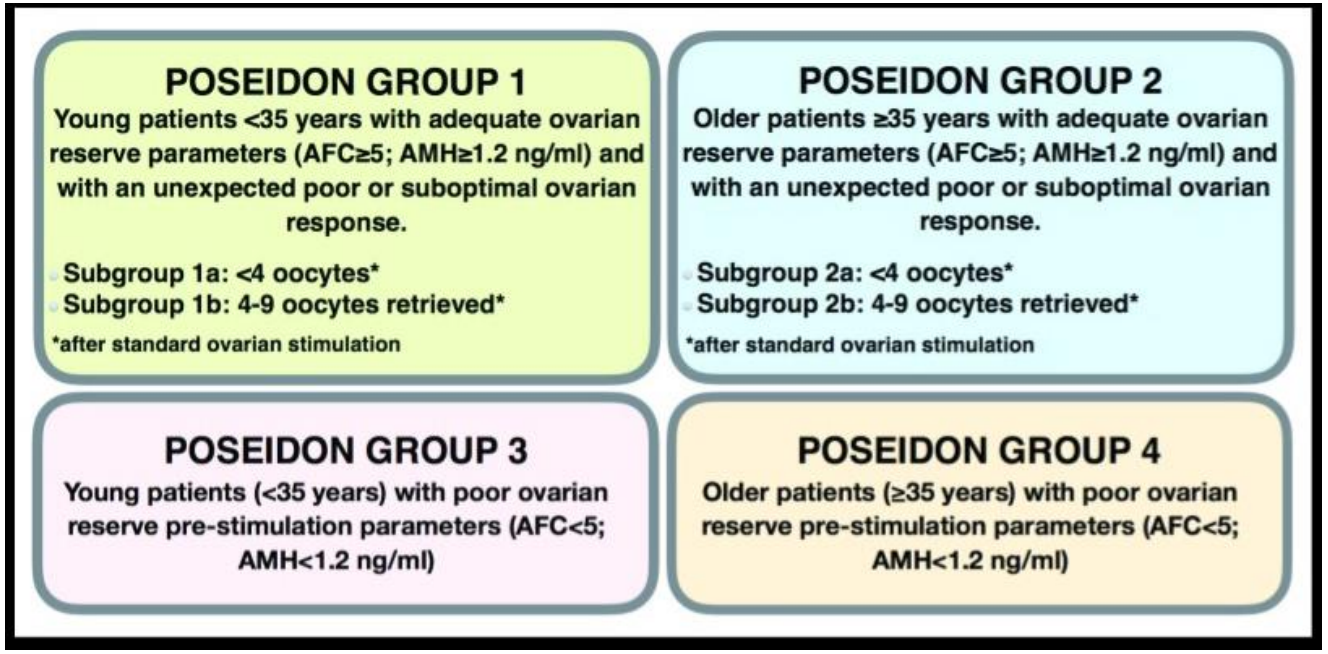
Drakopoulos et al., 2020

POR diagnosis

Editorial > Fertil Steril. 2016 Jun;105(6):1452-3. doi: 10.1016/j.fertnstert.2016.02.005.
Epub 2016 Feb 26.

A new more detailed stratification of low responders to ovarian stimulation: from a poor ovarian response to a low prognosis concept

Poseidon Group (Patient-Oriented Strategies Encompassing IndividualizeD Oocyte Number);
Carlo Alviggi [1], Claus Y Andersen [2], Klaus Buehler [3], Alessandro Conforti [1], Giuseppe De Placido [1], Sandro C Esteves [4], Robert Fischer [5], Daniela Galliano [6], Nikolaos P Polyzos [7], Sesh K Sunkara [8], Filippo M Ubaldi [9], Peter Humaidan [10]



