Differential effect of intrauterine growth restriction and assisted reproductive technologies on fetal cardiovascular remodeling

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Objective

Intrauterine growth restriction (IUGR) and assisted reproductive technologies (ART) have been independently related to cardiovascular remodeling in-utero. Pregnancies conceived by ART present a higher incidence of IUGR than the normal population, which may contribute to the degree and nature of cardiac remodeling observed in ART. Our aim was to evaluate the differential effect of ART and IUGR on cardiac remodeling.

Methods

A prospective cohort study including term singleton pregnancies divided into four groups: 70 normally grown fetuses conceived spontaneously (controls), 65 normally grown fetuses conceived by ART (ART-AGA), 25 IUGR fetuses conceived by ART (ART-IUGR) and 70 growth restricted fetuses conceived naturally (IUGR). IUGR was defined as birthweight below 10th centile. Fetal echocardiographic assessment was performed at third trimester of pregnancy.

Results

Different patterns of cardiovascular remodeling could be observed in ART and IUGR. ART fetuses (with or without IUGR) presented larger right atria (controls 1. 41 cm2 (IQR 0. 29) vs. ART 1. 6 cm2 (0. 72), P<0. 001) together with shorter and thicker ventricular walls (septal thickness: controls 2. 4 mm (0. 5) vs. ART 2. 7 (1. 5), P<0. 001), with more predominant changes in the right heart. In contrast, IUGR fetuses showed larger hearts (cardio-thoracic ratio: controls 0. 24 (0. 2) vs. IUGR 0. 31 (0. 4) P<0. 001) and more globular ventricles (left sphericity: controls 1. 78 (0. 3) vs. IUGR 1. 55 (0. 4) P<0. 001). Both ART and IUGR presented signs of systolic and diastolic dysfunction (tricuspid annular ring displacement: controls 0. 1 z-scores (0. 9) vs. ART -1. 2 (0. 7) vs. IUGR -1. 7 (0. 9) P<0. 001). IUGR fetuses conceived by ART presented a mixture of cardiovascular characteristics from both insults.

Conclusion

IUGR and ART present distinct patterns of fetal cardiac remodeling, which supports that they are independent causes of cardiac programming.