272 Can early diastolic left ventricular blood-to-tissue timing expose evidence of suction in the normal young heart?
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Background and purpose: The presence of left ventricular (LV) diastolic suction is still under discussion. Even though frequently discussed, it has only rarely been elucidated with modern ultrasonic technique. Hypovolemia is thought to reveal evidence of suction (1). The high sampling rate/temporal resolution of both blood pool- and tissue pulsed Doppler enable the detection of early diastolic LV tissue lengthening to the mitral inflow that might indicate LV suction, we sought to investigate this - at rest and during a preload reduction in normal individuals.

Methods: Twelve healthy subjects (aged 28±4 years, 9 women) were examined with a Vivid 7, GE Medical Systems, including pulsed blood pool- and tissue Doppler. The end-expiratory LV mean E′ e-time interval (i.e. between the onsets of the mitral inflow (E0) and the early diastolic LV lengthening (e0), calculated with the R-wave of the ECG as a reference), the right ventricular (RV) early diastolic maximal velocity (e max), the mean LV e max, as well as the global isovolumic relaxation time (IVRT) were assessed at: horizontal rest, tilting to standing up (45°) and lying back down.

Results: With a presumed preload reduction (standing up), the LV IVRT increased from 52±13 to 81±17 ms, p=0.006. The E′ e interval was slightly positive at rest (7±7 ms), but no change in E e with a preload reduction became significant for all 12. However, two kinds of reactions might be distinguishable. The onset of LV tissue lengthening was further advanced in relation to that of the mitral inflow in 9/12 individuals (from 8.8±2 to 11.5 ms, p=0.008). The remaining 3, who failed to exhibit this, displayed a greater fall in RV E max (6.5±2.2 vs -3.0±2.7 cm/s, p=0.012), as well as in LV mean e max (4.5±1.8 vs -3.1±1.5 cm/s, p=0.006) at standing up - suggesting that a more pronounced preload reduction might have been induced. These 3 did not differ in height (174±4 vs 174±9 cm, p=NS), but had a lower BMI (18.9±1.0 vs 23.6±2.3, p=0.02) and also reported of a habitual orthostatic tendency.

Conclusion: Our results - even though not unambiguous - may support evidence of LV suction in the normal heart, detectable through Doppler blood-to-tissue timing. The different responses to a presumed preload reduction raises the question whether, still, an optimal volume level might be required for suction to be seen. 1. ‘Mitral annulus velocity at onset of filling - a marker of diastolic suction’ Opdal A, Remme EW, Helle-valle T, Edwardsen T, Vartdal T, Pettersen E, Ilien H, Smissen OA (e-poster at the ESC, 2006).

273 Diastolic stress echocardiography: usefulness of new generation hand held devices in the ergometry laboratory
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Doppler indexes of diastolic filling have been tested in exercise and proved reliable to identify patients with elevation of LV filling pressures during exercise and to assess LV systolic and diastolic reserve exercise capacity. The aim of our study was a) to test the reliability of Tissue Velocity measurements performed by a new generation hand held device and b) to test the hypothesis that this device can detect a worse diastolic dysfunction in patients with positive treadmill stress test in the Ergometry laboratory.

Material and methods: A Sonosite MicroMax hand held echocardiographic apparatus with 2D, Doppler (Color, pulsed and continuous) and Pulsed Tissue Velocity Imaging capabilities was used. Twenty patients, underwent a thorough study in the Echocardiography laboratory by both a standard GE Vivid 7, and the Sonosite MicroMax systems. Subsequently, the hand held device was used for the study of thirty five consecutive patients, without history of infarction or valvular disease, referred to Ergometry laboratory for diagnostic treadmill exercise test. All underwent a 2D LV study at rest and a LV inflow Doppler study and Pulsed Tissue Velocity study both at rest and during the first minute of recovery period. Mitral early (E) and late (A) velocities were measured and E/A ratio was calculated. Mitral annular velocity during early diastole was measured in interventricular septum (E’isv) and lateral wall (E’lat) and the indexes E/E’isv and E/E’lat were calculated.

Results: There was a good correlation in the values of all Doppler and Tissue Doppler indexes measured by the two echocardiographic systems (r: 0.98-0.99, p<0.001 for all). The patients studied in the Ergometry laboratory, were divided according clinical and standard echocardiographic criteria in group N (16 pts with negative stress test) and group P (19 pts with positive stress test). At rest only E’ lat (N: 10.0±2.7, P: 8.3±1.7 cm/sec, p<0.05) and E/E’ lat (N: 7.1±1.8, P: 8.3±1.7 cm/sec, p<0.05) were different between the two groups. After exercise a significant difference was detected in E’ lat (N: 1.00±0.38, P: 1.27±0.73 cm/sec, p<0.05) in E/E’isv (N: 8.2±1.6, P: 9.8±2.2 cm/sec, p<0.01) and in E/E’lat (N: 7.6±1.6, P: 9.2±1.5 cm/sec, p<0.01). The increase of the E/E’ lat values was exercise also significantly higher in the group P (N: 0.04±0.2, P: 1.52±2.17 cm/sec, p<0.005).