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Hypothesis

POSEIDON 1

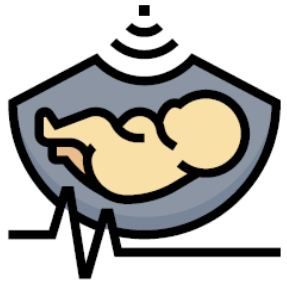
POSEIDON 2

POSEIDON 3

POSEIDON 4

Distinct reproductive outcomes

Chinta et al., 2021; Leijdekkers et al., 2019



Groups 1-4

Patients categorized in different POSEIDON groups not only respond distinctly to COS, but also present with different oocyte and embryo qualities

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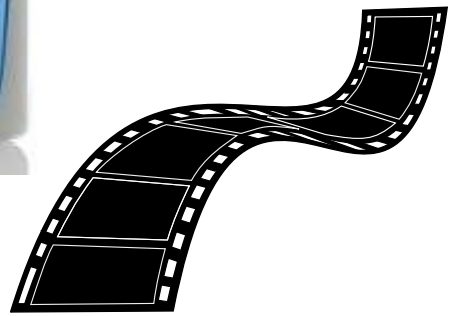
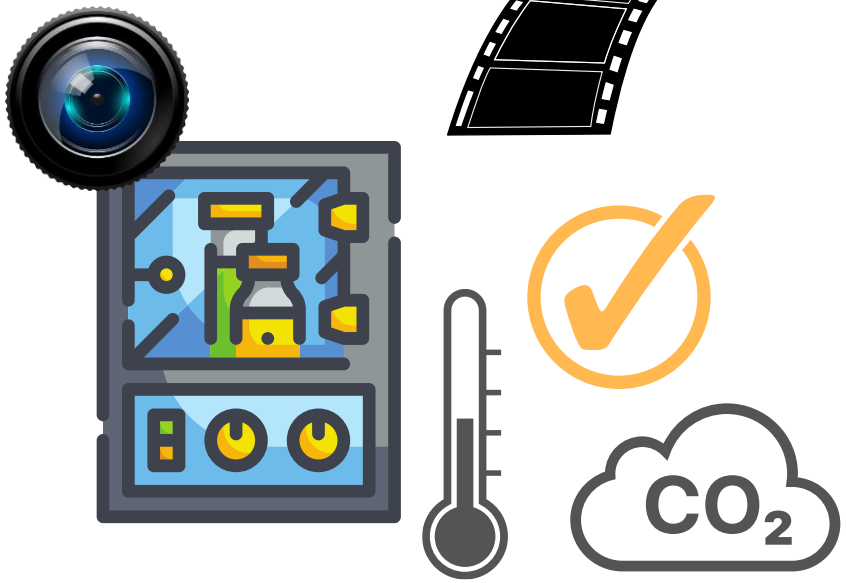
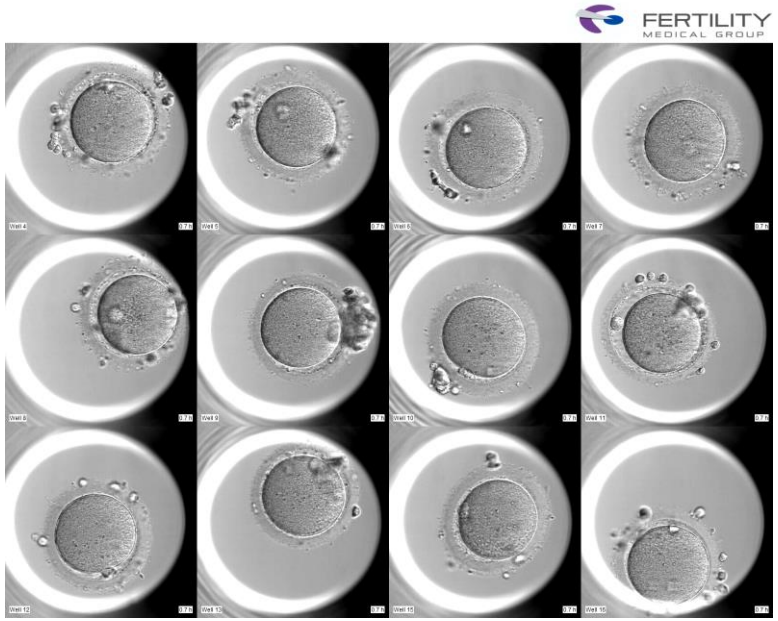
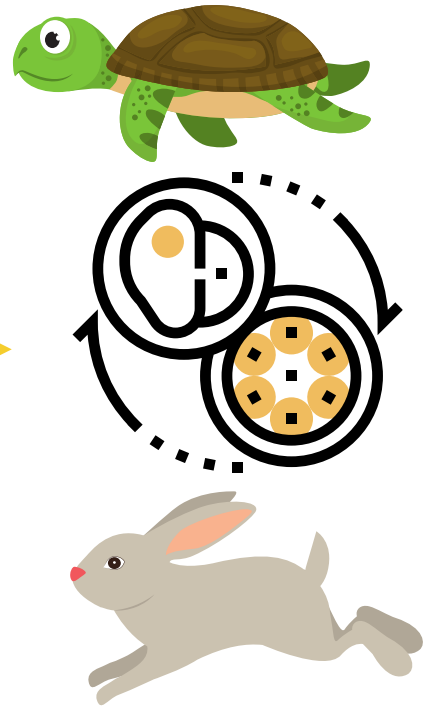
Time-lapse imaging system









