Left ventricular twist in patients with severe aortic stenosis: meaning and evolution after surgery

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Background: Structural and functional left ventricular (LV) remodeling is the result of myocardial adaptation to chronic pressure overload in patients with severe aortic stenosis (AS). Changes in LV rotational dynamics are supposed to occur due to increased afterload in order to maintain LV ejection fraction (EF) in this setting. However, data regarding rotational dynamics with AS severity and their evolution after aortic valve replacement (AVR) are scarce.

Goal: To describe LV twist in patients with severe AS according to LV remodeling and assess its evolution after surgical AVR.

Methodology: Single center prospective cohort study of patients with classical isolated severe AS referred to surgical AVR. Complete transthoracic echocardiography (TTE) and cardiac magnetic resonance (CMR) were performed before surgery for both valvular and LV remodeling assessment. TTE was performed at the 3rd to 6th post-operative month. LV twist was defined as the peak difference in systolic rotations of LV apex and base as viewed from the apex and calculated at bidimensional strain in short axis views. LV remodeling was categorized by CMR according to Figure 1. Correlation analysis was performed for indexes of AS severity and LV function.

Results: A total of 80 patients with classical high flow, high gradient, preserved LV EF (46% male; mean age 71 ± 8 years old; mean aortic valve [AV] gradient 61 ± 17.6mmHg, mean AV area 0.73 ± 0.18cm2, mean LVEF: 58 ± 9%) were included. LV twist before surgery was 24.5 ± 9.7% and this was modestly correlated with both LV flow (r = 0.315, p = 0.001) and AV gradients (r = 0.315, p = 0.013). Rotational indexes were no different across distinct types of LV remodeling. After AVR there was a significant decrease in LV twist (24.5 ± 9.7% vs. 16.5 ± 8.3%, p < 0.001), despite significant improvement in global longitudinal strain (-14.7 ± 3.9% vs -16.1 ± 3.1%, p < 0.001) and maintenance of preserved LVEF (58 ± 9% vs 60 ± 8%, p = 0.07).

Conclusion: As LV twist has an inverse relation to GLS after AVR, this may represent a compensatory mechanism for LVEF preservation in patients with severe AS. Rotational mechanics seems to be independent from structural LV remodeling in this setting.