Conclusion: Hand held device may play an important role in Ergometry laboratories in daily practice adding diastolic stress echocardiographic indexes in standard electrocardiographic criteria for the evaluation of coronary artery disease patients.

274 Relation between the type of connective disease and diastolic function
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Purpose: Connective tissue diseases (CTD) can cause myocardial degeneration as systemic inflammation. However the incidence of diastolic dysfunction has not been addressed among the different type of CTD. The purpose of this study is to clarify the incidence of early diastolic dysfunction by tissue velocity imaging in connective tissue diseases.

Patients and Methods: We investigated 69 patients with CTD (polyarthritis, dermatomyositis, SSc): 9 patients, systemic sclerosis (SSc); 23 (PM/DM, PM/lupus erythematosus (SLE)); 14 patients, rheumatoid arthritis (RA): 30 patients) who did not show obvious heart disease, systemic hypertension or ECG signs of left ventricular hypertrophy, comparing to 20 control subjects. E/A ratio and deceleration time (DCT) of mitral inflow were recorded. E/Ea ratio was also recorded.

Results: There was no difference in E/A and DCT in each group. E/Ea of PM/DM and SSc was significantly higher than that of control. In contrast, no difference in E/Ea of SLE and RA was observed compared to control (Table 1).

Conclusion: CTD diastolic dysfunction is significantly increased by connective tissue disease. E/Ea ratio measured by tissue velocity imaging in PM/DM and SSc, not in SLE and RA.

Table 1. E/e and CTD

E/Ea p value (compared to control)
Control 7.8±0.5 ns
PM/DM 16.3±2.1 p=0.0004
SLE 13.1±2.1 p=0.0002
RA 8.9±0.5 ns

275 Early impairment of left and right ventricular diastolic function in systemic sclerosis
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Background: Systemic sclerosis (SSc) is a connective tissue disorder of unknown aetiology, characterized by fibrosis of the skin and visceral organs, in which the heart is frequently (40-70% of patients) and severely involved. SSc may be associated with both left (LV) and right (RV) ventricular diastolic dysfunction. The aim of this study was to analyze LV and RV diastolic function in patients with SSc and its relation to exercise capacity.

Methods: We prospectively studied 45 consecutive patients (41F, 4M, mean age 54±15.4 yrs) with SSC (mean disease duration 9.4±3 yrs) and the group of 15 age-matched healthy subjects (13F, 2M, mean age 48±10.6 yrs). In addition to conventional evaluations, transthoracic echocardiography (TTE) for assessment of LV and RV diastolic function and 6-minute walking test (6-MWT) were performed.

Results: LV ejection fraction did not differ between SSc patients and controls (64.1±6 vs 66.2±3%, NS). 23 (51%) SSc patients resulted to have an inverted mitral E/A ratio (mit E/A <1) indicating an abnormal left ventricular filling. The mean value of mit E/A in SSc patients was lower than in controls (0.9±2.3 vs 1.2±2.3, p=0.02). An abnormal right ventricular filling, as expressed by an inverted tricuspid E/A ratio (Tr E/A <1) was detected in 13 SSc patients (29%) and in none of the controls (p=0.001). The mean value of Tr E/A in SSc group was lower than in controls (1.0±2.1 vs 1.2±2.3, p=0.002).

The mean value of Tei index for the right ventricle was higher in SSc patients than in controls (0.3±0.07 vs 0.29±0.03, p=0.02). In multiple regression analysis Tr E/A ratio resulted to be independently correlated to mit E/A ratio (r=0.65, p=0.01). The mean 6-MWT distance was shorter in SSc groups when compared with controls (520±165 vs 617±47 cm, p<0.001) and the mean capillary blood saturation after the 6-MWT was lower in SSc patients (91±8.4 vs 96.7±7.1%, p<0.001). Interestingly, Tr E/A ratio and mit E/A ratio correlated positively with 6-MWT distance (r=-0.49, p=0.01 and r=-0.48, p=0.02).

Conclusion: Impaired LV and RV diastolic function is observed in a significant percentage of SSC related patients and is independently correlated with exercise capacity. This finding may be useful to early identify SSc patients at higher risk of cardiac impairment and warrant further investigation to assess their prognostic significance.