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Aerobic capacity impairment in chronic heart failure caused by left ventricular dysfunction is related to diastolic dysfunction.  
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Introduction: Aerobic capacity (AC) impairment as well as diastolic dysfunction has been related to a worse prognosis in patients with heart failure (HF).  
Objectives: We sought to analyze the correlation between AC and diastolic function (DF) parameters in a group of patients with HF due to left ventricular dysfunction (LVD).  
Patients and Methods: We studied 39 consecutive patients, 32 men with mean age 54±11 yrs, 42% of which had coronary heart disease an 48% dilated cardiomyopathy. 73% were in NYHA class II and 27% in class III. Their mean ejection fraction was 24±7%. An exercise test was performed measuring the gas interchange. We also made a transthoracic echocardiography. We measured usual DF parameters. Mitral Doppler flow parameters included peak E, peak A, E/A ratio, deceleration time and Am duration (Amd) for mitral inflow. Ea mean of medial and lateral annulus early peak velocities. Atrial contraction duration (Apd) of pulmonary venous flow: Early diastolic LV flow propagation using color M-mode (Vp). Definition of LV hyper trophy (LHV) was indexed LV mass greater than 111 g/m² in men and 106 g/m² in women.  
Results: 100 patients (60.2%) had Em/Am ratio less than 1, 24 with LVH (LVH+) and 76 without LVH (LVH-). Results according to LVH are presented in the table.  

<table>
<thead>
<tr>
<th>Diastolic parameters according to LVH</th>
<th>Em/D (ns)</th>
<th>Am-D (ns)</th>
<th>Em/Vp</th>
<th>Em/Ea</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVH+ (n=24)</td>
<td>217±49</td>
<td>26±20</td>
<td>1.31±.63</td>
<td>8.6±3.4</td>
</tr>
<tr>
<td>LVH- (n=76)</td>
<td>200±57</td>
<td>25±32</td>
<td>1.16±.18</td>
<td>6.9±2.0</td>
</tr>
</tbody>
</table>

A poor correlation was found between Em/Ea and Em/Vp (r=0.24). Using the usual threshold of Em/Ea > 10 to define high LVFP, 6 patients (25%) in LVH+ had high LVFP, while 3 patients (4%) in LVH- had high LVFP. The significance of a high Em/Ea ratio (>10) was further confirmed by the values of systolic pulmonary pressure (±0.12 mmHg in the group Em/Ea>10 versus 31.0±5.0 mmHg in the group Em/Ea<10, p<0.005).  
Conclusion: In hypertensive patients, an Em/Ea ratio below 1 can be associated with elevated LVFP, particularly in LVH. In addition, Em/Ea and Em/Vp, which theoretically represent a comparable approach of evaluating LVFP, are poorly correlated.  

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The correlation between left ventricular early diastolic and systolic function.  
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Purpose: Left ventricular (LV) systolic and diastolic functions are in clinical prac tice determined using echocardiography and have been considered to be more or less independent of each other. However, the early LV diastolic properties may be dependent on the recall caused by the LV contractile force. The objective of this study was to further assess the relationship between LV early diastolic and systolic function.  
Methods: Standard transthoracic echocardiography (TTE) was performed in 67 pa tients with chronic heart failure. Three early diastolic parameters were determined; (1) the M-mode atrioven tricular plane displacement (AVPD) early diastolic down slope (EDS), (2) the maximum early diastolic tissue Doppler velocity (E) and (3) the early diastolic LV colour-M-mode flow propagation velocity (Vp). E is the mean of the four maximum tissue Doppler velocities recorded during early diastole at the basal LV septal, lateral, infero-posterior and anterior walls. Vp is the regist ration of the early diastolic inflow to the LV in the apical four-chamber view. The early diastolic parameters were compared with two LV systolic parameters, ejection fraction (EF) and AVPD. The early diastolic parameters were also compared with LV diastolic function expressed by a traditional four-grade scale, based on a com bination of the Doppler derived transmitral early/atrial maximum velocity ratio (E/A), E-wave deceleration time (E'D) and systolic/diastolic ratio of the pulmonary venous inflow (SD).  
Results: In linear regression analysis and Spearman rank correlation test, respec tively, all three early diastolic parameters correlated more closely with LV systolic function than with traditional LV diastolic function. LV E' correlated significantly with E' (r=0.0001, R=0.494) and AVPD (r=0.0003, R=0.437) and Vp (r=0.0047, R=0.349), AVPD correlated significantly with E' (r=0.005, R=0.380) and EDS (r=0.0016, R=0.422) but not with Vp (r=0.0214, R=0.176). Traditional LV diastolic function did not correlate with E (r=0.8457, R=0.036), EDS (r=0.8935, R=0.079) or Vp (r=0.9049, R=0.049).  
Conclusions: Parameters reflective of LV early diastolic function correlate more closely with LV systolic function than with LV diastolic function as assessed by Doppler evaluation. This may indicate that suction created by elastic recoil from energy stored during LV contraction is a major determinant of early diastolic filling.  

