

Right ventricular mechanics and its association with symptoms in transcatheter aortic valve replacement candidates: a three-dimensional echocardiography study

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Aortic valve stenosis is one of the most prevalent valvular disease with significant clinical burden. While it is initially a disorder of the left ventricle (LV), long-term effects of the disease also affect the right ventricle (RV) as well. Nevertheless, data are scarce regarding the changes of RV mechanics and their association with symptomatic status of the patients. 3D echocardiography allows a more detailed assessment of the RV, which may unveil distinct changes of its morphology and function in this clinical setting.

Accordingly, our aim was to examine LV and RV mechanics in TAVR candidate patients with severe aortic stenosis using three-dimensional (3D) echocardiography.

Seventy patients (51% male, age: 80 ± 6 years) were enrolled. Detailed medical history and symptomatic status were obtained. Beyond conventional transthoracic echocardiographic protocol, 3D loops were also acquired. We measured 3D LV and RV end-diastolic volume indexed to body surface area (EDVi), ejection fraction (EF) and global longitudinal (GLS) using dedicated software. Furthermore, we have determined 3D RV global longitudinal (RV GLS) and circumferential strain (RV GCS) using the ReVISION method.

LV EF ($r=0.28$, $p<0.05$) and LV GLS ($r=-0.26$, $p<0.05$) significantly correlated with age, while RV EF ($r=0.21$, $p=0.11$), RV GLS ($r=-0.17$, $p=0.19$) and RV GCS ($r=-0.07$, $p=0.61$) did not show association with it. 41% ($n=29$) of the patient population mentioned angina or had syncope. Patients with these symptoms had comparable LV EDVi (73 ± 23 vs. 69 ± 25 mL/m², $p=0.47$), LV EF (47 ± 15 vs. $51 \pm 10\%$, $p=0.14$) and LV GLS (-13.6 ± 4.8 vs. $-14.8 \pm 2.6\%$, $p=0.25$) to those who did not mention these complaints. On the other hand, patients with angina or syncope in their medical history had significantly lower RV EDVi (58 ± 13 vs. 70 ± 23 mL/m², $p<0.05$), while having significantly higher RV EF (46 ± 10 vs. $52 \pm 7\%$, $p<0.05$). Moreover, symptomatic patients had significantly lower RV GCS (-15.7 ± 5.6 vs. $-19.6 \pm 5.3\%$, $p<0.01$), while RV GLS did not differ (-15.8 ± 4.8 vs. $-17.4 \pm 4.1\%$, $p=0.17$).

Patients with severe aortic stenosis have marked changes in not only the LV, but the RV mechanics as well. While the symptomatic status does not seem to be associated with LV morphology and function, patients with angina or syncope had distinct changes in RV size and the contraction pattern of the chamber.