312 Left ventricular ejection fraction and b2-adrenergic receptor polymorphism in dilated cardiomyopathy.
M.V. Pitzalis, C. Forleo, S. Sorrentino, R. Romito, M. Iacoviello, F. Troisi, P. Guida, E. De Tommasi, B. Rizzon, P. Rizzon. Institute of Cardiology, Bari, Italy

Background: Left ventricular ejection fraction (LVEF) is the parameter commonly used to evaluate systolic function and to stratify prognosis in patients with idiopathic dilated cardiomyopathy (DCM). There are few data concerning the genetic determinants of systolic function in these patients.

The aim of this study was to evaluate the association between b2-adrenergic receptor (b2-AR) polymorphisms and LVEF in DCM patients before and after optimal medical treatment.

Patients and Methods: We enrolled 22 consecutive unrelated patients (age 45±14 years, 17 males, NYHA functional class 1.6±0.6) with DCM (WHO Criteria) in washout protocols after beta-blockers (BB), ACE-inhibitors (ACE-I) and Angiotensin II receptor inhibitors (ARB). LVEF was evaluated by echocardiography at the time of the enrollment and after one year, when all patients were receiving optimal treatment with BB and ACE-I or ARB. The genotype for the 5' leader cistron (5'LC) Arg16Gyc, Arg16Gly, Gln27Glu and Thr146Ile polymorphism of the b2-AR was performed on the basis of PCR amplified DNA using RFLP.

Results: LVEF significantly improved after optimization of therapy (from 37±10 to 41±10). We found a significant association between the Arg16Gly polymorphism and LVEF (Figure) before and after one year follow-up. In particular, homozygosity for the Gly16 allele (Arg16Gly) of the b2-AR was associated with lower LVEF values than the other patients. No association was found with the other studied polymorphisms.

Conclusion: DCM patients homozygous for the b2-AR Gly16 allele show lower LVEF values before and after BB, ACE-I and ARB treatment. This leads to hypothesise an influence of this allelic variant on systolic function in DCM.

314 Correlation of decreased myocardial Doppler longitudinal velocities and intraventricular conduction abnormalities in patients with myotonic dystrophy.
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Cardiac involvement in myotonic dystrophy (MD) is characterised by conduction system abnormalities. Myocardial involvement, usually subclinical, can be diagnosed by tissue Doppler, because it allows quantitative non-invasive assessment of regional myocardial function.

Aims: We investigated long-axis and short-axis LV function in patients with MD, with no symptoms or clinical signs of heart disease, in order to determine if they have subclinical cardiac involvement, by comparison with age-matched normal subjects, and to correlate myocardial conduction abnormalities with conduction abnormalities.

Methods: 28 subjects (14 with MD, and 14 age- and sex-matched normals) had conventional and tissue Doppler echocardiography. Myocardial velocities and timings to peak systolic contraction were measured. Genomic DNA was extracted from peripheral blood leukocytes, and CTG repeat expansions in the DM-PK gene were analysed using Southern blots.

Results: LV wall thickness, diameters, and EF were not different between the groups. 29% of the MD patients had global diastolic dysfunction. Both long-axis and short-axis systolic and early diastolic velocities were lower in patients with MD, whereas time-to-peak myocardial contraction was longer; longitudinal systolic velocities were lower in patients with MD, compared with 7.8±1.3 cm/s in normal subjects (p<0.001). 71% of the patients had impaired longitudinal systolic function. In patients with MD, the mean duration of the PR interval was 186±29 ms, and it was 200±9 ms in 5 (36%) patients. Mean duration of the QRS complex was 111±16 ms, and it was 120±5 ms in 5 (36%) patients; 1 patient had RBBB and 4 patients had LBBB. Longitudinal systolic and diastolic velocities correlated with the duration of the QRS complex (r=0.58 and r=0.63 respectively, both p<0.01). There was a trend for the time-to-peak systolic velocity to increase as the QRS duration prolonged (p=0.052, r=0.06). There were no significant correlations between longitudinal function and the duration of the PR interval. Mean number of CTG-repeats was 492±145. No significant correlations between the CTG-repeats and duration of MD since diagnosis, severity of muscle involvement, duration of the PR interval, duration of the QRS complex, or any of the echocardiographic parameters.