ISCHAEMIC HEART DISEASE  
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Can left ventricular ejection fraction and volumes be used for prediction of clinical endpoints after coronary artery bypass grafting in coronary artery disease patients?  
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Objective: It still remains undecided which patients (pts) who have undergone coronary artery bypass grafting (CABG) are at risk of future cardiovascular events. We attempted to determine if non-invasive cardiovascular investigation of left ventricular ejection fraction (LVEF) and volumes (LVV) performed early after surgery - were able to stratify the risk of cardiovascular events in the given population.  
Patients and Methods: In a prospective study, we evaluated 120 consecutive pts hospitalized at our Institute for coronary artery disease (CAD) treated with CABG. Early post-op, we determined LVEF and LVV (both telesystolic and telediastolic). Over a 5 year follow up, we analyzed recurrence of angina, acute myocardial infarction (AMI), sudden cardiac death and all other clinical cardiovascular events that required in-hospital treatment and investigated if their appearance correlated with disturbance of the echo parameters we studied.  
Results: The mean age of our pts was 59±6.4 yrs (ranging 41-71 yrs), with male in majority (82%) and more than a half (61%) with an AMI prior to CABG. Post-op, mild and moderate LVEF reduction was observed in 49/120 (41%) of pts, while 29/120 (24%) of pts had increased both LVEF. New coronary events occurred in 15 pts who developed angina (12.5%), 5 pts had a new AMI (4.16%) and 2 pts died suddenly (1.66%), while congestive heart failure (CHF) was present in 16 pts (13.3%). Reduced LVEF and increased LVV haven't been proven predictive of new coronary events, but they definitely have a predictive value for CHF (p<0.05).  
Conclusion: Reduced LVEF and increased LVV early after CABG have no influence on appearance of new coronary events, but do predict development of CHF.
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Can resting 2D echocardiography identify patients with ischemic cardiomyopathy and low likelihood of functional improvement after revascularization?

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Background: To evaluate the potential of a simple and widely available technique such as 2-dimensional echocardiography to identify patients with ischemic cardiomyopathy and low likelihood of functional improvement after revascularization.

Methods: Two-dimensional echocardiography was performed in 101 patients with left ventricular (LV) dysfunction due to chronic coronary artery disease, already scheduled for revascularization. Segmental wall motion abnormalities, wall motion score index (WMSI), end-diastolic wall thickness (EDWT), LV volumes and LV sphericity index (LVSII: DL) were evaluated. The LV ejection fraction (LVEF) was assessed by radiouclide ventriculography (RNV), before and 9 to 12 months after revascularization. An improvement in the LVEF > or = to 5% was considered clinically significant.

Results: On the analysis 999 segments were severely dysfunctional (WMSI: 2.75±0.7); 149 (15%) had an EDWT > or = to 6 mm and were considered scar segments. Severe LV dilatation was present in 24 patients (25%) and a spherical shape of the LV was observed in 35 patients (37%). After revascularization, a significant improvement in the LVEF (from 30±8% to 39±9%, p<0.0001) was observed in 30 patients (30%). Clinical and echocardiographic characteristics were similar in patients with and without improvement except for LV volumes (EDV: 140±36 versus 172±51 ml and ESV: 86±34 versus 117±43 ml, p<0.0005 for both). On univariate analysis the EDV (OR 1.06, CI 1.03-1.08, p<0.005) and the ESV (OR 1.02, CI 1.01-1.03, p<0.005) were predictive of no improvement. On multivariate analysis, ESV remained predictor of no improvement in LVEF (OR 1.02, CI 1.01-1.03, p<0.01). The likelihood of improvement in the LVEF declined as the ESV increased. The cut-off value of ESV > or = to 140 ml had the best accuracy to identify patients that virtually never improve. LVEF improvement after revascularization was present only in 1 (4%) patient with ESV > or = to 140 ml as compared to 29 (41%) patients with ESV < 140 ml (p<0.005).

Conclusions: In patients with ischemic cardiomyopathy, the presence of severe LV enlargement significantly reduce the chance of functional improvement after revascularization. Hence, the assessment of LV volumes, by an extremely widespread diagnostic technique as 2-dimensional echocardiography at rest, can be an initial screening tool to identify patients in which further viability testing could be avoided.

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Assessment of myocardial viability by acoustic densitometry in patients with left ventricle dysfunction due to coronary artery disease.

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Aim: The purpose of our study was to assess whether acoustic densitometry could distinguish between viable and irreversible dysfunctional myocardium in patients with coronary artery disease.

Methods: Seventy patients with chronic coronary artery disease and dysfunctional myocardial segments before planned myocardial revascularization were examined by acoustic densitometry. Fifty four patients had revascularization of at least one coronary artery supplying dysfunctional segments. Control echocardiography of these patients was performed after 3 months after bypass surgery or percutaneous coronary intervention for assessing contractility of revascularized, initially dysfunctional myocardial segments. The dysfunctional segments were defined as viable if they exhibited improvement in their thickening after revascularization. Wall motion was scored using 16-segment model of left ventricle, acoustic densitometry was evaluated from parasternal long axis view, parasternal short axis view at the level of papillary muscles and apical four-chamber and two-chamber views.

Amplitude of cyclic variation of integrated backscatter (CVIB) was evaluated from each dysfunctional segment. The receiver operating characteristics curve analysis was applied to determine the optimal cut off value of CVIB for distinction between viable and irreversible dysfunctional myocardium.

Results: Cut off values for anterosetal, posterior, interventricular septal, lateral, inferior and anterior segments were 4.1, 4.3; 4.4; 4.2; 4.5; 4.0 and 4.2 decibels, respectively. Sensitivity, specificity, positive and negative predictive values for identification of myocardial viability by acoustic densitometry using this cut off values were 81%, 81%, and 86%, respectively.

Conclusion: Acoustic densitometry can differentiate viable and irreversible dysfunctional myocardium in patients with coronary artery disease before myocardial revascularization.

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Echocardiographic outcome in patients with low ventricular ejection fraction after coronary bypass grafting.

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Objectives: To evaluate the outcome of systolic function and ventricular diame- ters in patients with low ejection fraction underwent by-pass grafting. To study the echocardiographic characteristics of patients underwent surgical anterior ventricular restoration (restore).

