501
Tei index and aerobic capacity in endurance athletes.
E. kaskiöglü1, H. Ollaz2, H. Akhan1, F. Mercanoglu1, A. Kayserilioglu1.
1Istanbul Faculty of Medicine, Sports Medicine, Istanbul, Turkey; 2Istanbul Faculty of Medicine, Cardiology, Istanbul, Turkey.

Background: Recently proposed Tei index (myocardial performances index), defined as the sum of isovolumic contraction time or mitral valve closure to aortic valve opening time and isovolumic relaxation time or aortic valve closure to mitral valve opening time, is a simple measure which enables noninvasive estimation of combined systolic and diastolic function. However, effect of athletic training on Tei index have not been investigated. This study was designed to compare Tei index in athletes and sedentary controls.

Methods: Thirty-seven elite distance runners and thirty-two age-matched sedentary male controls were included. All subjects were underwent echocardiographic examination and cardiopulmonary exercise testing. Doppler time intervals were measured from mitral inflow and left ventricular outflow tract velocities. Doppler Tei index was calculated using a simple formula developed for this purpose.

Results: The two groups of the study were similar with regard to age and body surface area. Heart rate was significantly lower in athletes than in controls (p<0.001). Maximal oxygen consumption (VO2max) was significantly higher in athletes than control. Tei index significantly was lower in athletes compared with controls (0.28±0.07 vs 0.46±0.11). There was positively correlation between Tei and VO2max.

Conclusion: Tei index significantly is different in athletes than controls. It is possible that chronic exercise affects systolic and diastolic functions. In this study, the Tei appears to be a more useful noninvasive method for detection left ventricular function and exercise capacity.

502
Effects of high intensity endurance training on AV-plane movement evaluated by Tissue Doppler Imaging.
B. Amundsen, N. Lundsett, U. Wisloff, A. Brubakk, S.A. Slordahl. Faculty of Medicine, University of Oslo, Norway

Purpose: High intensity endurance training increases VO2max. The effect on diastolic filling and left ventricular function have not been investigated. This study was designed to compare Tei index in athletes than control. Tei index significantly was lower in athletes compared with controls (0.28±0.07 vs 0.46±0.11). There was positively correlation between Tei and VO2max.

Methods: Thirty-seven elite distance runners and thirty-two age-matched sedentary male controls were included. All subjects were underwent echocardiographic examination and cardiopulmonary exercise testing. Doppler time intervals were measured from mitral inflow and left ventricular outflow tract velocities. Doppler Tei index was calculated using a simple formula developed for this purpose.

Results: The two groups of the study were similar with regard to age and body surface area. Heart rate was significantly lower in athletes than in controls (p<0.001). Maximal oxygen consumption (VO2max) was significantly higher in athletes than control. Tei index significantly was lower in athletes compared with controls (0.28±0.07 vs 0.46±0.11). There was positively correlation between Tei and VO2max.

Conclusion: Tei index significantly is different in athletes than controls. It is possible that chronic exercise affects systolic and diastolic functions. In this study, the Tei appears to be a more useful noninvasive method for detection left ventricular function and exercise capacity.

504
Pulsed tissue Doppler is related to myocardial acoustic density in arterial systemic hypertension.
M. Galdersi, G. de Simone, A. D’Errico, M. Chinalli, S. Cicala, C. Romano, A. Bianco, M. Pardo, O. de Divitiis. Federico II University, Clinical and Experimental Medicine, Naples, Italy.

Purpose: To examine whether myocardial acoustic density assessed by Integrated Backscatter (IBS) is associated with Tissue Doppler derived left ventricular myocardial function in uncomplicated arterial hypertension.