Conclusion: Patients who have MD but no clinically apparent heart disease, nonetheless have impaired longitudinal and radial function of the left ventricle compared with age-matched controls, both in systole and in diastole. Longitudinal function is inversely related to the duration of the QRS complex.

315 Assessment of diastolic function in endomyocardial fibrosis: value of flow propagation velocity.
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Background: Endomyocardial fibrosis is manifested mainly by diastolic heart failure. However, diastolic function has not been well characterized in this disease.

Methods: Eighteen patients with LV EMF and eighteen healthy subjects were studied. Cardiac volumes and ejection fraction were assessed by Simpson's method. Pulsed-wave Doppler was used to obtain mitral and pulmonary venous flows velocities and grade diastolic function. Pulsed-wave tissue Doppler imaging velocities along the septal side of mitral annulus, flow propagation velocity (VP) of the early diastolic mitral inflow, and myocardic performance index were assessed.

Results: According to this grading method, we found 4 patients with normal diastolic function, 5 with impaired relaxation, 5 with pseudonormal and 4 presented a restrictive pattern. A positive correlation of diastolic function grades and NYHA functional class was found (r=0.66, p=0.003). By stepwise logistic regression the best index that discriminated EMF patients from controls was VP. The probability of occurrence of EMF = exp(-9.42) - 0.1366 (p-value) = 0.006.

Conclusions: A wide range of diastolic function grades is found in patients with EMF and these correlated with functional class. Delayed myocardial relaxation, as reflected by altered VP, was a frequent finding, making VP the most useful index to discriminate EMF patients.

316 Echocardiographic assessment of left ventricular function following surgical treatment of endomyocardial fibrosis.
V.M.C. Salemi, S.A. Oliveira, R.D. Santos, C. Mady. University of São Paulo Medical School, Heart Institute (InCor), São Paulo, Brazil

Endomyocardial fibrosis (EMF) is a rare restrictive cardiomyopathy, characterized by fibrosascular tissue deposition within the endocardium and the myocardium of the inflow tract and apex of one or both ventricles. Surgical treatment consists in endocardial decalcification and atrioventricular valve repair. It is recommended for patients in NYHA functional class (FC) III and IV and it improves the quality of life and survival. The aim of this study was to compare the effects of surgical treatment of EMF in left ventricular (LV) function.

Methods: Thirty patients (11 women, 55±10 years) with surgically proven LV EMF with or without right ventricular involvement were studied prospectively by echocardiography. Seven patients were in atrial fibrillation. The interval between pre- and post-operative echo was 4.5 months. Stroke volume, cardiac output and cardiac index were evaluated by LV outflow pulsed-wave Doppler. Left ventricular end-diastolic and end-systolic volumes/BSA were analyzed by Simpson's modified biplane method. Propagation velocity (VP) of early mitral flow was assessed by color M-mode Doppler.

Results: Data are shown in the table 1. Cardiac output increased mainly secondary to the increase of stroke volume, as heart rate did not show any change. The diastolic function showed improvement as VP increased after surgery.

Table 1

<table>
<thead>
<tr>
<th>Pre-Operative</th>
<th>Post-Operative</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYHA FC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.9±1.3</td>
<td>3.0±0.5</td>
<td>0.0001</td>
</tr>
<tr>
<td>Heart Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78±18</td>
<td>80±11</td>
<td>0.66</td>
</tr>
<tr>
<td>Systolic BP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>119±13</td>
<td>115±11</td>
<td>0.51</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>77±7</td>
<td>72±13</td>
<td>0.31</td>
</tr>
<tr>
<td>LV End-Diastolic Volume/BSA (ml/m2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53±13</td>
<td>74±19</td>
<td>0.002</td>
</tr>
<tr>
<td>LV End-Systolic Volume/BSA (ml/m2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26±10</td>
<td>41±19</td>
<td>0.003</td>
</tr>
<tr>
<td>LV Mass Index (g/m2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>126±28</td>
<td>98±31</td>
<td>0.04</td>
</tr>
<tr>
<td>Stroke Volume (ml)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31±12</td>
<td>46±21</td>
<td>0.02</td>
</tr>
<tr>
<td>Cardiac Index (l/m2/min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3±0.4</td>
<td>2.1±0.8</td>
<td>0.002</td>
</tr>
<tr>
<td>VP (cm/s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37±15</td>
<td>58±15</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Conclusions: Echodoppler is well suited to assess significant improvements in LV systolic as diastolic function after surgical treatment of EMF, which is associated with decrease in NYHA FC.
317
The profile of cardiac failure in restrictive cardiomyopathy: an interpretation based on the site of restriction.

