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### 3.2: ASCENDING AND DESCENDING AORTA PULSE WAVE VELOCITY AND DISTENSIBILITY IN BICUSPID AORTIC VALVE PATIENTS

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increased odds ratio (OR) for CV events (OR: 1.10; 95% confidence interval (CI): 0.27–4.44), but the risk has been significantly elevated in the two-point group (n = 29, OR: 4.59, CI: 1.39–15.22) and it increased further in the three-point group (n = 16, OR: 9.03, CI: 2.22–36.65), as well as in the four-point group (n = 9, OR: 11.84, CI: 2.52–55.64).

**Conclusion:** The ICPS score can help in the identification of chronic kidney disease patients with high CV risk.

**3.2 ASCENDING AND DESCENDING AORTA PULSE WAVE VELOCITY AND DISTENSIBILITY IN BICUSPID AORTIC VALVE PATIENTS**

Andrea Guala <sup>1</sup>, Jose Rodriguez-Palomares <sup>2</sup>, Lydia Dux-Santoy <sup>2</sup>, Gisela Teixeira-Tura <sup>2</sup>, Giuliana Maldonado <sup>2</sup>, Nicolas Villalva <sup>2</sup>, Filipa Valente <sup>2</sup>, Laura Galian <sup>2</sup>, Marina Huguet <sup>1</sup>, Laura Gutierrez <sup>1</sup>, Teresa Gonzalez <sup>1</sup>, Ruben Fernandez <sup>1</sup>, Augusto Sao-Aviles <sup>1</sup>, David Garcia-Dorado <sup>1</sup>, Artur Evangelista <sup>2</sup>

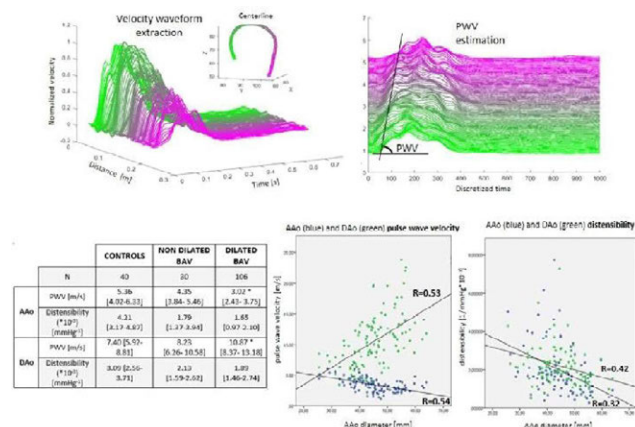
<sup>1</sup>Vall d'Hebron Institute of Research, Vall d'Hebron Hospital, Autonomous University of Barcelona, Spain

<sup>2</sup>Hospital Universitari Vall d'Hebron, Department of Cardiology, Vall d'Hebron Institut de Recerca (VHIR), Universitat Autònoma de Barcelona, Barcelona, Spain

**Purpose:** Bicuspid aortic valve (BAV) is a cardiac congenital disease associated with ascending aorta (AAo) dilation. The study of the impact of aortic biomechanics in this population has been limited by technical difficulties. Contrasting results have been reported for distensibility while studies including regional pulse wave velocity (PWV) are still lacking. Using 4D-flow MRI, we assessed AAo and descending aortic (DAo) biomechanical properties and determined their association in BAV aortopathy.

**Methods:** One-hundred thirty-six BAV patients with no severe valvular disease and 40 healthy volunteers were recruited. The protocol included a 4D-flow acquisition and a set of 2D CINE PC-MRI at 1.5 T. Aortic 3D geometry was reconstructed from 4D-flow-derived angiography and at least 100 analysis planes were identified in the thoracic aorta. Transit time was calculated on the velocity upslope through wavelet analysis [1]. CINE PC-MRI were used to compute distensibility. Statistical significance is reported corrected for confounding factors.

**Results:** Non-dilated BAV and controls have similar AAo and DAo PWV and distensibility. Dilated patients presented lower AAo PWV and higher DAo PWV compared to non-dilated (p < 0.001 and p = 0.017, respectively). Distensibility did not differentiate dilated from non-dilated patients and presented lower association with dilation severity (see Figure).



**Conclusions:** Confirming for the first time previous findings in abdominal aorta aneurysm and fluid-mechanics theory, AAo PWV is reduced in aneurysmatic BAV patients. BAV aortopathy is related to a stiffer DAo. Regional PWV outperforms distensibility as a marker of local aortic biomechanics. These data exclude congenital aortic wall pathology related to BAV

**Reference**

1. Bargiotas I., et al. Estimation of aortic pulse wave transit time in cardiovascular magnetic resonance using complex wavelet cross-spectrum analysis. J Cardiovasc Magn Reson 2015;17(65):1–11.

