

AORTIC COARCTATION: A COMPREHENSIVE BIOMECHANICAL ANALYSIS OF SHAPE, SIZE AND FUNCTION OF THE FETAL HEART

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Objectives: We examined the four-chamber view (4CV) and right (RV) and left (LV) ventricles using 181 measurements to evaluate the shape, size and function of the right (RV) and left (LV) ventricles of the heart in fetuses with coarctation of the aorta (CoA).

Methods: This was a retrospective case series comparing the 4CV of CoA fetuses and controls. The 4CV end diastolic area, length, width and sphericity index were measured to determine the configuration of the 4CV. Speckle tracking analysis was used to compute the RV and LV end-diastolic area, length, 24-segment sphericity index, 24-segment transverse width and the following functional parameters: fractional area change; global, lateral, and septal strain; basal-apical, lateral and septal annular displacement and fractional shortening and 24-segment transverse width fractional shortening. The Z-Score values of CoA vs. 200 controls were compared using nonparametric testing.

Results: 51 Co-A fetuses were compared to 200 controls. The 4CV CoA heart was significantly increased in width, decreased in length and more globular in shape. Abnormal CoA sphericity indices reflected a flatter LV and a more spherical shaped RV. The LV area, length, width and RV length were decreased in size. The transverse width of the RV was increased in size. RV and LV global, longitudinal and circumferential function were depressed in fetuses with CoA.

Conclusions: This novel and comprehensive assessment demonstrates previously unappreciated differences in the shape, size and function of the heart in fetuses with CoA. These differences may assist examiners in differentiating fetuses with and without CoA.

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