Restrictive cardiomyopathy (RC) is defined by abnormal myocardial stiffness. Under this single haemodynamic restrictive profile, were included different diseases with polymorphic clinical and echocardiographic (echo) signs. The importance of an accurate diagnosis lies in distinguishing RC from constrictive pericarditis, which can also present with "restrictive physiology" but which is often cured surgically.

**Aim:** The assessment of new working classification based on clinical-echo data according to the site to the restriction to patients (pts) with RC confirmed by cardiac catheterisation (cath): the correlation with other noninvasive methods: radionuclide angiography (RA), computerized tomography (CT) and magnetic resonance imaging (MRI).

**Methods:** We studied 19 pts with RC, all confirmed by cath. A complete medical history and examination, echocardiography, chest radiography and echo data (TM, 2D, Doppler) were performed in all pts. Echo data were compared with RA (11 pts), CT (4 pts), MRI (5 pts). Histopathological studies were performed with right ventricular endomyocardial biopsy samples in 7 pts; 5 pts underwent autopsy.

**Results:** Three type of RC were identified based on noninvasive methods data according to the site to the restriction: type A: symmetric RC (10pts), with biventricular restrictive Doppler pattern of flow, biventricular restrictive RA pattern (decreased filling fraction, increased time to peak filling rate >200ms, decreased peak filling rate, decreased first 1/3 diastolic filling fraction, atrial contribution to ventricular filling >30%) and biventricular restrictive morphology (normal dimensions of both ventricles, bidual enlargement) on echo, CT, MRI data; type B: left asymmetric RC (5 pts) involves selectively the left ventricle and type C: right asymmetric (4 pts) affects only the right ventricle.

**Conclusions:** The application of new working classification based on clinical-echo data according to the site of myocardial restriction may offer a coherent pathophysiological interpretation of various entities included in RC. Associated noninvasive methods can increase the accuracy of diagnosis by "anatomic" (CT, MRI) or functional (RA) data.

318
Assessment of diastolic function in isolated noncompaction of ventricular myocardium.
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**Introduction:** Isolated noncompaction of ventricular myocardium is a rare congenital cardiomyopathy characterized by an arrest in endomycardial morphogenesis in the absence of other structural heart disease. The disease affects systolic and diastolic function, however, left ventricular (LV) or right ventricular diastolic function has not been well characterized in this disease.

**Methods:** Five patients with noncompacted isolated myocardium, three of them from the same family were prospectively studied by echocardiography. Ages ranges from 8 to 52 years, 3 females, all in sinus rhythm with follow-up of 1.9 years. Ejec tion fraction was assessed by M-mode echocardiography. Pulsed-wave Doppler was used to obtain mitral, tricuspid and pulmonary venous flows velocities and grade diastolic function. Pulsed-wave tissue Doppler imaging velocities along the septal side of mitral annulus, flow propagation velocity (vp) of the early diastolic mitral inflow, and myocardial performance index were obtained.

**Results:** According to this grading method, we found 2 patients with normal diastolic function, 2 with pseudonormal and 1 presented a restrictive pattern. A positive correlation of these diastolic function grades and New York ork Heart Association functional class was found (r=0.92, p=0.017). One patient presented impaired relaxation of mitral annulus, flow propagation velocity (vp) of the early diastolic mitral inflow and myocardial performance index were obtained.

**Conclusions:** The application of new working classification based on clinical-echo data according to the site of myocardial restriction may offer a coherent pathophysiological interpretation of various entities included in RC. Associated noninvasive methods can increase the accuracy of diagnosis by "anatomic" (CT, MRI) or functional (RA) data.

319
Left ventricular restrictive filling pattern is associated with reduced cardiac sympathetic innervation in dilated cardiomyopathy.
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1Heraklion University Hospital, Cardiology Dept., Heraklion, Crete, Greece; 2Heraklion University Hospital, Dept. of Nuclear Medicine, Heraklion, Greece

**Background:** The hallmarks of Left Ventricular (LV) diastolic dysfunction are delayed relaxation and reduction of chamber compliance and are common findings in pts with systolic dysfunction.