Methods: 150 consecutive patients (118 men and 32 women, mean age 62±11 years) with low ejection fraction (mean EF 32.4%,) underwent coronary by-pass grafting. Mean Euroscore 5.67±3.47, 83.5% of patients presented three vessels disease and 21% there was left main coronary disease. 92.5% was implanted internal mammarian artery graft and 81% of patients were fully revascularized. All patients had previously angina or demonstrated ischemia. We performed an echocardiogram: before surgery, in 7th post-operative day and in 6th post-operative week.

Results: There were a significant improvement between pre-operative EF and 7th post-operative day (32.4% vs 40.1%, p<0.05) and poor improvement between 7th post-operative day and 6 months post-operative EF (40.1% vs 42.7%, p NS). Mean LVEDV/LVESV were 68/51 mms (pre-operative), 65/49 mms (7th post-operative day) and 63/48 mms (6th post-operative month) (p<0.05). In-hospital mortality was 5.1%. 20 patients, with previous anterior myocardial infarction and aneurysm, underwent surgical anterior ventricular restoration (restore). In this subgroup: mean diameters were 76/56 mms to 66/46 mms (7th post-operative day) and 64/42 mms (6th post-operative month), with improvement of mean EF since 24.6% (12%- 41%) to 36% (7th post-operative day) and 37% (6th post-operative month) (p<0.05); post-operative echocardiogram showed remaining diskinetic segments in 25% and akinetic segments in 58%. Mortality in restore subgroup was 5%.

Conclusions: There was a significant improvement (7.7 points) in EF at 7th post- operative day and poor improvement between this and 6th post-operative month EF. Surgery can be performed in this group with acceptable mortality. In- postoperative echocardiogram of patients underwent ventricular restoration frequently can be identified remaining diskinetic segments.

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Value of evaluation of right ventricular function, postystolic left ventricular contraction and pulmonary venous flow for prediction of post myocardial infarction remodeling.

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Increase in left ventricular size after myocardial infarction is associated with increased risk for adverse complications including death, recurrent myocardial infarction, heart failure. The aim of the study was to evaluate predictive value of pulmonary venous flow, tricuspid annulus motion, postystolic contraction (as additive methods for evaluation of cardiac function) for dilatation of left ventricle.

Material and methods: For this purpose forty patients with first myocardial infarction (age 55± 10 yrs) were investigated on the 2-3 day of myocardial infarction and repeatedly after 2-3 month. Left ventricular systolic function, diastolic function and left and right ventricular long axis functions were evaluated using echocardiography. The study population was divided into two groups in respect of increase of left ventricular end-diastolic diameter (LVEDD) - I group - with left ventricular dilatation (19 patients); II group - 21 patient without ventricular dilatation.

Results: There was statistically significant difference between the two groups in baseline LVEDD (4.69 ± 0.53 cm in I group, versus (vs) 5.25 ± 0.40 cm in II group), ejection fraction (EF respectively 38 ± 9% vs 48 ± 14%), time velocity integral of diastolic pulmonary venous flow (Dipi 4.15 ± 1.74 cm vs 6.84 ± 2.04 cm), systolic amplitude of tricuspid annulus motion (Vta - 1.00 ± 0.30 cm vs 1.31 ± 0.36 cm). In I group postystolic shortening (PSS) of the left ventricle in long axis was more frequently and longer in duration. In multiple regression analysis the best predictors of changes in UVEDD were baseline EF, wall motion score index, left ventricular postero- rior wall thickness, systolic amplitude of mitral annulus motion, Vta, and amplitude of PSS; r2 =0.91, p< 0.05.

In conclusion: variables of left ventricular systolic function, pulmonary venous flow, left and right ventricular long axis function, postystolic contraction can predict left ventricular remodeling after myocardial infarction.
Tissue velocity imaging of mitral annulus in cad patients after 10 weeks of training at different intensities.

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Purpose: Physical exercise is strongly recommended in both primary and secondary prevention of coronary artery disease (CAD), but data on effects of exercise intensity are sparse. Thus, the aim of the study was to evaluate the effects of two different aerobic exercise-training programs of uphill treadmill walking on maximum oxygen uptake (VO2peak) and myocardial function evaluated by ultrasound Tissue Doppler Imaging (TDI).

Methods: 17 subjects with angiographically documented CAD were enrolled in the study. They were randomly assigned to either moderate (M) (40 min continuous walking at 50-60% of VO2 peak) or high (H) intensity exercise (4x 4 min interval walking at 80-90% of VO2peak). Training was carried out under supervision 3 times per week for 10 weeks. Peak systolic (S), diastolic (D) and atrial (A) velocities were recorded at rest before and after training, and mitral annulus excursion during systole (E) was calculated from the integrated velocity signal. All values are mean of four points of the annulus. Changes in each group were compared using analysis of covariance (ANCOVA).

Results: VO2peak increased more in the H than in the M group (32 to 38 vs. 32 to 34, p<0.05). Heart rate, end-diastolic volume (EDV) and ejection fraction (EF) were unchanged after training in both groups (pretest-values from both groups together: 60±1 beats/min, 112±20 ml, 54±5%). For S, E, A and MAE, there was no difference from pre to posttest when the H and M groups were analysed together. That is, neither was there any difference in the change between the H and M groups (values at pretest for both groups: S=5±7.9, E=5±7.9, A=7±3.1, cm's/second for M and H group respectively. E/A-ratio for annulus velocities was also unchanged from pre- to posttest in both groups (pretest values for both groups: S=0.86±0.4). A significant correlation between VO2peak and E was found in pretest (Spearman's r=0.49, p<0.05), but only a trend was found in posttest (r=0.45, p=0.068). There was no relation between VO2peak and S, MAE, EDV or EF.