Methods: 26 never-treated, newly diagnosed, I-I WHO, hypertensive patients (M/W = 19/7, mean age = 52 years) underwent exam. Patients were in sinus rhythm, without coronary heart, myocardial or valve disease and/or diabetes mellitus. IBS was recorded in parasternal long-axis view from proximal anterior septum, basal posterior wall and posterior pericardium. Acoustic intensity obtained from the analyzed myocardial structures was corrected for gain setting, depth of the analyzed structure and signal from posterior pericardium. Pulsed Tissue Doppler was acquired in apical 4-chamber view placing the sample volume at the level of both basal posterior septum and left ventricular (LV) lateral mitral annulus. Myocardial velocities (systolic Sm, early E and atrial Am, Em/Am ratio) and time intervals (relaxation time (RT), pre-contraction time, contraction time) were measured at each level.

Results: In the overall population, Sm of LV mitral annulus was negatively related to IBS of both posterior wall (r = -0.58, p<0.002) and septum (r = -0.51, p<0.01). In multiple linear regression analyses, the relations of IBS with Sm of LV mitral annulus remained independent even adjusting for heart rate (HR), mean blood pressure (BP) and LV mass. During diastole, as the intensity of IBS of posterior wall increased, Em of the mitral annulus decreased to (r = -0.41, p<0.04) and RTm at the same level was prolonged (r = -0.49, p<0.01). These relations were confirmed even after controlling for mean BP and HR. No significant relations were found between IBS and Tissue Doppler measurements of posterior septum or between IBS and standard Doppler indexes of LV filling.

Conclusions: In never-treated, newly diagnosed, hypertensive patients, myocardial diastolic acoustic intensity is negatively and independently associated to myocardial systolic velocities and is also related to abnormalities of Tissue Doppler derived diastolic indexes at the level of mitral annulus.

505
Improvement of cardiac function after hemodialysis. Quantitative evaluation by colour tissue velocity imaging (TVI).
S.Y. Hayashi1, L.A. Brodin2, A. Alvestrand1, B. Lind2, P. Stenvinkel1.
1Department of Medicine, University of Linköping, Sweden; 2Karolinska Institutet, Clinical Physiology, Huddinge Hospital, Stockholm, Sweden.

Background: Overhydration and accumulation of uremic toxins may influence the myocardial function in hemodialysis (HD) patients. To evaluate the effects of fluid and solute removal during a single session of HD on cardiac function, color tissue velocity imaging (TVI) was used. This new echocardiography technique allows quantitative assessment of myocardial contractility, conduction and relaxation, during the isovolumic and ejection phases of the cardiac cycle and additionally the systolic and diastolic TVI parameters are less load dependent than conventional echocardiography.

Methods: Conventional echocardiographic and TVI images were recorded before and after HD in 13 clinically stable HD patients (62±10 yr, 6M) and 13 sex- and age-matched controls. Myocardial tissue velocities (v; cm/s) for isovolumetric contraction (IVC), peak systole (PS), early (E) and late (A) diastolic filling and strain rate (SR) were measured.

Results: LV hypertrophy (LHV) was present in 12 patients. Before HD, PSv (5.0±0.8 vs. 6.0±1.2 cm/s, p<0.05), E'/ (5.3±2.2 vs. 7.3±2.3 cm/s, p<0.05) and A'/ (6.6±1.7 vs. 8.3±2.9 cm/s, p<0.05) velocities were lower in patients than in the controls, indicating systolic and diastolic dysfunction. There were inverse correlations between systolic contraction (PSv) and contractility (IVCv) and both plasma levels of phosphate (r = -0.84, p<0.001 and r = 0.66, p=0.05 respectively) and Ca x P product (r = 0.68, p<0.01 and r = 0.67, p<0.05 respectively). The HD session increased IVCv (4.0±1.7 vs 5.5±1.9 cm/s, p<0.001), PSv (5.0±0.8 vs 5.7±0.8 cm/s, p<0.05) and SR (0.7±0.2 vs 0.9±0.2 1/s; p<0.05) indicating improved myocardial contractility and conduction.