The adrenergic nerve system has a major role in regulating cardiac function while cardiac fixation of 123-I-Metaiodobenzylguanidine (MIBG) has been used to assess myocardial adrenergic innervation. We assessed the relationship of LV sympathetic innervation with the LV diastolic filling pattern in pts with non-ischemic dilated cardiomyopathy (NIDC).

**Methods:** Thirty-seven patients, 13 women, mean age 56±11.3y, in sinus rhythm and angiographically proven NICD, NYHA functional class II-III, LV ejection fraction (EF) 30.8± 9.5%, who were clinically stable during the last month, were studied with planar MIBG and early (10 min), and late (4 hours) heart to mediastinum uptake ratio and washout was calculated. A complete echocardiographic study was performed to all patients.

**Results:** According to Doppler transmural early (E) to late (A) filling Velocity and E deceleration time (DTE) pts was divided into restrictive (E/A<2 or E/A=1-2 and DTE>140ms, Group I, 15 pts) or nonrestrictive (22 pts, group II) groups. There were no differences in age (57.1±10.6 vs 53.2±13.8yrs), NYHA class (2.2±0.36vs vs 2.4±0.44) or LV EF (33±9.4 vs 28±1.8±9.2%) between two groups. Group I pts showed increased left atrial diameter (45.8±4.1 vs 42.5±4.9, p=0.04), and decreased early (1.4±0.12 vs 1.63±0.21, p=0.01) and late(1.38±0.14 vs 1.5±0.23, p=0.01) MIBG uptake compared to group II. Late MIBG uptake was found to correlate with NYHA class (<0.044,p=0.006), A wave (<0.37,p=0.02) and DTE (<0.34,p=0.04).

**Conclusion:** Binary logistic regression analysis revealed that late MIBG uptake was independently associated with LV restrictive filling pattern (p<0.009).

In NIDC the transition of diastolic dysfunction from impaired relaxation to restrictive filling pattern is independent to LV systolic function and it is strongly correlated with the LV sympathetic innervation. A greater percentage of beta-receptors down- regulation or destruction may contribute to the aggravation of LV diastolic dysfunction in these pts.

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Time-movement and tissue Doppler imaging timing parameters of ventricular desynchronization in patients with dilated cardiomyopathy.
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**Background:** The aim of this study was to compare similar Time-Movement (TM) and Tissue Doppler Imaging (TDI) timing parameters in order to predict their value in the assessment of the severity of systolic asynchrony for biventricular pacing indication.

**Methods:** 31 patients (pts) aged 56.4±11.2 years with dilated cardiomyopathy were included. The following parameters were measured: QRS duration (QRSd); septal (S), posterior (P), lateral (L) and posterior-lateral (PL) wall delays, as the time from QRS onset to maximal wall contraction, and the derived parameters: left ventricular mechanical delays (LVD) as the time interval from maximal contraction between interventricular septum and posterior (LVPd), lateral (LVDl) and posterior-lateral wall (LVDpl), using parastral, 4 chamber view and subcostal incidence both in TM and TDI; IRT; and TDI measurement time (T) in each wall using TDI, TDI measurement time were performed using both color and pulsed TDI (from QRS onset to the end of S wave for each wall). Another derived parameter was calculated as the difference between similar TM and TDI parameters: error parameter (Er: LVDpEr, LVDlEr, LVDplEr).

**Results:** QRSd significantly higher in QRSd >100ms (120 ± 20ms) vs 90±10ms (p=0.001). No correlation between QRSd and QRSd >100ms was founded in 25 pts (19 pts LBBB and 6 pts QRSd >100ms); LVD was significantly higher in QRSd>120ms pts (p<0.0001 in each LVDpl,p). There was no correlation between QRSd and echocardiographic parameters (r<0.3 each). TM and TDI measurements matched in pts with good echocardiography; differences in similar parameters as LVD ranged from 0-70ms. Er >30ms were noticed in pts with fragmented wall motion and IRT >30ms.

**Conclusion:** Intraventricular asynchronous contraction occurs even in pts with normal QRS duration; these changes can be easily and accurately detected using simple TM timing parameters. The most delayed step to be stimulated can be found either using TM or TDI.
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Correlation between architectonic perturbations of left ventricular geometry, evaluated with 3D-echo, and perturbations of apical hemodynamics, leading to apical thrombosis in dilated cardiomyopathy.