Conclusion: 10 weeks of endurance training improved VO2peak significantly in CAD patients, but did not change mitral annulus velocities or MAE. There was no difference between training intensities. Diastolic function at rest seems to be closer related to maximum exercise capacity than systolic function.

Comparison of cardiac chamber size and left ventricular function in normotensive unstable angina patients with and without chronic obstructive pulmonary disease.

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The effect of chronic obstructive pulmonary disease (COPD) comorbidity on cardiac chamber size and left ventricular (LV) function in unstable angina (UA) patients (pts) has not been described in detail. The aim of this study was to compare cardiac chamber size and LV function in UA pts with and without COPD.

Methods: M-mode, 2-dimensional and Doppler echocardiography were performed on 42 pts with UA and 42 pts with UA+COPD. All pts were normotensive. The patients of two groups were matched.

Results: The results were as follows (table, *p<0.05, **p<0.01): Chamber size and LV function Variable UA UA+COPD LV diastolic dimension (cm) 5.5±0.4 6.4±0.4** LV e/d systolic stress (g/cm²) 156±21 202±28** LV mass/eight index (g/m²) 161±17 217±22** LV fractional shortening (%) 29.3±9 23.6±8 LA dimension (cm) 3.2±0.2 3.8±0.3 RV dimension (cm) 1.8±0.1 2.3±0.2 Transminal E/A ratio 1.18±0.20 0.77±0.13

Demographic data (age, gender, and associated other medical problems) were not statistically different between the two groups. Our results failed to show evidence for a relationship between longevity of combined disease and chamber size. There was confirmation though that chamber size is related to severity of COPD.

Conclusions: Unstable angina patients with chronic obstructive pulmonary disease comorbidity have significantly larger cardiac chamber dimensions, higher left ventricular wall stress, greater left ventricular mass, more impaired left ventricular systolic function and diastolic filling than those without chronic obstructive pulmonary disease comorbidity.
**Echocardiographic features in acute myocardial infarction of nonagenarian patients: prognostic implications.**

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**Background:** Echocardiographic characteristics and their implication in the outcome of elderly patients hospitalised with acute myocardial infarction are largely unknown.

**Methods:** We studied 92 consecutive patients 89 years of age or older admitted from January 1998 to December 2002 to our institution with an acute myocardial infarction with ST-segment elevation and/or left bundle branch block on their first 12 lead ECG. 74 (80.4%) had an echocardiographic study and were the population of interest, although 5 echocardiographies were performed in an acute situation to confirm heart rupture and only provided data concerning pericardial effusion.

**Results:** Age ranged from 89 to 97, mean 91±2.2 years. There were 60 women (65.2%).

**Echocardiographic features:**

1) Left ventricle. Ejection fraction: Normal: 13 patients (18.6%), 0.41-0.5 14 patients (20.3%), 0.31-0.4 9 patients (13.0%), <0.31 53 patients (47.8%). Dilatation 17 (24.4%), 10 (14.3%), and 8 (11.6%).

2) Moderate/severe valvular disease: Mitral regurgitation 24 (35.3%), Aortic stenosis 7 (10.5%).

3) Severe pericardial effusion: 6 (8.1%), all of them died during hospital admission. In-Hospital mortality was higher among patients with left ventricle ejection fraction <0.31 36.4% vs 5.6% in pts with left ventricle ejection fraction >0.3, p=0.007 and among patients with severe pericardial effusion: 100% vs 15% in patients with moderate/severe pericardial effusion, p<0.001. We also found a trend towards a higher mortality in patients with moderate/severe aortic stenosis 28.6% vs. 16.6% in patients with no significant aortic stenosis, p=0.4.

**Conclusion:** Patients aged 89 years or older with an AMI present frequently with severely depressed LVEF, severe pericardial effusion, and significant aortic stenosis. Each of these echocardiographic parameters could increase in-hospital mortality.

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**TEI-Pulsed tissue Doppler imaging index in the detection of viability in akinetic left ventricular segments.**

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**Methods:** We studied 30 patients (pts), with a previous myocardial infarction who underwent a dobutamine stress echocardiography (DSE) study (20µg/kg/min) for detection of possible viability of akinetic myocardial segments. IVCT, IVRT, deceleration time of E wave (decE), E wave (peak E) and S wave (peak S) were measured from m-mode echocardiography on parasternal long axis. The left atrial diameters were calculated from maximal late diastolic velocity and mitral orifice area. Left atrial contractility was assessed by atrial fractional shortening (AFS), which was estimated from m-mode echocardiography on parasternal long axis. The left atrial diameters were calculated from maximal late diastolic velocity and mitral orifice area. Left atrial contractility was assessed by atrial fractional shortening (AFS), which was estimated

**Results:**

1. The following pulsed TDI indices in the different segments of MA: peak velocity of A, L, I, and P segment of mitral annulus (MA), from the apical views. We measured the following pulsed TDI indices in the different segments of MA: peak velocity of S wave (peak S)(cm/sec), time to peak S (tpeakS)(msec), deceleration time of E wave (decE)(msec), isovolumic contraction time (IVCT) and isovolumic relaxation time (IVRT).

2. Cross Hospital, Department of Laboratory Medicine, Athens, Greece

**Conclusions:**

1. The presence of left atrial contribution is a predictor of myocardial viability regarding age, sex, ejection fraction of LV, presence of hypertrophy, severe depressed LVEF , severe pericardial effusion, and significant aortic stenosis.

