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CHANGES OF THE ELECTROCARDIOGRAPHIC STRAIN PATTERN IN PATIENTS WITH AORTIC STENOSIS AND ITS UNDERLING MECHANISMS

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Objective The electrocardiographic (ECG) lateral leads S-T depression and T wave inversion (ECG strain pattern) is commonly present in patients with left ventricular hypertrophy (LVH) caused by aortic stenosis (AS). The quantitative correlation between the strain pattern and the degree of AS and LVH has not been fully elucidated. The aim of the present study was to assess the time course of changes in lateral leads S-T segment level and T wave amplitude after aortic valve replacement (AVR) for AS, and to determine whether aortic valve pressure gradient (AVPG) and left ventricular mass index (LVMI) can predict the ST-T changes.

Methods Seventy-two patients (age 72.6±5.6, 47 male) with AS who underwent stentless AVR with stentless aortic bioprosthesis were prospectively studied by digital 12-lead ECG and echocardiography before AVR and at 1 week, 6, 12 and 24 months after the operation. Aortic valve mean AVPG and LVMI, S-T segment level and T wave amplitude with respect to ECG isoelectric line were measured by built-in software of lead I, aVL, V₅ and V₆. The mean S-T segment level and T wave amplitude of four leads was calculated.

Results After correcting AS, mean AVPG fell from 43.3±16.9 to 10.3±5.0, mm Hg ($p<0.001$); the preoperative S-T depression was improved immediately from -39.4±40.8 to -3.7±40.7 uV, ($p<0.001$) at 1 week after AVR and remained unchanged up to 24 months afterwards. Despite LVMI has regressed significantly at 6 months after AVR (129.6±31.3 vs 174.7±39.0, g/m², $p<0.01$), the improvement of T wave amplitude from pre-AVR occurred at 12 month after AVR (64.2±108.7 vs -11.5±189.4 uV, $p<0.001$). Stepwise regression analysis of whole dataset identified that mean AVPG or LVMI was the most significant echo predictor of S-T segment level or T wave amplitude, respectively ($r=-0.42$ and -0.35 ; $p<0.001$).

Conclusion In patients with AS, the two elements of ECG strain pattern are determined by different physiological

mechanisms and improve with different time courses after AVR. S-T segment depression is mainly caused by aortic valve pressure gradient, it therefore improves immediately after AVR; T wave amplitude reduction is, however, resulted from LVH, and it improves only after LVH has regressed towards normal level. S-T segment and T wave amplitude should therefore be regarded as different physiological entities when its clinical implications in AS patients are considered.