I. Benedek, T. Hinta. University Hospital Mures, Cardiology Clinic, Targu-Mures, Romania

In dilated cardiomyopathy (DCM), preferential localisation of intracavitary thrombosis in the Left Ventricular (LV) apex could be explained by architectonic and hemo-dynamic perturbation of the LV shape, which create an apical thrombogenic area. Decrease of flow velocities and persistence of flow are more pronounced in areas where architectonic modifications occur (LV apex), favoring thrombus development at these sites.

Methods: Thirty-six patients with DCM - group A, and a control lot of 25 healthy subjects - group B. Venticular shape and geometry were evaluated using B-mode echo. Doppler mapping of blood flow velocity in the LV was performed at different sites, along 3 longitudinal axes at 3 levels: basal, medioventricular and apical. Three-dimensional echocardiography (Sonos 5.500 - Agilent Technologies) was performed in 12 cases, transthoracic and transesophageal, for analysis of LV architectonics.

Results: LV thrombosis was present in 56.7% of DCM cases, all of them in the apex. Study of LV architectonics showed dilatation of LV in DCM group, 25% more pronounced in the apex than in the medioventricular area, (p<0.001). Doppler mapping of flow velocities showed a decrease of diastolic velocity from basis to apex with 0.48 m/sec (avg) in pts. with DCM and 0.25 m/sec (avg) in control group (p<0.001).

In DCM group, this velocity decrease was 2.2 times more pronounced in the apical half of the LV (0.33 m/sec) than in the basal half (0.15 m/sec), while in control group this decrease was uniformly distributed (0.13 m/sec vs 0.12 m/sec). Time duration of flow (on Doppler wave) increased from basis to apex (with +0.25 msec avg) in group A (p<0.007) while in group B it decreased from basis to apex (with -0.25 msec p=0.007). 3D echocardiography showed in all the 12 cases modifications of LV architectonics, with a relative “narrowing” in the medioventricular area, 31% more pronounced than in the control lot. Contrast echo showed a longer persistence of flow and turbulent flow in the apex in all DCM cases.

Conclusions: In DCM, LV’s shape and architecture presents significant perturbations, demonstrated with 3D echo, which favor a turbulent flow in the dilated apex, leading to development of thrombi especially in this area. Doppler mapping of flow velocities shows progressive decrease of flow velocity from basis to apex, more pronounced in the apical part of the LV, creating proper conditions for apical thrombosis in DCM.

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Influence of aetiology on long-term survival in patients with chronic heart failure.

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Aetiology of ischemic heart disease has been shown to be associated with worse prognosis than idiopathic aetiology in patients with chronic heart failure. Other reports showed that survival was worse for idiopathic dilated cardiomyopathy or was unrelated to aetiology. Due to these conflicting results, large therapeutic multicentre heart failure trials included patients regardless of aetiology. We hypothesized that patient group selection bias, for example the study of heart transplant candidates, may explain these conflicting results. To determine whether ischemic or idiopathic causes of cardiomyopathy were associated with prognosis, 287 patients with LV ejection fraction (EF) 40% and LV end diastolic diameter > 6.0cm were followed prospectively. VEF was assessed by visual estimation, M-mode echo (when there were no regional wall motion abnormalities or left bundle branch block), Simpson’s prospectively. LVEF was assessed by visual estimation, M-mode echo (when there may explain these conflicting results. To determine whether ischemic or idiopathic aetiology of ischemic heart disease has been shown to be associated with worse prognosis.

Conclusion: Posterior semi- circular reductive mitral annuloplasty reduces signifi-cantly MAA, IAD and eliminates MR. This procedure corrects remodeling of the left ventricle and we recommended it in patients with PDCM immediately after first decompensation.

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Assessment of mitral annulus dilatation in patients with primary dilated cardiomyopathy before and after posterior semi- circular reductive annuloplasty.

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1Institute of CVD, Clinic For Cardiovascular Surgery, Sremska Kamenica, Yugoslavia; 2Institute for CVD, Clinic for cardiology, Sremska Kamenica, Yugoslavia

Mitral regurgitation (MR) is one of the most common independent factors causing heart failure in patients with primary dilated cardiomyopathy (PDCM). The main cause of MR in PDCM is mitral annulus dilatation.

Purpose: The aim of the study is to compare changes in mitral annulus area (MAA), changes in index of annular dilatation (IAD), changes in degree of MR before and after posterior semicircular mitral annuloplasty.

