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Change in global strain during the first months of life in children born after intra-uterine growth restriction.

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Background and objectives: Being born small for gestational age (SGA) may be associated with cardiovascular disease and metabolic disorders in adult life. Underlying changes may be detected early in life. We have assessed left ventricular function in children from suspected intra-uterine growth restriction (IUGR) pregnancies compared to non-affected controls shortly after birth and after 3-4 months.

Subjects and methods: In this prospective controlled study, pregnancies with IUGR > 22% weight deviation were identified by ultrasound examinations due to suspected IUGR. Control pregnancies were identified at routine ultrasound examinations at gestational week 18-20.

Echocardiography (Vivid E9, GE Ultrasound) analysed with Velocity vector imaging (VVI, Siemens Medical Solutions) was used to determine cardiac motion by tracking the grey scale image. Longitudinal velocity, displacement and strain were assessed. Standardized 4-chamber loops were recorded at birth (12-72 hours) and at 3-4 months after delivery for blinded off-line analysis.

Results: We included 20 infants with IUGR [mean (SD) prenatal weight deviation -30.6 (10,48)%, BW 2.0 (0.8) kg, BW SDS -2.6 (1.1), GA 36.3 (3.9) weeks] and 35 non-affected controls [BW 3.4 (0.4) kg, BW SDS 0.00 (0.8), GA 39.8 (1.5) weeks)]. At birth, global strain did not differ between the groups [-16.5 (2.9) % and -16.7 (3.3) %, respectively]. In IUGR, no change in strain at 3-4 months was observed [-17.4 (2.5) %] while controls significantly increased [-18.9 (3.8) %, P= 0.002] resulting in a lower global strain in IUGR compared to controls (P = 0.041). Longitudinal velocity and displacement were significantly different at birth and at 3-4 months. However, this difference was lost by correction for left ventricular length.

Conclusions: Our data suggest that children with IUGR have less pronounced development of global strain over the first 3-4 months of life resulting in less systolic deformation which could indicate a propensity for cardiovascular disease in adult life. We found that IUGR related differences in myocardial longitudinal velocity or displacement of basal segments, also previously reported, were related to cardiac size. Global strain, purportedly independent of heart size may be a better marker of changes in cardiovascular function in early life.