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STUDY OF QUANTITATIVE ASSESSMENT OF LEFT VENTRICULAR SYSTOLIC FUNCTION BY TISSUE MOTION ANNULAR DISPLACEMENT IN HEART FAILURE PATIENTS

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Objective To evaluate the ability of tissue motion annular displacement (TMAD) for assessment of global left ventricular systolic function in heart failure patients.

Methods The HF group and the control group were composed of 18 patients with heart failure (14 male, age 47.61 ± 11.39 years) and 16 healthy subjects (11 male, age 40.4 ± 10.6 years) respectively. Apical two-, three- and four-chamber views were used to observe the mitral annulus motion of six sites (posteroseptal, lateral, inferior, anterior, posterior and antero-septal annulus). TMAD parameters were measured, including maximal systolic displacement (Ds), long-axis fractional shortening (FS_L), time intervals from R wave to maximal systolic displacement (Ts) and SD of Ts of six sites (Ts-SD). Velocity-time integral of S wave was determined by pulsed wave-Doppler tissue imaging (PW-DTI). Left ventricular ejection fraction (LVEF), left ventricular end systolic volume (LVESV) and end diastolic volume (LVEDV) were determined by two-dimensional echocardiography. The correlation between mitral annular motion parameters and LVEF were analysed.

Results (1) TMAD depicts mitral annular displacement-time curve as an irregular shape in patients with heart failure. Compared to the control group, Ds were decreased significantly (5.32 ± 2.18 vs 13.18 ± 0.95 mm, $p < 0.001$). There were significant statistical differences between the HF group and the control group in Ts and Ts-SD ($p < 0.001$). (2) There was a high correlation between the mean Ds of six sites and LVEF ($r = 0.753$, $p < 0.01$), while it was poorly correlated to LVESV and LVEDV in the HF group. The correlation coefficient of the mean VTIs of six sites in the HF group was 0.735 ($p = 0.001$). (3) A strong correlation and agreement were found between mitral annular displacement determined by TMAD and PWDTI ($r = 0.763$, $p < 0.001$; 7.22 ± 1.92 mm vs 5.31 ± 2.18 mm).

Conclusions (1) TMAD depicts mitral annular displacement-time curve as a irregular shape in patients with heart failure. The mitral annular displacement decreases significantly. The motions of six annular sites are delayed and not coordinated. (2) The strong correlation between TMAD parameters and LVEF indicates its value as a novel descriptor of global left ventricular systolic function in heart failure.