

Assessment of Vascular Phenotype Using a Novel Very High Frequency Ultrasound Technique in Adolescents after Aortic Coarctation Repair and/or Stent Implantation: Relationship to Central Hemodynamics and Left Ventricular Mass

*Sarkola T. (1,3), Redington A. (1,2), Slorach C. (1), Hui W. (1), Bradley T. (1), Jaeggi E. (1,2)
Division of Cardiology, Labatt Family Heart Centre (1) and the Research Institute (2), The Hospital for Sick Children, University of Toronto, Toronto, Canada; Helsinki University Central Hospital for Children and Adolescents, Helsinki, Finland (3).*

Background: Coarctation of the aorta (CoA) is associated with abnormal vascular function, increased blood pressure (BP) and premature cardiovascular disease even after successful intervention. We postulated that residual abnormalities of arterial structure and function and left ventricular (LV) mass are directly related to BP.

Methods: Thirty-six youths with CoA (age 16 ± 1 years; neonatal surgery only $n=16$ and/or stent implantation in childhood or adolescence $n=20$) and 37 age-matched controls were prospectively examined by very-high resolution vascular ultrasound imaging (25-55 MHz), echocardiography and applanation tonometry.

Results: CoA was associated with increased right arm systolic BP ($p<0.001$), intima-media thickness (IMT) in the common carotid ($p<0.001$), right brachial ($p<0.05$) and radial ($p<0.05$) arteries and ascending aortic stiffness ($p<0.05$). Carotid IMT correlated positively with age at first intervention ($r=0.36$, $p<0.05$). With left subclavian flap type repair, left arm systolic BP ($p<0.001$) and left brachial ($p<0.001$), radial ($p<0.001$) and ulnar ($p<0.05$) arterial IMTs were all reduced. When adjusted for BP, body mass index, age and gender, only carotid IMT ($p<0.001$) and LV-mass ($p=0.013$) of stented patients, as well as left arm arterial IMTs ($p<0.01$) in subclavian flap type repair patients remained different from controls. No differences between CoA and controls were found for arterial adventitial thicknesses, lumen dimensions, thigh systolic BP, abdominal aorta and carotid stiffness and right carotid to radial pulse wave velocity.

Conclusion: CoA is associated with increased preductal arterial IMT, LV mass and ascending aortic stiffness. The more pronounced findings after CoA stent implantation are likely related to the later age of intervention.