Material and Methods: Twenty patients (9 male and 11 female, mean age 31) with PDCM were included in the study. The following parameters were analyzed using TEE: mitral annulus diameter in systole (MADs), mitral annulus diameter in diastole (MADDi), mitral annulus area in diastole (MAAD), lengths of anterior mitral leaflet in diastole (LAMDi).

Methods: The study included using Goldberg’s formula and IAD was obtained using formula: IAD = MADs/LAMDi.

Results: Results are presented in the table.

<table>
<thead>
<tr>
<th>Group</th>
<th>MADS (cm)</th>
<th>MADDi (cm)</th>
<th>MAAD (cm²)</th>
<th>IAD (cm²)</th>
<th>IAD</th>
<th>MIR to No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before annuloplasty</td>
<td>4.06 ± 0.41</td>
<td>4.36 ± 0.36</td>
<td>14.81 ± 2.4</td>
<td>2.11 ± 0.2</td>
<td>1.86 ± 0.3</td>
<td>3.73 ± 0.1</td>
</tr>
<tr>
<td>After annuloplasty</td>
<td>1.8 ± 0.1</td>
<td>2.41 ± 0.2</td>
<td>5.0 ± 1.1</td>
<td>2.1 ± 0.2</td>
<td>1.05 ± 0.4</td>
<td>0</td>
</tr>
</tbody>
</table>

Conclusion: Posterior semicircular reductive mitral annuloplasty reduces signifi-cantly MAA, IAD and eliminates MR. This procedure corrects remodeling of the left ventricle and we recommended it in patients with PDCM immediately after first decompensation.

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Thoracic ultrasonography in differentiating dyspnea in patients with heart failure.

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Background: Optimal management of CHF requires monitoring of the symptoms of congestion. Pulmonary congestion (PC) is a useful marker of CHF. The diagnosis of PC is confirmed by clinical and X-ray examination. The mean sign of PC – dyspnea, is not specific and can be caused by pulmonary diseases. Thoracic US is very sensitive and specific in detection of pleural fluid. However, US is not recognized as the leading method of examination of respiratory system. The fluid amount in lung is increased by PC and it changes the sonographic characteristics of lung.

Objective: The aim of this study was to find the US signs of PC.

Methods: We studied 169 patients with different grade CHF and X-ray signs of PC (group I), 30 patients with dyspnea caused by exacerbation of chronic obstructive bronchitis, bronchial asthma or emphysema (II group) and 80 normal persons with patients and patients with heart diseases who had no CHF (III group). Left ventilatory cavity size and EF% was determined by 2D-EchoCG, pulmonary artery pressure – by Dopplerographic evaluation of tricuspid or pulmonary regurgitation flow. Sonographic evaluation of a lung was done in horizontal and vertical positions of patient, from 12 points on thoracic wall, which corresponded to the projection of lower, middle and upper lobes of a right lung and upper and lower lobes of left lung.

Results: In patients with CHF significantly often was found the one of the sorts of re- verberation “Comet Tail Phenomenon” (CTP) (100% versus 46%, p<0.005). The count of positions on thoracic wall from where the CTP was registered in I group was 9.2 ± 3.14, in II group – 1.19 ± 1.11 (p<0.001) and in III group - 1.36 ±1.30 (p<0.001). There was good correlation between the count of CTP registration points from the thoracic wall and the heart failure NYHA class (r=0.56), left ventricular systolic (r=0.40) and diastolic (r=0.32) diameters and negative correlation with EF% (r=-0.42). If we take 5 positions as a reference value the sensitivity of sign in diagnosis of PC was 84.6% an specificity – 98.8%. In CHF group CTP was prominent, protracted and multiple, while in the II and III group it was single and short lasting.

