

Cardiac magnetic resonance and B-natriuretic peptide: prognostic value in patients with asymptomatic chronic aortic regurgitation

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Background: Indication for surgical treatment in asymptomatic patients with severe aortic regurgitation (AR) is currently based on 2-dimensional echocardiography derived left ventricle (LV) diameter and ejection fraction. Suboptimal sensitivity of this guideline-directed approach may lead to late intervention in a substantial number of patients.

Purpose: We aimed to develop a new prognostic stratification scheme based on novel imaging and biochemical markers of heart failure.

Methods: Consecutive patients with chronic severe AR not indicated for surgery per the current guidelines were enrolled into prospective multi-center study. Baseline examination consisted of B-natriuretic peptide (BNP); comprehensive echocardiography (ECHO) including 3-dimensional (3D) vena contracta area (VCA); comprehensive cardiac magnetic resonance (CMR) including regurgitant volume and fraction measurement, and extracellular volume (ECV); all imaging data were analysed in core lab. The perioperative myocardial biopsy from basal septum was performed in all surgically treated patients for histological myocardial fibrosis quantification by Picrosirius Red staining. Patient follow-up was every 6 months. The endpoint was a disease progression (indication for surgery per the current guidelines).

Results: In total, 132 patients were enrolled between 2015 and 2019, the endpoint occurred in 39 patients during a median follow-up of 1217 days. Baseline clinical data did not differ between patients with endpoint (surgical group) and stable patients (medical group). Baseline BNP levels were higher in the surgical group (57 vs. 20, $P < 0.01$). Most baseline ECHO parameters did not differ, only 3D VCA, mitral inflow E-wave and flow reversal velocity in the descending aorta were significantly different between two groups (33 vs. 25 mm², 61 vs 68 cm/s, 21 vs. 19 cm/s with $P = 0.012$, $P = 0.019$, $P = 0.001$). Both CMR-derived end-systolic and end-diastolic LV volumes were significantly different (all $P < 0.01$); the LV ejection fraction was similar (61 vs. 61%, $P = 0.83$). The ECV was similar in both groups (24.2 vs. 24%, $P = 0.69$) and correlated well with histologically validated diffuse myocardial fibrosis (15%). CMR-derived regurgitant volume and fraction were significantly higher in the surgical group (58 vs. 36 ml, $P < 0.01$ and 45 vs. 33%, $P < 0.01$). Based on our results, we developed a multi-factorial scoring system combining the independent predictors of disease progression (specificity 79%, sensitivity 74%).

Conclusion: Baseline CMR-derived LV volumes, CMR-derived regurgitant fraction, and BNP levels can predict disease progression in asymptomatic patients with chronic severe aortic regurgitation. The novel multi-factorial scoring system might identify candidates of early surgical treatment but this hypothesis will require prospective clinical testing.

Abstract Figure. Cardiac magnetic resonance imaging

