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Cumulative live birth rate after IVF - trend over time and the impact of blastocyst culture and vitrification

Z. Saket[1], K. Kallen[2], K. Lundin[1], Å. Magnusson[1], C. Bergh[1]

[1]Institute of Clinical Sciences- Sahlgrenska Academy, Department of Reproductive Medicine- Sahlgrenska University Hospital- SE-413 45 Göteborg- Sweden, Gothenburg, Sweden

[2]Intitution of Clinical Sciences- Lund University, Department of Obstetrics and Gynecology- Tornblad Institute, Lund, Sweden

Study question:
Has cumulative live birth rate (CLBR) improved over time and which factors are associated with such an improvement?

Summary answer:
During 2007-2017, CLBR per oocyte aspiration increased significantly (27.0 % to 36.3 %), in parallel with an increase in blastocyst transfer and cryopreservation by vitrification.

What is known already:
While it has been shown that live birth rate (LBR) per embryo transfer (ET) is higher for fresh blastocyst than for fresh cleavage stage embryo transfer, CLBR per oocyte aspiration, including one fresh ET and all subsequent frozen embryo transfers (FET), does not seem to differ between the two culture strategies.

Study design, size, duration:
STUDY DESIGN, SIZE, DURATION: National register study including all oocyte aspirations performed in Sweden 2007-2017, n=124 700. Donation cycles excluded.

Participants/materials, setting, methods:
Data were retrieved from the Swedish National Registry of Assisted Reproduction (Q-IVF). CLBR was defined as the number of deliveries with at least one live birth resulting from one oocyte aspiration, including all fresh and/or frozen embryo transfers within one year. The delivery of a singleton, twin, or other multiples was registered as one delivery. Cryopreservation of cleavage stage embryos was performed by slow freezing and of blastocyst by vitrification.

Main results and the role of chance:
Overall, the CLBR per oocyte aspiration increased significantly during the study period, from 27.0 % to 36.3 % (OR 1.039, 95% CI 1.035-1.043) and from 30.0 % to 43.3 % if at least one ET was performed (AOR 1.055, 95% CI 1.050-1.059). The increase in CLBR was independent of maternal age, number of oocytes retrieved and number of previous IVF live births. The CLBR for women <35 years and ≥ 35 years both increased significantly, following the same pattern. During the study period a substantially increasing number of blastocyst transfers were performed, both in fresh and in FET cycles. An important contributor included in the blastocyst strategy, may be the extended culture of the total cohort of embryos, also embryos earlier discarded at early cleavage stages, in order to reach the blastocyst stage. These embryos may contribute to the total number of available blastocysts and thereby increase the chance of a live birth within that oocyte aspiration cycle. Other important predicting factors for live birth, such as number of embryos transferred, could not explain the improvement, on the contrary the single embryo transfer (SET) rate increased with time.

Limitations, reasons for caution:
The retrospective design implicates that other confounders of importance for CLBR can not be ruled out. In addition, some FET cycles might be performed later than one year post oocyte aspiration for the last year (2017) and are thus not included in this study.

Wider implications of the findings:
The results suggest that blastocyst transfer, particularly when used in FET cycles and in combination with vitrification, is an important contributor to the improved live birth rates over time. This gives a possibility for fewer oocyte aspirations needed to achieve a live birth and a shortened time to live birth.

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