Conclusion: (1) Thoracic US is sensitive and accurate method for evaluation of PC in patients with CHF and in differentiating dyspnea induced by CHF from dyspnea induced by respiratory diseases. (2) The US sign of PC in HF is a “Comet Tail Phe-nomenon”, which is protracted, prominent, multiple and registered from larger area of thoracic wall (5 positions or more).
326 Management of end-stage heart failure: non-invasive or invasive monitoring?  
N. Mansencal1, F. Digne1, T. Joseph1, R. Pillière 1, J.F. Morisson-Castagnet1, M. Plewka, J. Drozdz, M. Ciesielczyk, K. Wierzbowska, P. Lipiec, T. Jezewski, M. Krezminska-Pakula, J.D. Kasprzak. Medical University of Lodz, Cardiology Dept., Lodz, Poland

Tissue Doppler echocardiography allows the quantification of cardiac cycle intervals. The aim of this study was to compare the relationships between tissue Doppler echocardiography measurements of cardiac cycle intervals with mitral Doppler inflow derived time intervals in healthy and failing hearts. The study group included 60 healthy subjects (aged 53±12 yrs, LVEF 64±2%) and 60 patients with heart failure (aged 55±8 yrs, EF 29±10%). Using transthoracic pulsed Doppler echocardiography of mitral and aortic flow we measured time intervals of cardiac cycle from mitral and aortic flow: pre-ejection phase (PSEP), ejection phase (EP), isovolumic relaxation time (IVRT), rapid filling time (RFT), diastasis time (DT) and atrial contraction time (ACT). Than we compared standard time intervals with tissue Doppler echocardiography time intervals - PEPm, IVRTm, RFTm, DTm and ACTm.

We found close linear correlation between parameters derived from standard and tissue Doppler echocardiography in healthy subjects (Pep vs PEPm r=0.899 p<0.0001, EP vs EPm r=0.892 p<0.0001, IVRT vs IVRTm r=0.910 p<0.0001, RFT vs RFTm r=0.526 p<0.0003 DT vs Dm r=0.894 p<0.0001, ACT vs ACTm r=0.475 p=0.008).

In patients with heart failure due to regional asynchrony the correlation was weak (Pep vs PEPm r=0.688 p<0.0001, EP vs EPm r=0.486 p=0.006, IVRT vs IVRTm r=0.288 p=NS, RFT vs RFTm r=0.484 p<0.0007, DT vs Dm r=0.782 p<0.0001,ACT vs ACTm r=0.468 p<0.009).

Conclusion: Regional TDE time intervals of cardiac cycle correlates with standard echocardiographic measurements in healthy subjects but not in patients with heart failure.
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**Differentiation of ischaemic and idiopathic dilated cardiomyopathy in patients with global systolic left ventricular dysfunction.**

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Many studies have shown that conventional echocardiographic parameters are unable to distinguish between ischaemic and non-ischaemic aetologies in patients with global severe left ventricular dysfunction when history of coronary disease is rare. The aim of this study was to determine whether colour tissue Doppler imaging and strain could make this distinction. The study cohort comprised 18 controls (33±10y, 9 Males), 37 patients, with idiopathic dilated cardiomyopathy (DCM) (62±10y, 28 Males, LVEF 30±13%, LV end-diastolic volume (LVEDV) 6.1±0.4cm) and 16 patients with > 3-vessel coronary artery disease (IHD) (67±11y, 13 Males, LVEF 29±10%, LV end-diastolic volume (LVEDV) 6.4±0.3cm). Colour tissue Doppler velocities and strain were measured in the left ventricular posterior wall on M-mode recordings. No patient had a kinetic, thin and echo bright posterior wall. Wall motion score index (2.34±0.39 versus 2.25±0.42) and the number of akinetic LV segments per patient were not significantly different for IHD and those with DCM. During systole, ejection epicardial velocity measured at the peak of endocardial velocity was higher in DCM than in IHD (21±13 versus 10±9mms, p<0.04). The ratio of pre-ejection to ejection endocardial velocity was lower in DCM compared to IHD (25±27 versus 72±44, p=0.01). During early diastole, peak endocardial velocity (68±33 versus 42±24, p=0.03), peak epicardial velocity (53±31 versus 28±17, p=0.01), and endocardial velocity measured at peak epicardial velocity (36±27 versus 10±9, p=0.003) were higher in DCM than in IHD. Systolic strain and tissue Doppler derived myocardial velocities gradients were similar in both groups of patients. Conclusion, analysis of colour tissue Doppler echocardiograms in endocardial and epicardial layers may be able to identify those patients with global severe left ventricular dysfunction that have ischaemic heart disease.

