

New magnetic resonance imaging indexes for the evaluation of elastic properties of aortic wall in patients with bicuspid aortic valve.

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Introduction: Bicuspid aortic valve (BAV) is frequently associated to aortic wall abnormalities as dilation of ascending aorta (AAo) and even dissection.

Aim: to compare BAV patients with matched control subjects, prospectively evaluating two new indexes of aortic wall biophysical properties: maximal rate of systolic distension and diastolic recoil (MRSD and MRDR respectively).

Methods: we enrolled 53 consecutive young patients with BAV (36 male, mean age 16 ± 4 years), with no more than mild aortic valve disease, and 22 age- and sex- matched healthy volunteers as control group. All subjects underwent a cardiac MRI study comprehensive of phase velocity mapping acquisition at several aortic level. We defined two new indexes of aortic wall biophysical properties, briefly the cross sectional area of ascending aorta (5 mm over the sino-tubular junction) was measured in each cardiac phase and expressed as a percentage of the maximal end systolic cross-sectional area. The variation in percentile of maximal area was measured by the difference between each cardiac phase and the previous one (percentile of maximal area/10-3 sec). Thus, MRSD was defined as the maximal systolic increase of ascending aorta cross-sectional area in percentile and MRDR as the highest reduction in percentile of cross sectional area during diastolic recoil. MRSD and MRDR were measured in the ascending aorta in patients with BAV and in controls.

Results: 26 patient with BAV had enlarged AAo (dilated BAV), 27 had normal diameters (non-dilated BAV). Compared to controls, MRSD was significantly lower in the whole BAV group (4.37 ± 1.1 vs 9.1 ± 2.1), in dilated-BAV (4.5 ± 1.1 $p < 0.0001$), and non-dilated BAV (4.3 ± 1.0 , $p < 0.0001$). MRDR was higher in the whole BAV group (-4 ± 1.2 vs -7.6 ± 2.7 , $p < 0.0001$), in dilated BAV (-3.9 ± 1.3 , $p < 0.0001$) and in non-dilated BAV (-4.1 ± 1.2 , $p < 0.0001$). At ROC curve analysis MRSD was able to distinguish BAV from controls with a sensibility of 100% and specificity of 95%. Conclusion: MRSD and MRDR were slower in BAV patients than in controls independently of the dimension of ascending aorta.