

ASCENDING AORTIC DISTENSIBILITY, STIFFNESS INDEX BETA AND TISSUE DOPPLER-BASED WALL STRAIN IN BICUSPID AORTIC VALVE PATIENTS

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Objectives. Recently tissue Doppler-based strain (TDS) of the aortic wall was used for the assessment of elastic aortic properties. We evaluated aortic elasticity by conventional formulas and related them to aortic TDS in bicuspid aortic valve (BAV).

Method. The study group consisted of 85 patients with BAV. Conventional formulas for aortic elasticity were: aortic distensibility (DIS) = $2 \times \text{CSD} - \text{DD} / [(\text{SBP} - \text{DBP}) \times \text{DD}] [\text{cm}^2 \times \text{dyne}^{-1} \times 10^{-6}]$ and aortic stiffness index β (SI) = $\ln(\text{SBP} / \text{DBP}) / [(\text{SD} - \text{DD}) / \text{DD}] [-]$, where SD, DD and SBP, DBP are systolic and diastolic mid-ascending aortic diameters and blood pressures, respectively. Maximal systolic TDS (%) of the mid-ascending anterior aortic wall was calculated. Independent predictors of DIS, SI and TDS were found by multiple linear regression analysis. Variables included: age, gender, weight, systolic blood pressure [SBP], BAV cusp fusion patterns (right-noncoronary or right-left fusion), LVEF ascending aortic diameter, and the severity of aortic stenosis and regurgitation. Significant variables were entered into the multiple regression analysis in a stepwise fashion.

Results. Mean values of measured parameters were: TDS = $16.5 \pm 6.3\%$; SI = 10.1 ± 6.02 , DIS = $2.60 \pm 1.76 \text{ cm}^2 \times \text{dyne}^{-1} \times 10^{-6}$.

In univariate analysis TDS was associated only with aortic regurgitation severity ($r=0.33$; $p=0.023$). DIS was predicted by age ($r=-0.37$; $p=0.03$) and SBP ($r=-0.52$; $p=0.002$) in univariate analysis.

In multivariable analysis both age ($p=0.01$) and SBP ($p<0.0001$) were independent predictors of DIS. In univariate analysis SI was associated with age ($r=0.45$; $p=0.006$), SBP ($r=0.51$; $p=0.002$) and weight ($r=0.5$; $p=0.002$) and was independently predicted by age ($p=0.045$) and SBP ($p=0.003$). TDS was not related to SI and DIS.

Conclusions. In bicuspid aortic valve patients, aortic stiffness index and distensibility are independent of the severity of aortic stenosis and regurgitation and should be the preferred methods of screening of aortic elasticity. Tissue Doppler-based aortic wall strain is independent of conventional measures of aortic elasticity and is associated with the severity of aortic valve disease and thus could be used for the evaluation of aortic hemodynamic stress caused by bicuspid aortic valve.