MP1-5

Accuracy of prenatal diagnosis of coarctation of the aorta using z-scores

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Aim: To assess the utility of new z-scores and prospective measurements of the outflow tracts in the prenatal diagnosis of coarctation of the aorta (COA).
Methods: All continuing cases of COA (including with ventricular septal defect or persistent left superior caval vein) from 1998 to 2016. The period was divided into two eras, era 1 between 1998-2007 where the outflow tract measurements were made retrospectively and era 2 between 2008 – 2016 where the measurements were made prospectively. Diameters of the aortic valve, pulmonary valve, distal transverse aortic arch (DTAA) and arterial duct (AD) were taken from the echocardiogram closest to 20 weeks. New z-scores created from prospectively made measurements from 7000 normal fetuses were used to calculate z-scores for the measured parameters.
Results: There were 193 fetuses with prenatal suspicion of COA. COA was confirmed after birth in 56/107 (52%) in era 1 and in 42/86 (49%) in era 2. There was no significant difference between the true COA and false positive groups in the incidence of nuchal translucency measurement (p=0.3), presence of left superior vena cava (p=0.3) or VSD (p=0.7). Bicuspid aortic valve was seen in 22/37 (59%) of the true coarctation group and 13/46 (28%) of the false positive group (p=0.04).
The z-scores of the cardiac measurements are shown in table 1. The aortic valve and DTAA z-scores were significantly smaller in the true COA cases compared to the false positive cases, but there was considerable overlap. Multiple regression analysis demonstrated that DTAA z-score was the only significant predictor (p=0.004) with an area under the receiver operator curve of 0.712 (p<0.001). DTAA z-score <0 confers a sensitivity of 100%, but with a false positive rate of 90%. To achieve a false positive rate of 50% the DTAA z-score cut-off would be -2.65 and a sensitivity of 83% would need to be accepted.
Conclusion: Bicuspid aortic valve is overrepresented in the false positive group compared to the normal population. Despite the acquisition of prospectively acquired measurement of the outflow tracts, biometry alone is not sufficient to reduce the false positive rate, this suggests that further factors need to be identified to improve the prenatal diagnostic accuracy.

	Era 1: 1998-2007	Era 2: 2008-2016				
	True coarctation (n=56)	False positives (n=51)	P value	True coarctation (n=42)	False positives (n=46)	P value
Gestation at scan (range) in weeks	21(19-32)	22 (16-36)	0.59	22 (15-32)	23 (19-33)	0.57
Pulmonary valve Z score	1.5 (-1.5 to 3.3)	0.8 (-2.2 to 4.1)	0.15	1.5 (-1.4 to 2.5)	1.0 (-6.9 to 3.4)	0.44
Aortic valve Z score	-1.5 (-6.8 to 2.0)	-1.3 (-5.4 to 3.8)	0.04	-2.0 (-6.2 to 2.7)	-1.4 (-5.7 to 4.8)	0.06
Aortic:pulmonary valve diameter	0.62 (0.39-0.85)	0.68 (0.49-1.02)	0.001	0.62 (0.40-1.03)	0.70 (0.45-0.91)	0.01
Arterial duct Z score	0.9 (-4.4 to 3.4)	0.4 (-3.3 to 3.8)	0.11	0.8 (-4.0 to 2.7)	0.4 (-3.5 to 2.7)	0.3
DTAA diameter	1.8 (1.1 - 3.2)	2.3 (1.3 - 4.3)	<0.001	2.0 (0.8 - 3.3)	2.3 (1.3 - 3.5)	0.007
DTAA Z score	-3.7 (-9.3 to -0.2)	-2.1 (-7.1 to +2.5)	<0.001	-3.8 (-10.9 to -0.3)	-2.7 (-6.2 to +1.2)	0.005
DTAA: arterial duct	0.66 (0.26 -1.18)	0.81 (0.53 -1.50)	<0.001	0.66 (0.3-1.09)	0.75 (0.26-1.45)	0.02
No. of cases of bilateral superior vena cava	10/55	9/52	0.91	9/42	11/44	0.70