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Objective

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To compare embryo quality, and speed and pattern of cell divisions in the four groups of POR as stratified by the POSEIDON criteria.

Material and methods

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Design

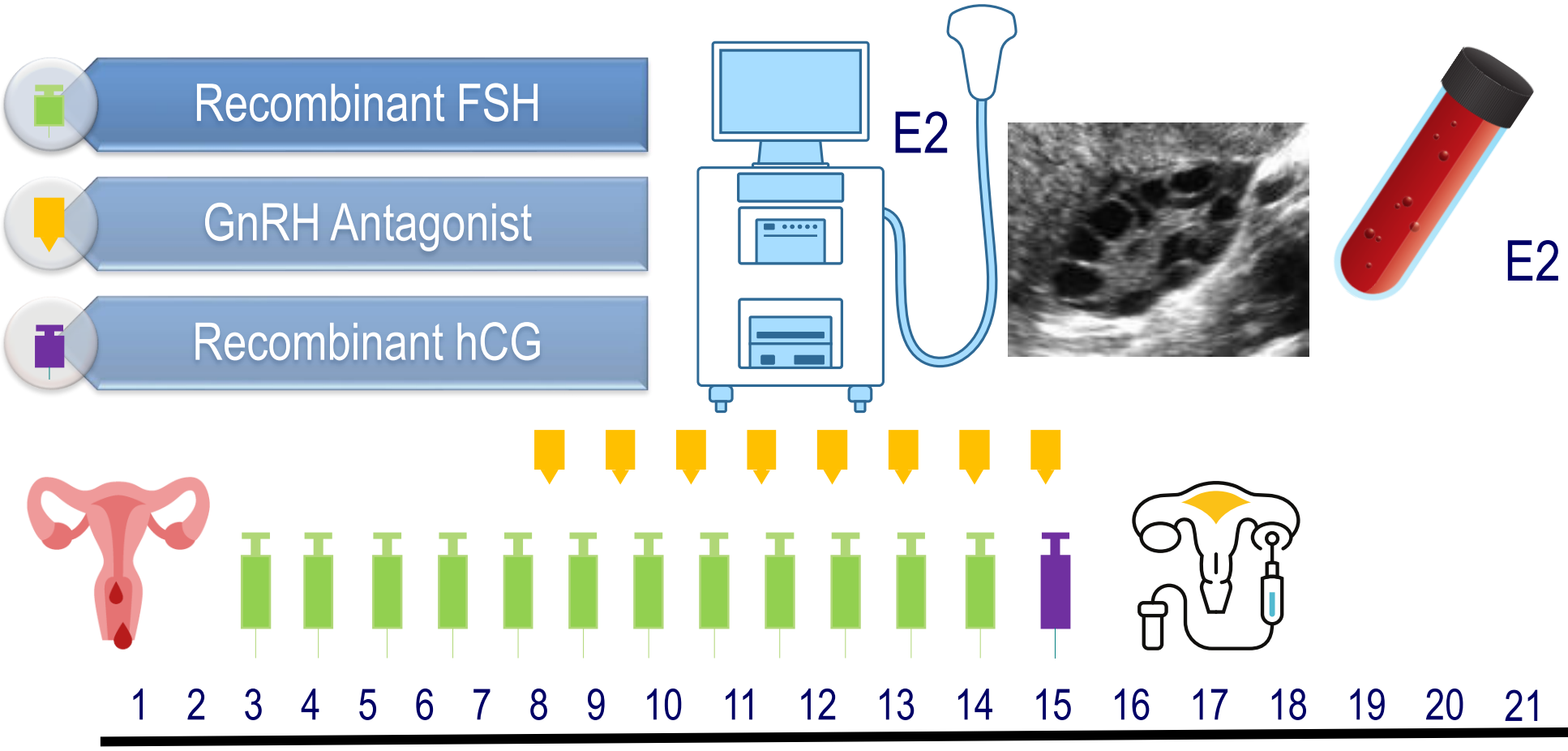
Retrospective cohort study

Mar 2019 – Apr 2022

Morphokinetic events and ICSI clinical outcomes were compared among the groups.

FERTILITY

Controlled ovarian stimulation



FERTILITY

Embryo culture

Until day 5

11 focal planes

Every 10 minutes

One or two embryos transferred on D5

FERTILITY

Data analysis and statistics

Post hoc power analysis

Glimmpse

α 5%

1328 blastocysts

Effect tB

Superior to 80%

IBM SPSS Statistics

GMM – Bonferroni post hoc

Morphokinetic development

Random effect

GzLM – Bonferroni post hoc

Clinical outcomes

Single observation per couple – no random effect

OR or Beta coefficient (B)

95% CI

p-values (5%)

Results

INTRODUCTION ✓

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Comparison of demographic data and cycles' characteristics among POSEIDON groups (n=846 cycles)

