

Partial fusion of two aortic valve leaflets is related to alterations in ascending aorta flow: 4D flow CMR study

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Funding Acknowledgement: European FP7/People 267128; Spanish Ministry of Economy and Competitiveness RTC-2016-5152-1 and Instituto de Salud Carlos III PI14/0106

Introduction: Bicuspid aortic valve (BAV) is the most common congenital valve defect. It consists in the fusion of two aortic valve leaflets, and it is associated with a high prevalence of proximal aorta dilation. Dilation is highly prevalent (around 30%) in BAV patient relatives with a tricuspid valve (TAV) identified by echocardiography. However, the presence of partial aortic valve leaflet fusion (also called mini-raphe or forme fruste BAV, see figure 1A) is easily missed by echocardiography. A recent study reported that 44% of patients from a small cohort of BAV patient relatives with aortic dilation followed by CT showed mini-raphe.

Purpose: We aimed to use 4D flow CMR to assess if the presence of mini-raphe is associated with aortic flow alterations, which may be concurs in the etiology of aortic dilation in BAV patient relatives.

Methods: Twenty BAV patients first-degree relatives with partial fusion (<50%) of aortic valve leaflets and proximal aorta dilation were identified by CT or cine CMR and prospectively included. One-hundred twenty-five BAV and 95 patients with TAV from our prospective dataset of 4D flow CMR were included for comparison. Propensity score matching was used throughout the study to correct the comparisons between mini-raphe and BAV and mini-raphe and TAV patients for differences in age, maximum aor-

tic diameter, sex, height, weight, proximal aortic pulse wave velocity and, only for BAV, fusion pattern. The hemodynamic parameters previously related to aortic dilation were computed. They were jet angle, normalized flow displacement and systolic flow reversal ratio (SFRR, identifying through-plane vortices) were computed and compared in the ascending aorta and in the aortic arch.

Results: The presence of mini-raphe was statistically-significantly associated with increase in jet angle (Figure 1B), flow displacement (Figure 1C) and vortices (Figure 1D) in most of the ascending aorta and aortic arch when mini-raphe patients were compared with TAV patients. The severity of flow asymmetry found in mini-raphe patients was lower than the one characteristic of BAV patients, but vortices were even higher in a small region at the distal ascending aorta.

Conclusion: Partial fusion of the aortic valve leaflets is related to increase in proximal aorta flow eccentricity and vorticity. These flow abnormalities are not as marked as those associated with BAV. Data regarding prevalence of mini-raphe as evaluated with CT or cine CMR are needed, especially in familiar of BAV patients.

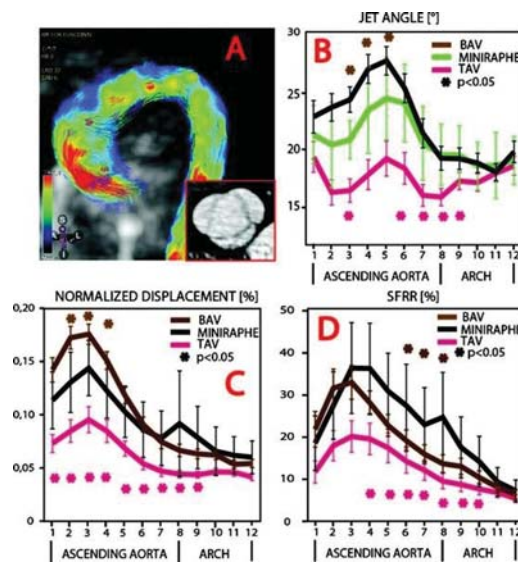


Figure 1