Conclusions: In HD patients, LHV is accompanied by both systolic and diastolic dysfunction. The systolic function seems to be impaired by high plasma levels of phosphate and an increased Ca x P product. One single session of HD improved systolic function as indicated by the observed increases in isovolumetric contraction velocity (IV Cv), peak systolic velocity (PSv) and strain rate (SR).
506 Doppler myocardial imaging differentiates myocardial hypertrophy induced either by arterial hypertension or aortic stenosis. K. Harre 1, F. Weidemann 1, O. Turschner 1, G. Erli 1, W. Voelker 1, J.M. Strotmann 1, 2. 1Medizinische Universitätsklinik, Würzburg, Germany; 2Medizinische Universität Lübeck, Lübeck, Germany. Background: Doppler Myocardial Imaging (DMI) has been shown to differentiate myocardial hypertrophy induced by aortic ligation and exercise in animal models. The purpose of this clinical study was to compare the impact of aortic stenosis and arterial hypertension on DMI parameters of regional left ventricular function.

Methods: Twenty patients with arterial hypertension (HTN) and twenty patients with aortic stenosis (AOS) and exclusion of arterial hypertension were enrolled in the study. Coronary artery disease was ruled out by coronary angiography and LV angiography was done to measure ejection fraction in both groups. Ten age matched normals served as control. All patients had a conventional echocardiography study including a DMI study with an evaluation of the posterior wall derived from parasternal long axis views. The following parameters were assessed: enddiastolic wall thickness (WTed), peak systolic velocity (pVel), peak systolic strain rate (pSR), LV enddiastolic diameter (LVEDD) and LV ejection fraction (EF).

Results: Both patient groups showed a normal EF and there was no difference in WTed. Peak velocity in the AOS group (aortic orifice area 0.6 ± 0.2 cm²) was significantly lower compared to normals but did not differ from the HTN group. In contrast peak strain rate in the AOS group was significantly lower compared to both the HTN group and the normals (see table).

<table>
<thead>
<tr>
<th>parameter</th>
<th>group 1</th>
<th>group 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pVel (cm/s)</td>
<td>4.0 (0.7)</td>
<td>2.6 (0.7)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>pSR (1/s)</td>
<td>15 (2.1)</td>
<td>13 (2.1)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>pSRd (mm)</td>
<td>48 (6)</td>
<td>46 (6)</td>
<td>n.s</td>
</tr>
<tr>
<td>LVEDD (mm)</td>
<td>70 (10)</td>
<td>70 (10)</td>
<td>n.s</td>
</tr>
<tr>
<td>EF (%)</td>
<td>61 (14)</td>
<td>61 (14)</td>
<td>n.s</td>
</tr>
</tbody>
</table>

Conclusion: Doppler myocardial imaging detects differences in strain rate values in patients with myocardial hypertrophy of different origin in the presence of normal systolic LV function.

507 Echo-Doppler evaluation of the right ventricular diastolic function in hypertension. S. Cirko 1, T. Goda 2,1. 1University Hospital Center, Department of cardiology, Albania; 2University Hospital Center, Department of Cardiology, Tirana, Albania. Background: It has been reported that systemic hypertension causes diastolic prior to systolic dysfunction of the right ventricle (RV). The aim of this study was to assess the RV diastolic function in patients with systemic hypertension.

Methods: We studied 40 normotensive (NT) and 90 hypertensive subjects (HT). They were free of any other type of cardiopathy, pneumopathy or pulmonary hypertension. All subjects had normal RV dimensions and function. LV mass index (LVMI, g/m²), left (LA) and right atrium(RA) were measured. LV and RV fillings were assessed by doppler at the level of the mitral and tricuspid valve by measuring respectively Em, A and Et, At velocities.

Results: Age and sex propotion were similar for both groups.