Variable	POSEIDON 1 (n=144)	POSEIDON 2 (n=570)	POSEIDON 3 (n=24)	POSEIDON 4 (n=128)	p-value
Female age (years)	33.5 ± 0.2 [a]	39.4 ± 0.1 [b]	33.5 ± 0.4 [a]	40.1 ± 0.2 [c]	**<0.001**
Male age (years)	36.6 ± 0.5 [a]	40.4 ± 0.2 [bc]	37.7 ± 1.2 [ab]	41.5 ± 0.6 [c]	**<0.001**
Female BMI (kg/m^2)	24.0 ± 0.4 [a]	23.8 ± 0.8 [a]	24.4 ± 0.2 [a]	24.5 ± 0.3 [a]	0.654
Total dose of FSH	2377.6 ± 84.7 [a]	2807.0 ± 44.8 [b]	2221.9 ± 22.2 [ab]	2599.3 ± 101.9 [ab]	**<0.001**
Aspirated follicles (n)	9.2 ± 0.2 [a]	8.1 ± 0.1 [b]	6.4 ± 0.5 [c]	4.6 ± 0.2 [d]	**<0.001**
Retrieved oocytes (n)	6.0 ± 0.2 [a]	5.1 ± 0.1 [b]	4.7 ± 0.4 [b]	3.1 ± 0.2 [c]	**<0.001**
Mature oocytes (n)	4.5 ± 0.2 [a]	3.7 ± 0.1 [b]	4.0 ± 0.4 [ab]	2.2 ± 0.1 [d]	**<0.001**
Mature oocyte rate (%)	74.2 ± 2.0 [a]	73.1 ± 1.0 [a]	86.4 ± 2.0 [a]	72.4 ± 2.0 [a]	0.085
Fertilization rate (%)	72.2 ± 2.4 [a]	69.0 ± 1.2 [ab]	72.1 ± 2.8 [a]	53.9 ± 2.2 [b]	**0.039**
Blastocyst development (%)	48.6 ± 3.1 [a]	41.2 ± 1.5 [b]	37.0 ± 3.6 [b]	30.3 ± 3.2 [b]	**0.035**
Transferred embryos (n)	1.7 ± 0.2 [a]	1.6 ± 0.1 [a]	1.5 ± 0.6 [a]	1.6 ± 0.3 [a]	0.954

Note: Values are means ± standard error, unless otherwise noted. Different letters within the same line represent statistically significant differences.

