

Coronary orifices patterning in outflow tract defects: a marker of outflow tract rotation during cardiac development.

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Background: Coronary arterial anatomy is often abnormal in cardiac outflow tract defects (OTD), particularly in common arterial trunk (CAT). Our hypothesis is that the position of the coronary orifices on the aortic/truncal circumference in OTD could be related to the location of a coronary-repulsive subpulmonary myocardial domain that influences the epicardial course of the main stems and their final connection to the aorta.

Material: We analyzed 101 heart specimens with OTD from the anatomic collection of the French Reference Center for Complex Congenital Heart Defects: 46 CAT, 15 tetralogy of Fallot (TOF), 29 TOF with pulmonary atresia (TOF-PA), 11 double-outlet right ventricle with subaortic ventricular septal defect (DORV), and 17 controls.

Methods: Hearts were analyzed in anatomic position with the extremities of the right and left atria on the intersecting line of a horizontal and vertical plane. The position of left and right coronary orifices (LCO, RCO) was measured in degrees on the aortic/truncal circumference, and their configuration analyzed. We calculated the anterior angle between LCO and RCO (α) that represents the area devoid of coronary orifices.

Results: The LCO was more posterior in OTD compared to control, mean position 0° in controls, 31° in TOF, 47° in TOF-PA, 44° in DORV, 63° in CAT ($p<0.005$). The LCO was more posterior in CAT than in other OTD ($p<0.05$).

The RCO was more anterior in TOF (242°), TOF-PA (245°) and DORV (271°) than in controls (213°, $p<0.05$), but not in CAT (195°).

The α angle was similar in TOF, TOF-PA, DORV and control (respectively 149°, 162°, 133° and 147°) but significantly larger in CAT (229°, $p<0.0001$).

Coronary orifices were abnormal in 87% CAT (LCO 72%, RCO 42%), 20% TOF, 17% TOF-PA, 9% DORV, 23% controls.

Conclusion: In all OTD but CAT, the posterior displacement of LCO and anterior displacement of RCO, while the α angle remains constant, might be due to incomplete rotation of the myocardium at the base of the outflow tract, leading to abnormally positioned subpulmonary myocardial domain. The larger α angle, and the abnormal configuration of LCO found in CAT, could reflect its dual identity, aortic and pulmonary.