ALTERED RIGHT ATRIAL FUNCTION DEVELOPS DURING FETAL LIFE IN HYPOPLASTIC LEFT HEART SYNDROME

ACC Moderated Poster Contributions
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Background: Atrial dysfunction predicts morbidity and mortality in adult heart failure and correlates with myoarchitectural changes. Children with single ventricle hearts also demonstrate abnormal atrial function. We have recently showed that fetuses with hypoplastic left heart syndrome (HLHS) develop right ventricular (RV) dysfunction function similar to the changes in children with palliated HLHS. However, it is unclear whether atrial dysfunction begins prenatally. We sought to determine if fetuses with HLHS show altered right atrial (RA) function.

Methods: Echocardiograms from 46 fetuses with HLHS were retrospectively compared to gestation matched controls (range 19-39 weeks). RA and RV function were assessed using Velocity Vector Imaging peak global velocity, displacement, strain (ε) and strain rate (SR). The fraction of total tricuspid inflow Doppler velocity time integral due to the A wave (atrial fraction) and RA 2D area were also examined.

Results: HLHS fetuses had reduced mean RA relaxation and contraction velocities, displacement, reservoir ε and contraction SR (all P<0.0001). These reductions progressively diverged from controls (all P<0.05), as did increases in RA area (max P<0.05, min P<0.0001). RA fractional area change was reduced (P<0.05), whilst atrial fraction (P<0.05) was increased in HLHS compared to controls. Pooled data showed good correlations (all P<0.0001) between RA reservoir ε with RV ε (r=-0.47) and RV SR (r=-0.50), similarly RA contraction SR correlated with RV ε (r=0.53) and RV SR (r=0.64). Whilst no relationship between RA area and RA contraction SR was observed in controls, RA area negatively correlated with RA contraction SR in HLHS fetuses (RA area max r=-0.32, P<0.05, min r=-0.47, P<0.01)

Conclusion: In fetal HLHS the RA progressively dilates with RV filling more dependent on RA contraction, suggestive of altered RV diastolic properties. Although RA deformation is strongly influenced by RV systolic function, atrial dilatation also appears to negatively impact on atrial function. Impaired RA contractile performance may be a consequence of altered loading or reflect developing intrinsic changes in atrial myoarchitecture.