2. The TEI index to discriminate viable from non viable akinetic myocardial portions without the use of contrast is highly promising and possibly superior to other TDI indices for detection of possible viability of akinetic myocardial segments. All pts had a history of one or two risk factors for heart failure development.

3. The presence of at least three risk factors predisposes to advanced diastolic dysfunction of the restrictive filling pattern. Moreover, only patients with such severe abnormality on echo-Doppler study appear to be seriously affected by the number of the above factors regarding indices such as E/A(TMF) and VFP.

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**Not left atrial contribution but contractility is better following primary angioplasty than after thrombolysis: an echocardiographic study.**


**Background:** Left atrial (LA) function is important for an optimal filling of the left ventricle. Acute myocardial infarction (AMI) results in not only left ventricular but also left atrial dysfunction.

**Methods:** We performed 2-D echocardiography and pulsed Doppler echocardiography in 48 consecutive patients at sixth month after acute myocardial infarction. The AMI patients without thrombolysis or primary angioplasty were accepted as control group (C). LA contribution was assessed by atrial ejection force (AEF). AEF was calculated from maximal late diastolic velocity and mitral orifice area. Left atrial contractility was assessed by atrial fractional shortening (AFS), which was estimated from m-mode echocardiography on parasternal long axis. The left atrial diameters before and after the P wave of ECG (D1 and D2, respectively) were used in the following formula: LAV= 8 A1 x A2/3L, in which LAV is expressed as "mean value ± standard deviation", statistical analysis was performed by the student's t-test and p<0.05 was considered statistically significant.

**Results:** We detected 44 P (18.49%) in group I, 133 P (55.86%) in group II and 61 P (25.63%) in group III. 6/44 P (13.63%), 33/133 P (24.81%) and 18/61 P (29.51%) respectively showed the restrictive TMF pattern. Significant differences appeared between group I and group III regarding the restrictive pattern. It was found: E/A (TMF) 2.39±0.43 versus 2.95±0.68 (p<0.05) and VFP 36.9±5.08 cm/sec versus 31.56±8.50 cm/sec (p<0.05).

**Conclusions:** More than half of the patients with heart failure due to coronary artery disease have a history of one or two risk factors for heart failure development. It seems that the presence of at least three risk factors predisposes to advanced diastolic dysfunction of the restrictive filling pattern. Moreover, only patients with such severe abnormality on echo-Doppler study appear to be seriously affected by the number of the above factors regarding indices such as E/A(TMF) and VFP.

**Statistical significance of p value was set at 0.05.**

**Results:** Results are shown on the table.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>A (n=20)</th>
<th>T (n=16)</th>
<th>C (n=12)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
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<td>66±8</td>
<td>64±8</td>
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<tr>
<td>M/F ratio</td>
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<td>12.4</td>
<td>10.2</td>
<td>No significance</td>
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<td>LAV (ml)</td>
<td>47±4</td>
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<td>56±4</td>
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<td>AEF (%)</td>
<td>16±4</td>
<td>21±4</td>
<td>19±4</td>
<td>A-T-C</td>
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<tr>
<td>AFS (%)</td>
<td>28±4</td>
<td>21±4</td>
<td>17±3</td>
<td>A-T-C</td>
</tr>
</tbody>
</table>

**Conclusions:** 1. Atrial ejection force, which is an indicator of left atrial contribution to left ventricular filling, is not different among the groups. 2. Atrial fractional shortening, which is an indicator of left atrial contractility, is better in those patients with angioplasty, followed by thrombolysis and conservative therapy, consecutively. These results can be explained by increased atrial volume following thrombolytic therapy.
Value of diastolic dysfunction as assessed by tissue Doppler echocardiography in diagnosing ischemic heart disease in young male patients with typical angina.


Background: Although the history and physical examination is the main part of the examination, echocardiography plays a very important role in diagnosing heart diseases. Tissue Doppler is becoming a routine part of the echo examination.

Methods: The study included 66 young male patients with typical angina (age = 42 ± 9 years.). The patients with previously diagnosed other entities that may influence tissue Doppler findings such as diabetes and hypertension were excluded. In addition to the routine parameters, these parameters were also obtained from five consecutive beats: mitral E peak velocity (E), mitral A peak velocity (A), annular E peak velocity (Em), annular A peak velocity (Am), annular peak systolic velocity (Sm), isovolumetric contraction peak velocity (IVC), isovolumetric relaxation peak velocity (IVR), mitral E/A and annular Em/Am. Tissue Doppler parameters were obtained from lateral annulus on 4C view. Validity of each parameter was tested by receiver operating characteristics (ROC), comparisons between ischemic and nonischemic patients were tested by Mann-Whitney U test. Statistical significance was set at 0.05.

Results: Only Em and Em/Am was significantly different between ischemic and nonischemic patients (p = 0.027 and p = 0.003), while E and E/A was at borderline significance (p = 0.073 and p = 0.055). None of the parameters showed a good ROC analysis result as assessed by area under ROC curve. The results are summarized on the table.

<table>
<thead>
<tr>
<th>Sens-90</th>
<th>Spec-90</th>
<th>Area under ROC curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Em (m/s)</td>
<td>11</td>
<td>19.5</td>
</tr>
<tr>
<td>Em/Am</td>
<td>0.85</td>
<td>1.78</td>
</tr>
<tr>
<td>E (m/s)</td>
<td>42</td>
<td>95</td>
</tr>
<tr>
<td>E/A</td>
<td>0.65</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Conclusion: None of the parameters were excellent in discriminating the ischemic ones from nonischemic ones, however there are some cut-off values that may promote the using or not using the further more sophisticated tests.