**3.3 ASSESSMENT OF AORTIC MORPHOLOGY IN A BICUSPID AORTIC VALVE POPULATION**

Froso Sophocleous <sup>1</sup>, Benedetta Biffi <sup>2</sup>, Elena Giulia Milano <sup>3,4</sup>, Cha Rajakaruna <sup>3,4</sup>, Massimo Caputo <sup>3,4</sup>, Costanza Emanuelli <sup>1,5</sup>, Chiara Bucciarelli-Ducci <sup>3,4</sup>, Tom Gaunt <sup>1</sup>, Silvia Schievano <sup>2</sup>, Giovanni Biglino <sup>1</sup>

<sup>1</sup>Bristol Medical School, University of Bristol, UK

<sup>2</sup>Institute of Cardiovascular Science, University College London, UK

<sup>3</sup>University of Bristol, UK

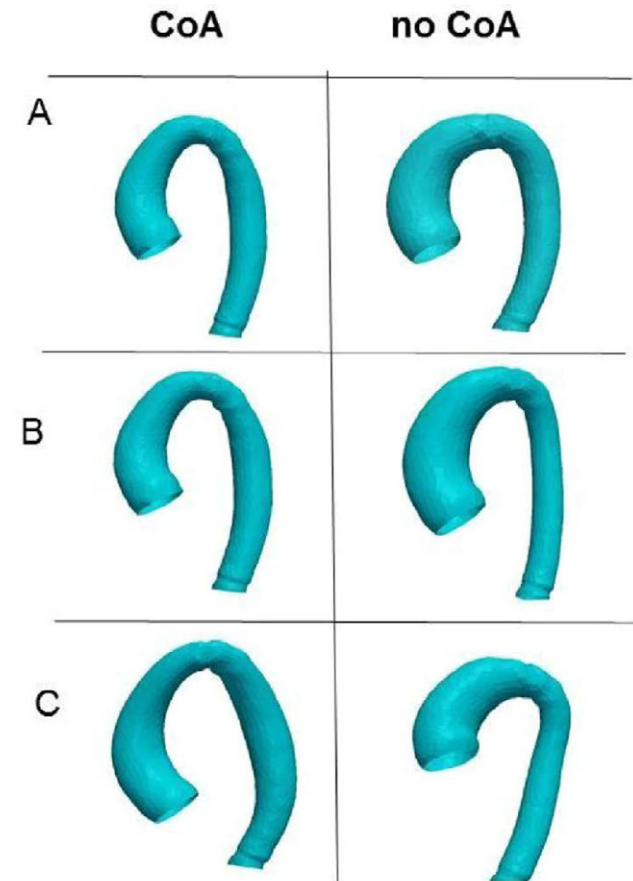
<sup>4</sup>University Hospitals Bristol, UK

<sup>5</sup>Imperial College London, UK

**Background:** Bicuspid aortic valve (BAV) is a congenital heart disease associated with aortic wall abnormalities and co-existing with other congenital defects (e.g. aortic coarctation). This study aimed to explore aortic shape features in a BAV population, identifying sub-groups with different aortic morphologies.

**Methods:** Single-centre retrospective study. Patients with an MRI scan and native BAV diagnosis between 2011 and 16 were studied (n = 525); those with a 3D MRI dataset were included for shape analysis (n = 108, 64% males, 38 ± 16.5 years). MRI-derived 3D aortic reconstructions were analysed using a statistical shape modelling framework [1]. A mean aortic shape ('template') was computed and shape deformations were correlated with demographic, volumetric and functional data.

**Results:** Aortic coarctation (n = 71) was significantly associated with a more gothic arch (p = 0.02), more tubular ascending aorta and descending aorta dilation (p < 0.001). Also, smaller aortic size in patients with coarctation was associated with the younger age of this group (33 ± 13 vs. 47 ± 19, p < 0.001), given the overall relationship between aortic size and age (p < 0.001). Aortic stenosis



**Figure 1** Shape features of coarctation (CoA) vs no CoA in BAV population. A) The 'template' (or average shape) for patients with CoA on the left, and patients without CoA on the right. B) Patients with CoA have tubular ascending aortas (left), while patients without CoA tend to have increased ascending aortic dilation (right). C) Patients with CoA have more of a gothic arch (left), whereas patients without CoA have a rounder arch (right).