<table>
<thead>
<tr>
<th>parameter</th>
<th>group 1</th>
<th>group 2</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVMI (g/m²)</td>
<td>51.6±13.4</td>
<td>62.6±13.5</td>
<td>0.002</td>
</tr>
<tr>
<td>RA dimension (mm)</td>
<td>33±3.1</td>
<td>33±3.9</td>
<td>n.s</td>
</tr>
<tr>
<td>LA dimension (mm)</td>
<td>51±9.4</td>
<td>46±9.1</td>
<td>0.044</td>
</tr>
<tr>
<td>E/A ratio</td>
<td>9.1±0.48</td>
<td>5.4±0.35</td>
<td>0.002</td>
</tr>
<tr>
<td>M-Color Slope (cmsg)</td>
<td>3.9 n.s</td>
<td>3.9 n.s</td>
<td>n.s</td>
</tr>
</tbody>
</table>

Conclusion: Clinical study demonstrated that LV diastolic dysfunction influences maximal exercise capacity and could explain lower maximal performance observed in patients with hypertension.

508 Diastolic dysfunction assessed with echocardiography in offspring of hypertensive. A. Garzon, F. Soria, M. Villegas, R. Florenciano, G. De la Morena, A. Garcia, J. Lacunza, R. Lopez-Palop, E. Pinar, M. Valdes. Virgen de la Arrixaca, Cardiology, Murcia, Spain. Objectives: Offspring of essential hypertensive parents have a high risk of developing hypertension (HT). However, whether diastolic dysfunction and/or morphological changes precede the increase in blood pressure is not well established. We used echocardiography-Doppler to evaluate if there are changes in diastolic function or cardiac structure that precede to development of HT in offsprings of HT parents compared with offsprings of normotensive (NT) parents.

Methods: 59 NT patients aged between 15 and 35 were enrolled and divided in two groups: NT group (both parents NT) and HT group (both parents HT). We assessed standard demographic and clinical variables. Blinded echocardiography was performed assessing morphological (thicknesses and internal diameters of the left ventricle, left atrium (LA) dimension) and diastolic function parameters that included: (1) LV mass,(2) Doppler mitral inflow pattern (E and A peaks and its ratio E/A),(3) pulse wave Doppler pulmonary veins pattern, (4) color-Mode slope (M-color), (5) tissue Doppler E’/A’ratio, and (6) the percentage of LV diastolic volume due to atrial contraction measured with acustic cuantification (AQ).

Results: 30 patients in the NT group (aged 25.2±4.9 years) and 29 patients in HT group (26.9±4.9 years) were included. We found no differences in demographic or clinical variables. Morphological and diastolic function parameters are shown in the table.

509 Impact of left ventricular diastolic dysfunction on maximal exercise capacity in hypertensive patients. M. Dekleva, B. Pencic, V. Babić-Celic, N. Kostić, S. Ilic, S. Dimkovic. University Clinical Centre Dr Mišo, Department of Echocardiography, Belgrade, Yugoslavia. Objective: Left ventricular diastolic dysfunction (LVDD) may lead to increased filling pressure and pulmonary congestion during exercise. Peak oxygen uptake (pO2), maximal oxygen consumption (VO2 max), ventilatory response to exercise (VE), and test duration (RER), measured during cardiopulmonary exercise testing are accepted parameters to assess functional capacity and predict survival in heart failure patients. We sought to define the association between degree of LVDD and parameters of functional capacity measured during exercise testing in hypertensive asymptomatic patients with normal systolic LV function.

Methods: We studied 30 patients with hypertension (19 male/11 female, aged 55.8± years) without evidence of coronary artery disease, congestive heart failure, diabetes mellitus and thyroid or renal disease. Each subject performed a symptom limited byocile exercise test with standardized 25 Watt increment stress protocol. LVDD was evaluated by Doppler echocardiography. In these patients echocardio graphic measurements included assessment of mitral flow velocities (EA), left atrial size (LA) and ejection fraction (EF).

Results: All patients had preserved systolic function (EF = 58±15%) and impaired LV relaxation (E/A= 0.79±15s) with slightly dilated LA size (14.5±0.9 mm). In hypertensive patients with LVDD, VO2 max was significantly reduced, according to the fraction of predictive value calculating by observed value of VO2 max FAI index and E/A ratio (r=0.736, p=0.003), with an association between the degree of LVDD and reduction of peak oxygen uptake (E/A vs pO2: r=0.719, p=0.044). There was also significant correlation between E/A ratio and VE (r=0.736, p=0.040) and between E/A and RER (r=0.816, p=0.025).

