Myocardial Aspects in Aortic Stenosis and Functional Increased Afterload Conditions in Patients with Stressed Heart Morphology

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Aortic stenosis as the main mechanic reason of increased afterload and basal septum (BS) hypertrophy needs an effective surgical therapy. Imaging studies regarding BS have gained more importance to document the details of myocardial tissue geometric and functional aspects. In the recent cardiac magnetic resonance (CMR) studies, both global and regional myocardial remodeling have been evaluated in patients with aortic stenosis as well as functional hemodynamic stress-mediated conditions. We would like to mention the importance of BS hypertrophy as a conjunctive point of determination in hemodynamic stress-mediated conditions in this letter. We reported the similarity of segmental involvement of BS in acute and chronic stress-mediated heart diseases and described this focal finding as the “stressed heart morphology” (SHM) by mentioning the association of this focal finding with increased mechanic and functional afterload conditions including hypertension, acute stress cardiomyopathy, and aortic stenosis (Fig. 1).

We criticized the CMR (LARGE) study supported by the British Heart Foundation since no attempt was made for blood pressure recording. In this study, physiologic exercise was speculated to be the reason of BS hypertrophy. Therefore, we have recently considered to emphasize the importance of functional hemodynamic stress detection using blood pressure recording at exercise stress in individuals including endurance athletes with SHM determined by CMR and the possibility of this finding as the early imaging biomarker for left ventricular (LV) remodeling. In addition to importance of hemodynamic stress in this group, we also mentioned the hyperdynamic tissue aspects of BS with increased LV outflow tract blood flow under stress and pointed out that BS possibly is the most involved segment because it is the closest part of septum to increased afterload.

Furthermore, we needed to document this finding prospectively beyond the cross-sectional observations in humans and studied the evolution of segmental remodeling in an animal model using third-generation microscopic ultrasonography. In this study, BS hypertrophy was the initial remodeling in animals with mechanic blockage by transaortic construction which is a completely consistent finding with BS hypertrophy in the patients with aortic stenosis.

Increased blood flow and hyperdynamic basal septal response to stress induction in BS hypertrophy similar to our small animal study with transaortic construction in which there was an early increment of systolic velocity up to 4 weeks which is related to compensatory hyperfunction in the early time points before development of LV basal dysfunction detected by third-generation microscopic ultrasonography. As a result, BS
Fig. 1  (A) The image of increased transvalvular aortic gradient measurements of a severely symptomatic patient with advanced aortic stenosis and basal septal hypertrophy (peak jet velocity: 4.01 m/s, max. peak gradient: 64 mmHg and max. mean gradient: 35 mmHg).  (B) Two-dimensional echocardiography of the same patient shows predominantly hypertrophied basal septum (1.97 cm) compared to the thicknesses of mid-septum (1.14 cm) and lateral wall (1.05 cm) which are in normal limits.
hypertrophy could be detected in increased afterload conditions and called SHM to mention the relation to increased hemodynamic stress beyond the underlying mechanism which could be both mechanic or functional stress-mediated clinic conditions, because it is the closest part of septum to increased afterload.

**Disclosure Statement**

There is no conflict of interest to disclose.

**References**


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