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Subfertility versus in vitro fertilization procedures: unravelling the origins of fetal cardiac remodeling in assisted reproductive technologies

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Objective

To assess cardiac structure and function in fetuses spontaneously conceived fetuses from subfertile and fertile couples and compared it to those conceived by in vitro fertilization (IVF).

Methods

Prospective cohort study of singleton pregnancies recruited from 2017 to 2021, including 96 spontaneously conceived pregnancies from fertile couples (time-to-pregnancy less than 12 months), 97 spontaneously conceived from subfertile couples (time-to-pregnancy over 12 months) and 96 from IVF (in vitro fertilization after fresh embryo transfer). Fetal echocardiography was performed in all pregnancies at 29-34 weeks. Echocardiographic comparisons were adjusted by nulliparity, birthweight centile, gestational age and estimated fetal weight at scan.

Results

Parental age, ethnicity, body mass index and smoking exposure, median gestational age and estimated fetal weight were similar in all study groups. While both fertile and subfertile SC groups presented similar fetal cardiac results, fetuses conceived by IVF showed larger atria (right atria-to-heart ratio: IVF mean 18.9% [SD 3.4] versus subfertile 17.8% [3.5] versus fertile 17.6% [3.3]; P-value<0.001), more globular ventricles (right ventricular sphericity index: IVF 1.56 [0.25] versus subfertile 1.72 [0.26] versus fertile 1.72 [0.26]; <0.001), and thicker myocardial walls (relative wall thickness: IVF 0.86 [0.22] versus subfertile 0.64 [0.13] versus fertile 0.64 [0.18]; <0.001). Whereas SC fetuses from fertile and subfertile couples had preserved cardiac function, IVF fetuses showed signs of suboptimal systolic and diastolic function with reduced tricuspid ring displacement (IVF 7.26 mm [1.07] versus subfertile 8.04 mm [1.18] versus fertile 7.89 mm [1.51]; <0.001) and increased left myocardial performance index (IVF 0.49 [0.08] versus subfertile 0.45 [0.09] versus fertile 0.45 [0.10]; <0.001).

Conclusion

Subfertility per se does not seem to be associated to fetal cardiac remodeling, which have been previously described in IVF fetuses. Future studies are warranted to further investigate the factors related to fetal cardiac changes associated to IVF.