Conclusion: Study demonstrated that LV diastolic dysfunction influences maximal exercise capacity and could explain lower maximal performance observed in patients with hypertension.

Data is given as mean and standard deviation of mean in brackets.*indicates significant difference to the control group, # indicates significant differences to the HTN group.
510 Role of Doppler tissue imaging in the assessment of diastolic dysfunction in hypertensive patients with and without concentric geometric remodeling. M.V. Pitzalis, R. Romito, M. Iacovelli, K. Lucarelli, P. Guida, B. Rizzon, C. Forleo, P. Rizzon. Institute of Cardiology, Bari, Italy

It has been shown that in patients with essential hypertension and cardiac hypertrophy, there are differences in diastolic function evaluated by using TD or TDI.

We studied 17 patients (46±9 years, 11 male) with never treated essential hypertension. Echocardiographic evaluation was used to assess the following parameters: concentric remodeling (CR) pattern, defined as a normal left ventricular mass index with a relative wall thickness > 0.45; global diastolic dysfunction (GDD), detected by correcting for age the TD flow early to atrial (E/A) ratio values; regional diastolic dysfunction (RDD) evaluated by TD, with the sample volume positioned within the basal septum; and TD had a specificity and positive predictive value of 100%.

In conclusion, in hypertensive patients with cardiac remodeling an abnormal response to the TOD determinants, we verified that the 24h systolic BP was lower in group 1 patients than in group 2 patients. Whereas the variables with negative correlation was the systolic-nocturnal fall. The following parameters were measured in the echocardiogram: left ventricular mass-index (LVMI), relative wall thickness (RWT), ejection fraction (EF), subendocardial fractional shortening (SFS), and midwall fractional shortening (MFS). Transmural flow velocity was evaluated to obtain the peak E, peak A, E/A ratio, mitral annulus peak E wave was measured. The patients were divided in 3 groups composed by elderly subjects, being selected as "normotensive", "prehypertensive" and "hypertensive" in a first group. The prevalence of HTN and that of LVH in an adult population was of only 15%, reflecting poor BP control. These findings have important medical and economic implications and should represent the basis for setting-up more efficient programmes for a better BP control in the general population.

512 Prevalence of hypertension and left ventricular hypertrophy in a Romanian population. A populational clinical - echocardiographic study. C. Ginghina 1, B.A. Popescu 2, M. Serban 1, I. Ghiorghiu 1, M. Parlea 1, C. Matei 1, I. Kutusa 1, E. Apatrei 1, I. Institute of Cardiology, Bucharest, Romania; 2Bucharest, Romania

Background: Hypertension (HTN) is one of the major risk factors for atherosclerosis and coronary artery disease. Its prevalence has important medical and socio-economic implications. Left ventricular hypertrophy (LVH) adversely impacts the prognosis of hypertensive patients (pts).

Aim: To determine the prevalence of HTN and that of LVH in an adult population (>35 years) in Bucharest, the capital of Romania.

Methods: 363 patients (pts) (50.9% men, mean age 56.3 ± 11 years) from a region of Bucharest, Romania, selected to constitute a statistically representative sample group were screened. A complete echocardiographic study was performed on each patient, including measurements of LV dimensions, ejection fraction (EF), fractional shortening (FS), and transmural flow peak E, A, and E/A ratio by PW-Doppler. LV mass was calculated using the Devereux formula.

Conclusions: The prevalence of HTN in this population is high, as is the prevalence of LVH. BP control in treated pts with known HTN is poor. These findings have important medical and economic implications and should represent the basis for setting-up more efficient programmes for a better BP control in the general population.

