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The echocardiographic assessment of left ventricle diastolic function in Olympic class athletes

W. Braksator 1 ; W. Krol 1 ; A. Mamcarz 1 ; K. Krol 1 ; W. Braksator 1 ; K. Krol 1 ; M. Dluzniewski 1 ; H. Krysztofiak 1

1The Cardiovascular Institute, Cardiology Dept., Tokyo, Japan; 2Tohoku Kouseinienk Hospital, Cardiology Dept., Sendai, Japan; 3Medical Ultrasound Technology Institute, Tokyo, Japan; 4Aloka Co., Tokyo, Japan

Abstract:

Echocardiography is an essential tool for the assessment of heart's morphology and function in elite athletes. However, there are not many papers concerning diastolic function in this specific group.

Introduction:

Echocardiography is a basic tool in assessment of heart’s morphology and function in elite athletes. However, there are not many papers concerning diastolic function in this specific group.

Aim of the study:

The aim of the study was to assess left ventricular diastolic function in Olympic-class athletes using conventional Doppler imaging and Tissue Doppler Imaging (TDI).

Materials and methods:

85 professional athletes took part in a study. Most of them were members of Polish Olympic Team (Athens 2004). There were 24 women and 61 men in examined group. A single transthoracic echocardiographic examination has been performed in time of very intensive training. Mitral inflow velocity profile was assessed using pulsed Doppler imaging. Deceleration time (DT), duration of isovolumetric relaxation time (IVRT), maximal velocity of early (E) and atrial (A) phase and their ratio were estimated. Velocity of septal part of mitral annulus was assessed using TDI in four chamber apical view during early (E) and atrial (A) phase.

Results:

There was no single case of impaired LV diastolic function in examined group, however some parameters exceeded normal values for healthy individuals (CCD). E/A ratio <1 was not observed but in 56.7% of examined it exceeded 2. In 50.6% examined with E/A ratio >2 E/E’ ratio was >8 but with normal velocities of mitral annulus in TDI it may indicate diastolic dysfunction, paradoxically. IVRT was longer than 92 ms in 24% case and DT exceeded norms (150-200 ms) in 56% examined but without reversed E/A ratio. This alteration does not indicate impaired relaxation. In examined with high E/A ratio (>2) LV EDD was increased (2.8 cm/m2 vs 2.67 cm/m2 p<0.02), LV mass (137.9±20.4 gr/m2; p>0.05). The diastolic function indexes by PW technique were comparable by sex male, age (50.8±9.7 vs 51.4±7.8 years; p>0.05), increased left ventricular wall thicknesses and mass index (138.3±16.4 vs 137.9±20.4 gr/m2; p>0.05). The diastolic function indexes by PW technique were in the range of normality for both groups (E/A 1.2±0.4 vs 1.0±0.2, p<0.05).

Conclusions:

PW-TDI diastolic study and FPV were able to differentiate physiological from pathological LVH. While the corrected momentum of LV blood flow in normal range may have been within the range of normality (E’ 9.3±2.9 cm/sec; E’/E 7.9±2.1; Vp 61.5±13.4 cm/sec, in hypertensive group these parameters have resulted constantly altered, with values always out of normal validated limits for middle-aged population (E’ 7.0±2.3 cm/sec; E’/E 10.9±3.3; Vp 49.2±10.7 cm/sec, with significant statistically differences in the two groups (p<0.001).

In our study TDI appeared more statistically significant than FPV.

Conclusion:

In accordance with previous observations, our study showed that TDI is an easy and validated method to assess diastolic function between normal and pseudonormal patterns. Moreover, our results show its specificity and sensibility to distinguish pathological from physiological LVH in middle-aged population. PV can be used in addition to TDI in diastolic function assessment, even if it seems to be less significant.

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The momentum of early diastolic blood flow in the left ventricle in subjects with diastolic dysfunction

T. Uejima 1 ; H. Sawada 2 ; M. Tanaka 3 ; S. Ohtsuki 4 ; T. Okada 4 ; A. Harada 4

1The Cardiovascular Institute, Cardiology Dept., Tokyo, Japan; 2Tohoku Kouseinienk Hospital, Cardiology Dept., Sendai, Japan; 3Medical Ultrasound Technology Institute, Tokyo, Japan; 4Aloka Co., Tokyo, Japan

Abstract:

Purpose: We have recently developed a novel software which permits an angle-independent flow velocity mapping produced from color-Doppler ultrasound data by applying stream function. It allows us to calculate the corrected momentum of the left ventricular (LV) blood flow. We assessed the hypothesis that the momentum of early diastolic LV blood flow is reduced in subjects with diastolic dysfunction.

Methods: 77 nonconsecutive but unselected subjects were studied (age 30-84; ejection fraction 6-72%). The subjects were ineligible if they had atrial fibrillation or valvular heart disease. Mitral inflow indices and mitral annular velocities were used to group the subjects as normal (n=25), abnormal relaxation (n=32), pseudonormal (n=10) and restrictive (n=10). The color Doppler ultrasound data sets in the apical long axis view were used to generate flow velocity vector maps with the newly developed software. The momentum (M) of LV blood flow was calculated frame by frame as M = the sum of the blood density * pixel area * vector length. LV M was computed for LV area (LV/A) and M/LVA. To evaluate the degree to which the flow was unidirectional, the unidirectional index (UI) was created which was defined as follows: UI= the magnitude of the sum of the velocity vectors/the sum of the magnitude of the velocity vectors. We compared the result of M, M/LV and UI among the four groups.

Results: Results were shown in the table. M was similar among all groups, whereas M/LVA was significantly higher in normal group than those in the other groups. UI was significantly higher in normal group than that in restrictive group. It was revealed that LV blood flow was more organized in subjects with normal LV filling.

Conclusions: The corrected momentum of early diastolic blood flow in LV was reduced, as the flow was less organized, in subject with diastolic dysfunction. It could potentially be applied to assess LV diastolic function.

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Influence of hypertrophy location on diastolic function in hypertrophic cardiomyopathy

G. Aelligano 1 ; C. Moure 1 ; M. Huguet 1 ; A. Evangelista 1 ; J. Pael 1 ; J. Llevadot 1 ; A. Jomet 1 ; M. Pascual 1

1Centro Cardiovascular Sant Jordi, Cardiology Dept., Barcelona, Spain; 2Cetir Sant Jordi, Cardiology Dept., Barcelona, Spain; 3Hospital Universitari Vall d’Hebron, Cardiology Dept., Barcelona, Spain

Abstract:

Hypertrophic cardiomyopathy (HCM) has great phenotypic, clinical and prognostic heterogeneity. The aim of the study was to relate...