MONOZYGOTIC TWINNING IS ASSOCIATED WITH DYSMORPHIC EMBRYONIC CLEAVAGE FACTORS IN ASSISTED REPRODUCTIVE TECHNOLOGY CYCLES

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Background

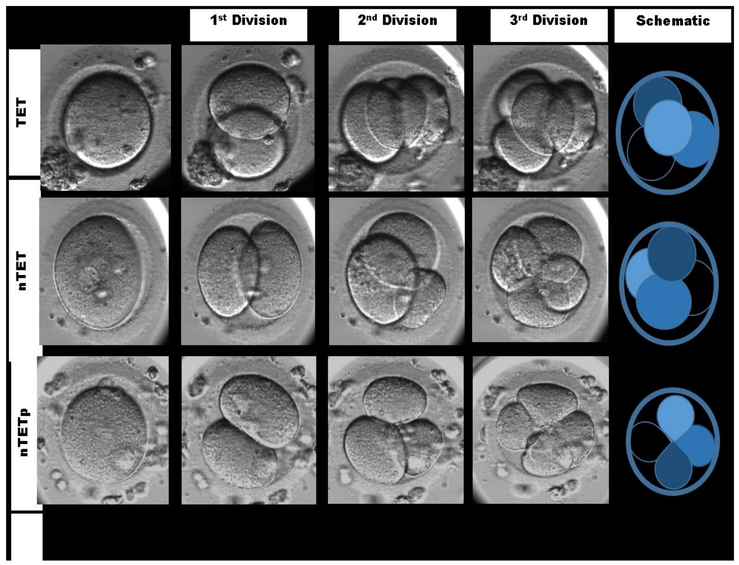
- Monozygotic twinning occurs more frequently in assisted reproduction technology (ART) cycles than in unassisted conception, though the exact cellular causes after single embryo transfer in ART cycles remain unclear.
- Studying embryologic traits linked to monozygotic twinning can help refine risk assessment and embryo selection, improving maternal and neonatal outcomes.

Objective

To evaluate if there is an association between embryonic cleavage planes and division kinetics and monozygotic twinning in single embryo transfers.

Methods

- Monozygotic twin pregnancies over a 4-year period (January 2020-December 2024) were identified from ART cycles with a single blastocyst transfer.
- Monozygotic pregnancies (n=44) were compared to a consecutively selected control group of singleton pregnancies (n=122) during the same time interval.
- Patient demographic data was extracted.
- Embryoscope time-lapse videos were evaluated to assess cleavage plane and morphokinetics of embryo development from zygote to blastocyst. The first 3 cleavage events were classified as meridional or equatorial. Descriptive statistics and chi squared tests were performed.

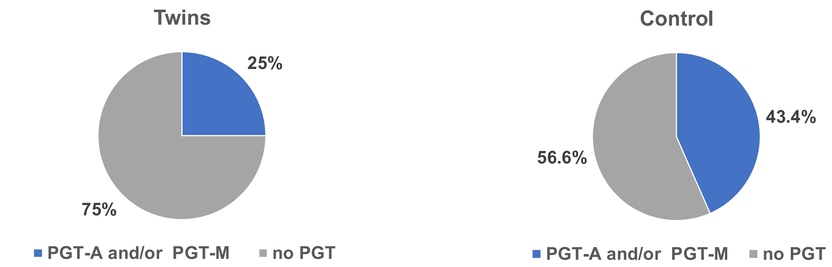


Desai N, Gill P. Blastomere cleavage plane orientation and the tetrahedral formation are associated with increased probability of a good-quality blastocyst for cryopreservation or transfer: a time-lapse study. Fertil Steril. 2019

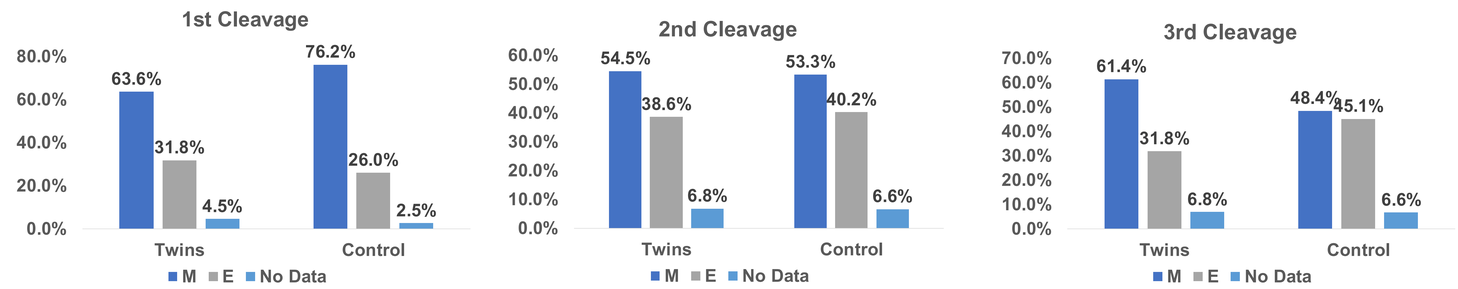
Results

Demographic and cycle characteristic data did not differ significantly between monozygotic twin and control groups.

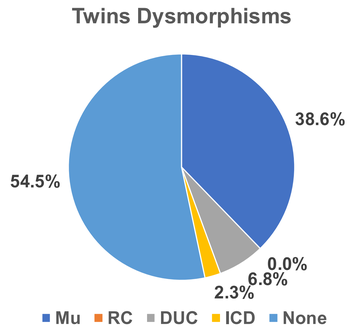
Use of preimplantation genetic testing (PGT) with blastocyst embryo biopsy was higher in the control group (43.3%) than the twinning group (25%) (p=0.03).

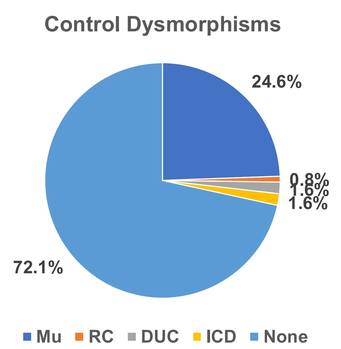


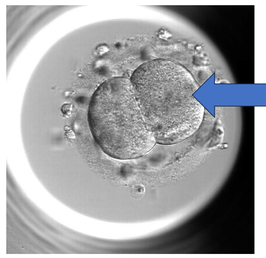
There were no statistically significant associations in the distribution of meridional (M) versus equatorial (E) cleavage planes between the groups.



There was a greater percentage of dysmorphisms observed with twins versus controls (47.7% vs. 28.7%, p=0.027).
Types of dysmorphisms included multinucleated, reverse cleavage, uneven cleavage, and irregular chaotic division.







Example of multinucleated dysmorphism (3 visible nuclei)

There was no significant difference between groups regarding pronuclei position at the 1-cell stage (linear, intermediate, perpendicular, not visible; p=0.36), polarity (p=0.83), tetrahedral vs. non-tetrahedral (including planar; p=0.675), evenness of blastomeres (p=0.32), or the presence of exclusions and/or extrusions (p=0.73).

Conclusions and Further Directions

- Our retrospective study of monozygotic twins in ART cycles after single embryo transfer demonstrated **more dysmorphisms in embryonic cleavage in embryos resulting in monozygotic twins** as compared to embryos resulting in singleton pregnancies.
- The use of PGT-A and/or PGT-M **did not** increase the rates of monozygotic twinning.
- Further investigation of embryoscope data may provide additional insights regarding predictive factors for monozygotic twinning.
- Next steps include expansion of the data set to determine if any additional differences between groups can be found.