FERTILITY

Comparison of morphokinetic parameters among the POSEIDON groups (n=846 cycles and 3326 injected oocytes)

Variables (h)	POSEIDON 1 (n= 660 embryos)	POSEIDON 2 (n= 2206 embryos)	POSEIDON 3 (n= 86 embryos)	POSEIDON 4 (n= 374 embryos)	p-value
tPNa					
tPNf					
t2					
t3					
t4					
t5					
t6					
t7					
t8					
tM					
tsB					
tB					

Note: Values are means ± standard error, unless otherwise noted. tPNa – timing to pronuclei appearance, tPNf – timing to pronuclei fading, t2 – timing to two cells, t3 – timing to three cells, t4 – timing to four cells, t5 – timing to five cells, t6 – timing to six cells, t7 – timing to seven cells, t8 – timing to eight cells, tSB – timing to start blastulation, tB – timing to blastulation. Different letters within the same line represent statistically significant differences.

FERTILITY

Comparison of morphokinetic parameters among the POSEIDON groups (n=846 cycles and 3326 injected oocytes)

Variables (h)	POSEIDON 1 (n= 660 embryos)	POSEIDON 2 (n= 2206 embryos)	POSEIDON 3 (n= 86 embryos)	POSEIDON 4 (n= 374 embryos)	p-value
cc2	11.1 ± 0.2 [a]	11.0 ± 0.1 [a]	11.0 ± 0.2 [a]		**0.018**
cc3	12.9 ± 0.3 [a]	13.1 ± 0.1 [a]	13.7 ± 0.7 [a]		0.559
s1	2.7 ± 0.1 [a]	3.0 ± 0.1 [a]	2.5 ± 0.3 [a]		0.082
s2	1.6 ± 0.2 [a]	2.4 ± 0.1 [b]	2.6 ± 0.5 [ab]		**0.002**
s3	9.2 ± 0.4 [a]	10.1 ± 0.2 [ab]	11.3 ± 1.1 [ab]		**0.012**

Note: Values are means ± standard error, unless otherwise noted. s1 – timing to complete t2-tPNf synchronous divisions, s2 – timing to complete t4-t3 synchronous divisions, s3 – timing to complete t8-t5 synchronous divisions, cc2 – duration of the second cell cycle (t3-t2), cc3 – duration of third cell cycle (t5-t3). Different letters within the same line represent statistically significant differences.

FERTILITY

Comparison of intracytoplasmic sperm injection (ICSI) clinical outcomes among POSEIDON groups (n=846 cycles)

Variable	POSEIDON 1 (n=144)	POSEIDON 2 (n=570)	POSEIDON 3 (n=24)	POSEIDON 4 (n=128)	p value
Implantation rate (%)	26.9 ± 0.7 [a]	22.4 ± 0.4 [b]	20.0 ± 1.0 [ab]	14.0 ± 0.7 [b]	<0.001

Note: Values are means ± standard error, unless otherwise noted. Different letters within the same line represent statistically significant differences.

FERTILITY

Conclusion

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- CONCLUSION

- ✓ Embryo quality and morphokinetic behavior differed across the POSEIDON groups, being more favorable in POSEIDON group 1, as well as implantation, clinical pregnancy, and miscarriage rates.

- ✓ Embryo development was more favorable in POSEIDON group 1 (young age and adequate ovarian reserve), suggesting that oocyte quality is determinant of embryo developmental potential.

- ✓ These findings show the reasonability of stratifying POR by the POSEIDON criteria and provide information for the appropriate counselling of POR regarding their possible prognosis.

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FERTILITY

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