New perspective in Syndrome X.

C. Czestochowa, Poland

Background: The development of intraventricular gradients during dobutamine stress echocardiography occurs frequently and is usually associated with the development of symptoms during pharmacologic stress. The development of intraventricular gradients during exercise stress echocardiography seldom occurs. In a previous study we used exercise echocardiography (EE) to study a group of 32 patients (pts) with the Syndrome X. We detected the development of intraventricular gradients in 11 pts of these pts - 73±31mmHg - and there was clear identification of systolic anterior motion of mitral valve in 7 pts.

Methods: We studied 10 pts; 6 men with ST segment depression of more than 1 mm for 80 msec in exercise ECG testing, normal echocardiogram – no left ventricular hypertrophy – no CAD on coronary arteriography.

Results: The intraventricular gradients during EE before propanolol administration were 76±52mmHg. After propanolol administration 6 pts didn’t develop an intraventricular gradient. 3 pts showed a decrease in the intraventricular gradient and one patient developed an intraventricular gradient similar to the one calculated in the first EE. In the clinical evaluation performed one month after, 7 pts reported significant improvement in angina symptoms.

Conclusion: In patients described having X Syndrome in which an intraventricular gradient was detected during exercise, propanolol administration per os prevented the development of this gradient or decreased its degree significantly. 2. The administration of 50mg of atenolol per os for 30 days significantly reduced angina symptoms in these pts.

Transthyoracic echocardiographic detection of coronary atherosclerosis.

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It is well known that transthoracic echocardiography (TTE) allows for coronary artery assessment in significant number of patients. The aim of this study was to use TTE as a screening method to detect coronary atherosclerosis during routine echocardiography. One hundred patients scheduled for coronary angiography (used as standard) were examined with ultrasonic transducer with a frequency 2.5MHz. Second harmonic mode in B-mode and fundamental mode for Doppler examination was used. A modified short axis view was utilized to identify blood flow in left main coronary artery and proximal part of left anterior descending artery and circumflex artery. Diagnostic quality of visualization was obtained in 90 patients (90%). In coronary angiography obstructive coronary artery disease (i.e. at least 1 vessel with 50% obstruction) was observed in 41 patients. In echocardiography, coronary stenosis was diagnosed when maximal flow velocity of at least 1.5 m/s was found. We tested this method as a screening during routine echocardiography, so we were looking for flow jet no longer than 3 mm. In such conditions, specificity of transthoracic echocardiography for stenosis detection was high -89%, but sensitivity was lower, only 50%. These results indicate, that finding of high velocity jet of blood flow in coronary arteries could be a simple and useful method, indicating the presence of flow limiting narrowing, but it should not be used to exclude coronary artery disease.

Conclusions: Doppler examination of the proximal left coronary artery during routine transthoracic echocardiography could be a clinically valuable tool in identification of coronary atherosclerosis.
**669** Contrast-enhanced magnetic resonance imaging versus thallium scintigraphy in the detection of myocardial viability.

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**Purpose:** Contrast-enhanced magnetic resonance imaging (MR) is a new method in the assessment of myocardial viability. The aim of this study was to compare it to SPECT-Thallium scintigraphy.

**Methods:** The patients with documented coronary artery disease and impaired left ventricular systolic function defined by ejection fraction less than 45% were enrolled. Myocardial viability study was performed both by SPECT using 201Thallium and contrast-enhanced magnetic resonance imaging. SPECT of the myocardium was performed four hours after 201Thallium chloride administration. Cardiac MR imaging was done 20-30 minutes after administration of gadolinium contrast agent (0.2 mMol/kg). Short axis views of the myocardium were divided into segments. In each segment myocardial viability was scored semiquantitatively according to the 201Thallium activity (SPECT) and the relative amount of contrast enhanced tissue (MR). The results of viability assessment were compared in corresponding segments.

**Results:** 25 patients were included. The mean ejection fraction was 35.2%. The total number of myocardial segments evaluated was 907. Myocardial viability assessed by SPECT was normal in 52.9%, impaired in 13.9% and absent in 26.8% of segments evaluated. On MR viability study there were 59.7% of segments with no contrast enhancement showing no irreversible injury, 37.2% of segments contained both contrast enhanced and viable tissue and in 3.2% there was a predominance of contrast-enhanced irreversibly changed tissue. Comparing the two methods the results of viability assessment corresponded in 51.3% of segments. 42.7% showing no irreversible injury, 5.3% displaying impaired viability and 2.2% with prevailing irreversible injury. In 23.7% of segments that were assessed as non-viable by Thallium scintigraphy there were signs of viability using contrast-enhanced MR study and almost one third of these segments showed no contrast-enhanced tissue. In 16.5% of segments that displayed normal Thallium activity there were signs of irreversible injury using MR. On the other hand in 8.6% of segments with decreased thallium activity there was no contrast enhancement on MR study.

**Conclusions:** According to our results of this study it seems possible that in comparison to Thallium scintigraphy the contrast-enhanced MR imaging can more accurately diagnose irreversible myocardial injury and better detect viable myocardium. The latter finding may be important in selecting the eligible candidates for myocardial revascularisation.

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**670** Free-Breathing, three-dimensional, bright blood coronary artery magnetic resonance angiography – Comparison of sequences.


**Purpose:** To compare six free-breathing, three-dimensional, magnetization-prepared magnetic resonance angiography sequences with respect to their suitability to depict the coronary arteries.