511 Arterial distensibility and ambulatory blood pressure as determinant of left ventricular hypertrophy and intima-media thickness in elderly subjects. L.S. Costa 1, J.C. Tress 2, E.C. Zilli 1, J.V. Libonato 1, R. Pozzan 1, A. Brandão 1, C. Drumond Neto 1, A.P. Brandão 2. 1Santa Casa da Misericórdia Hospital, Cardiology department, Rio de Janeiro, Brazil; 2Niterói Hospital, Cardiology, Niterói, RJ, Brazil; 3Universidade do Rio de Janeiro, Rio de Janeiro, Brazil; 4Santa Casa da Misericórdia, Cardiology, Rio de Janeiro, Brazil

Morbidity and mortality in hypertension are primary related to arterial damages that may affect several organs. The aim of this study was to evaluate the ambulatory blood pressure measurement (ABPM) and pulse wave velocity analysis (PWV) in 3 groups composed by elderly subjects, being selected as "normotensive" (Group I, n=42, 72.04 ± 6.02years), "isolated systolic hypertensive" (Group II, n=32, 72.34 ± 5.5years) and "systolic-diastolic hypertensive" (Group III, n=30, 71.42 ± 5.72 years), in an effort to identify, among the assessed variables, those that could be correlated to the determination of the target organ damage (TOD) defined as left ventricular hypertrophy (LVH) and intima-media thickness of the left and/or right common carotid artery (IMT-CCA). The variables analyzed involved the ABPM measures; the IMT-CCA measures, by means of carotid ultrasonography; the left ventricular growth defined as LVH (LVMI > 110 g/m² in men and > 104 g/m² in women) or left ventricular hypertrophy (LVH). BP control in treated pts with known HTN is poor. The prevalence of HTN in this population is high, as is the prevalence of LVH. BP control in treated pts with known HTN is poor. These findings have important medical and economic implications and should represent the basis for setting-up more efficient programmes for a better BP control in the general population.

513 Incremental value of a complete echocardiogram to detect left ventricular dysfunction in hypertensive patients with left ventricular growth. A. Diaz 1, D. Martin-Raymondi 1, J. Barba 1, L. Tomas 2, M. Serrano 2, J. Diez 1. 1Clínica Universitaria de Navarra, Cardiology, Pamplona, Spain; 2Hospital de Navarra, General Medicine, Pamplona, Spain

Left ventricular growth is a major risk factor of cardiac dysfunction in hypertensive patients. Although echocardiography allows the study and quantification of ventricular dimensions, mass and systolic and diastolic function, not all the parameters that can be assessed are measured routinely. In this study we investigate whether a complete echocardiographic study allows to identify subtle functional alterations in the hypertensive left ventricle. We studied 101 patients newly diagnosed of essential hypertension. None of the patients exhibited past or current medical history of cardiac disease or cardiac failure. Office blood pressure measurements was taken and 2-Dimensional and M-mode Doppler ultrasound recordings were performed. The following parameters were measured in the echocardiogram: left ventricular mass index (LVMI), relative wall thickness (RWT), ejection fraction (EF), subendocardial fractional shortening (SFS), and midwall fractional shortening (MFS). Transmural flow velocity was evaluated to obtain the peak E, peak A, E/A ratio, mitral deceleration time (DT) and isovolumetric relaxation time (IVRT). With tissue Doppler (DTI) of the mitral annulus peak E wave was measured. The patients were divided in 2 groups according to the absence (group 1) or the presence (group 2) of left ventricular growth defined as LVH (LVMI > 110g/m² in men and >104 g/m² in women) or concentric remodeling (RWT < 0.44). Values of blood pressure were higher (P<.001) in group 2 patients than in group 1 patients. Although no differences were observed in transmural flow parameters between the 2 groups, E wave measured by DTI was lower (P<0.01) in group 2 patients than in group 1 patients. These findings suggest that MSF and DTI should be evaluated in hypertensives with left ventricular growth to identify those patients presenting early compromise of the systolic and diastolic function, respectively.