**Materials and Methods:** Six bright blood sequences were evaluated: Cartesian turbo field echo (C-TFE); radial turbo field echo (R-TFE); spiral turbo field echo (S-TFE); radial balanced turbo field echo (R-bTFE); Cartesian balanced turbo field echo (C-bTFE); and axial balanced turbo field echo (A-bTFE). The right coronary artery was imaged in ten healthy volunteers using all six sequences in randomized order. Images were evaluated with respect to signal to noise ratio (SNR), contrast to noise ratio (CNR), visible vessel length, vessel edge sharpness, and vessel diameter, by two independent observers. A repeated-measure analysis of variance with Tukey-Kramer post-test was performed.

**Results:** C-bTFE depicted the coronary artery over the longest distance with high vessel sharpness, good SNR, and excellent background suppression. C-TFE provided similar SNR and CNR, but more vessel blurring and visualized the vessels over a shorter length. S-bTFFE provided highest values of SNR and CNR, but reduced visible vessel length and sharpness. S-TFE was the fastest sequence used but showed reduced SNR and CNR. The radial approaches resulted in images with the highest vessel sharpness, excellent background suppression, and fair visible vessel length, but an increased noise level.

**Conclusion:** C-bTFFE provided visualization of the longest length of the coronary artery, whereas S-bTFFE provided best SNR and CNR in the proximal vessel segment.

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**671** Does coronary artery bypass grafting correct ischemic mitral regurgitation?

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The aim of the study was to assess coronary artery bypass grafting (CABG) impact on ischemic mitral regurgitation (IMR) observed before surgery.

**Materials and methods:** We analyze consecutive 120 patients (pts) (63±12 years old, men 78, women 42) with history of history of 0-wave myocardial infarction (MI) during last 6 months, qualified to CABG. In transhoracic echocardiography (TTE) before CABG we found no MR in 38 pts (group I), small MR in 46 pts (group II), moderate MR in 29 pts (group III) and severe MR in 7 pts (group IV). Two weeks after CABG TTE was done for MR evaluation. TTE was made using Philips Sonos 5500 and Hewlett-Packard 2500 and recorded on magnetopeto disc and SVHS tape for later assessment by 2 independent cardiologists.

At 7 pts with severe IMR CABG with mitral plasticy was done, others 113 pts has CABG alone.

**Results:** Table 1. Analysis of IMR after CABG

<table>
<thead>
<tr>
<th>No change</th>
<th>Decreased IMR</th>
<th>Increased IMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MI anterior-lateral</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>MI inferior</td>
<td>25</td>
<td>17</td>
</tr>
<tr>
<td>LA (cm)</td>
<td>3.9±0.4</td>
<td>4.8±0.4</td>
</tr>
<tr>
<td>LVDd (cm)</td>
<td>5.5±0.7</td>
<td>5.4±0.5</td>
</tr>
<tr>
<td>EF (%)</td>
<td>41±10</td>
<td>40±11</td>
</tr>
<tr>
<td>WMSI</td>
<td>1.8±0.5</td>
<td>1.8±0.5</td>
</tr>
</tbody>
</table>

In group I there were no change in 27(71%) pts, 0 pts with decreased IMR and 11 pts with increased IMR. In group 2 we found no change of IMR in 29(63%) pts, 7 pts had decreased IMR and 10 pts increased. In group III there were no change of IMR in 19(65%) pts, 8 pts has decreased IMR and 2 pts increased. In group IV there were no IMR change in 0 pts, decreased IMR in 7 pts and increased in 0 pts.

**Conclusions:** 1. CABG alone has no significant impact on frequency and severity of IMR in mild and moderate IMR. 2. In group with decreased IMR were mainly pts with history of anterior-lateral MI but the groups were similar in aspect of other echo parameters (LA, LVDd, EF, WMSI) before CABG.
693 Ventricular aneurysm complicating myocardial infarction with patent coronary arteries.

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Background: In a minority of patients, the coronary angiograms performed in the early post-infarction period have shown either normal coronary arteries or non-obstructive coronary lesions.

Purpose: To evaluate the main characteristics of the patient with acute myocardial infarction (AMI) and patent coronary arteries in terms of clinical findings and post-infarction events.

Methods: A retrospective study in Prof. Dr. C. C. ilieșcu Institute of Cardiovascular Diseases, Bucharest, Romania, including 124 patients admitted with AMI, which were subjected to a coronary angiogram within the first 30 days post-infarction. The study group (S), including 62 patients with patent coronary arteries, was compared to an age- and sex-matched control group (C) consisting of 62 patients with significant coronary lesions. The mean follow-up was 6 months (1-11 months).

Results: During the post-infarction period, the echocardiography identified mechanical complications in 12 patients (10.4%) of the S group and in 16 patients (25.8%) of the C group, p<NS. There were 11 (17.7%) ventricular aneurysms and one acute mitral regurgitation in S group and 14 (22.6%) ventricular aneurysms and 2 (3.2%) surgical complications in 12 patients (19.4%) of the S group and in 16 patients (25.8%) of the C group, p<NS.

Conclusion: The incidence of the mechanical complications in patients with AMI and patent coronary arteries was comparable with the one in the group with significant stenoses. The subgroup with patent coronary arteries and ventricular aneurysm had a higher average age than the group with significant stenoses and ventricular aneurysm and also than the whole study group. The ventricular aneurysm was associated with a higher incidence of other complications, outlining a subgroup at important risk after the AMI with patent coronary arteries.

694 Left ventricular long axis function during dobutamine stress differentiates ischaemic from non-ischaemic cardiomyopathy with greater sensitivity than standard wall motion analysis.


Background: Regional wall motion abnormalities do not reliably distinguish ischaemic from non-ischaemic cardiomyopathy. Changes in wall motion score index (WMSI) during dobutamine stress echocardiography can identify coronary artery disease (CAD) in dilated cardiomyopathy (DCM). However, the technique may be inconclusive in ischaemic cardiomyopathy. Changes in wall motion score index (WMSI) during dobutamine stress echocardiography (DSE) may be of value in identifying coronary artery disease in dilated cardiomyopathy, even in patients with left bundle branch block.

Methods: Twenty-eight patients (pts) (mean age 61±9 years) with known CAD (sensitivity 67%, specificity 94%) were included in the study. Pts were subjected to DSE with an initial low dose of dobutamine (10 μg/kg/min). The left ventricular WMSI was compared with the resting WMSI. The sensitivity and specificity of the test were calculated.

Results: The mean increase in WMSI was 0.7 with an area under the curve of 0.78 (95% CI 0.70-0.87). The sensitivity and specificity were 88% and 50%, respectively.

Conclusion: Dobutamine stress echocardiography with the use of WMSI can distinguish between ischaemic and non-ischaemic cardiomyopathy with greater sensitivity than standard wall motion analysis.

695 Comparison of peak treadmill exercise echocardiography and peak supine bicycle exercise echocardiography for the detection of ischaemia.

I. Garrido1, J. Péteiro2, R. Soler3, E. Rodriguez4, L. Monserrat1, A. Castro-Beiras. Juan Canalejo Hospital, Cardiology, A Coruña, Spain;

Although treadmill (T) is the most frequently used modality for exercise echocardiography (EE), images are usually acquired during the immediate postexercise period as opposed to supine bicycle (Bc) EE. The aim of this study was to compare the value of T-EE obtaining images at peak stress versus peak Bc-EE for the detection of ischaemia in patients (pts) with known or suspected coronary artery disease (CAD).

Methods: We performed peak T- and peak Bc-EE (Bruce protocol) in a random order within 10 days (6±2) in 38 patients (mean age 61±9 years) with known or suspected CAD who underwent or were likely to undergo coronary angiography (CA) within 6 weeks. CA was performed in 31 pts showing CAD (>49% luminal narrowing in 12 pts and 1-vehicle CAD in 13). Each patient image with both stress modalities was scored from 0 to 6 points according to the number of clearly visualized endocardial segment borders and systolic excursion by view (4, and 2-chamber apical and short-, and long-axis parasternal views).

Results: The duration of the test was longer with Bc (11±5 min. vs. 8±3 min, p<0.001). Peak heart rate (HR) was higher with T (142±19 bpm vs. 123±20 bpm, p<0.001), whereas blood pressure (BP) was higher with Bc (209±33 mmHg vs. 170±28 mmHg, p<0.001), resulting in similar product heart rate x BP x T or Bc (1000±660 mmHg x bpm with Bc vs. 246±67 with T, p<NS).

Conclusion: Although the product heart rate x blood pressure is similar with supine Bc and T, ischemia is more pronounced with Tr, suggesting that peak treadmill EE is more sensitive for the detection of CAD.

696 Value of first-pass and delayed contrast-enhancement by magnetic resonance imaging for the prediction of left ventricular wall motion recovery after reperfused acute myocardial infarction.

I. Garrido1, B. Pinto1, R. Soler2, E. Rodriguez4, L. Monserrat1, A. Castro-Beiras. Juan Canalejo Hospital, Cardiology, A Coruña, Spain; 2Juan Canalejo Hospital, Radiology, A Coruña, Spain.

Magnetic resonance imaging (MRI) with contrast administration may evaluate microvascular injury and fibrosis. We sought to determine whether first-pass (FP) and delayed contrast-enhancement (DCE) MRI predicts recovery of LV function after acute myocardial infarction (AMI).

Methods: We included 28 patients (pts) (mean age 55±12 years) with AMI (anterior AMI in 20) submitted to percutaneous transluminal coronary angioplasty with stent implantation. FP and DCE with gadolinium were performed within 4 weeks after AMI in 20) submitted to percutaneous transluminal coronary angioplasty with stent implantation. FP and DCE with gadolinium were performed within 4 weeks after AMI. 2-dimensional echocardiography (2-DE) was performed within 7 days after AMI and at follow-up (9±1 week) to measure wall motion score index (WMSI). A 17-segment LV model was used for perfusion whereas a 16-segment model was used for 2-DE.

Results: Follow-up 2-DE was available in 27 pts that were subdivided in 2 groups: Recovery (RG) (n=17) and no recovery group (NRG) (n=10). Peak creatine phosphokinase was higher in the NRG (p<0.05). No significant differences in other clinical, angiographic and 2-DE variables were found between groups at baseline. Global and regional WMSI improved from 1.3±0.3 to 1.1±0.2 (p<0.001) and from 1.5±0.5 to 1.2±0.3 (p=0.001) in the RG, and improved from 1.4±0.2 to 1.5±0.2 (p<0.05) and from 1.7±0.4 to 1.9±0.3 (p<0.05) in the NRG. The number of segments with FP defect was not different in both groups (2.2±0.3 vs. 1.6±2.6) whereas the number of segments with DCE was greater in the NRG (4.2±2.2 vs. 1.9±2.6, p<0.05). The transmural extension of the defect was 5.3±3.6% in the RG and 26±35% in the RG (p<NS). DCE affecting less than 2 segments was the more accurate MRI index to predict LV recovery with positive predictive value of 91% and negative predictive value of 60% (p<0.05). Conclusion: DCE by MRI has high positive predictive value for recovery of LV function after reperfused AMI.