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**Longitudinal and radial systolic wall motion velocity in transplanted heart for rejection surveillance and early detection of patients with allograft vasculopathy.**

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Noninvasive acute rejection (AR) surveillance and early detection of transplant coronary arteriopathy (TxCA) are major objectives in the management of heart recipients. Echocardiography is part of post-transplant routine follow-up, but its clinical value is controversial. Recently attention has been focused on tissue Doppler wall motion analysis, which can detect ventricular dysfunction earlier than conventional echocardiography. We assessed the usefulness of pulsed wave tissue Doppler (PW-TDI) velocity and time parameters for AR surveillance and detection of patients with new appearance or aggravation of TxCA.

**Methods:** To evaluate the left ventricular (LV) wall motion, we selected the posterior wall because it enables optimal recording from the same region of both radial and longitudinal wall motion. In 356 patients, serial PW-TDI recordings were performed at the basal posterior wall in the parasternal short axis and in the apical long axis views. We measured the systolic and early diastolic peak velocities Sm and Em, the systolic time TSm (onset of first heat sound to Sm) and the diastolic time TEM (onset of second heat sound to Em). These parameters were tested for relationship to cardiac catheterization and biopsy findings.

**Results:** For both radial and longitudinal wall motion, all tested parameters showed significant alterations during biopsy-proven AR (p < 0.01). During the early post-transplant period, the sensitivity and specificity for biopsy-proven rejection of Em reduction, TEM extension and Em/TEM reduction was > 91%. For late ARs (by the 2nd post-transplant year), the sensitivity and specificity of these diastolic parameters was lower (78 - 83%). The sensitivity and specificity of Sm reduction, TSm extension and Sm/Tsm reduction was highest for late ARs (> 90%). For PW-TDI changes the threshold value of 10% was selected in accordance with the reproducibility of measurements tested during the study. With TxCA, the PW-TDI pattern (radial and longitudinal) showed significant changes (p < 0.01) for both systolic and diastolic parameters, but the systolic changes were more obvious. Thus, even patients with TxCA visible only by IVUS, showed significant alterations (p < 0.01) for all systolic parameters. At definite cut-off values for systolic parameters, angiographic TxCA can be excluded with a probability of up to 93%.

**Conclusion:** Serial PW-TDI recorded at the basal posterior wall provide useful diagnostical information after heart transplantation, which facilitates the early detection of AR and TxCA and enables the timing of invasive examinations.

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**Usefulness of systolic left ventricular long-axis function for the prediction of mortality in patients with severe left ventricular dysfunction due to ischemic cardiomyopathy.**

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**Objectives:** To assess the prognostic value of response of left ventricular (LV) long-axis function to dobutamine infusion, in patients with severe heart failure due to ischemic cardiomyopathy.

**Methods:** Fifty-one coronary artery disease (CAD) patients, age 62±8 years, with severe LV dysfunction (EF<35%) and NYHA functional class III or IV were included in the study. None of the patients was a candidate for revascularization either because absence of myocardial viability or because inappropriate coronary anatomy. All patients underwent stress echocardiography. Left atrioventricular pressure gradient was used as a reliable parameter of diastolic dysfunction. Dox 5-40 g/kg/min, using 2D guided M-Mode, towards the four sides of the left atrioventricular plane (septal, lateral, inferior and anterior), from the apical 2- and 4-chambers view. The amplitude of LAS was determined as the average value of the four, mentioned above, sides. LAS increase >10% during dobutamine infusion compared with baseline was considered significant.

**Results:** Cardiac mortality during 36±6 months follow up was 59%. The response of LAS to low-dose dobutamine infusion was independent predictor of cardiac death in multivariate analysis (p<0.001), whereas LAS response to peak dobutamine infusion had >15% increase of LAS at low-dose dobutamine infusion (LAS increase>17.6%), in the rest 32 (63%) patients, LAS did not show any significant change (LAS increase<2.5%). Patients with improved LV long-axis function during low-dose DSE had significantly lower 2-year cardiac mortality compared with the others who didn’t show any positive response to the drug (19 patients with cardiac mortality =26% vs. 32 patients with cardiac mortality=81%, p<0.001).

**Conclusions:** The response of LV long-axis function to low-dose dobutamine infusion showed a strong independent prognostic value, in CAD patients with severe heart failure. Assessment of this parameter during DSE facilitates identification of heart failure patients with extremely high mortality, for whom immediate cardiac transplantation can be lifesaving.

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**Prognostic value of Tei index before and after dobutamine challenge in patients with idiopathic dilated cardiomyopathy.**

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**Background:** Numerous parameters of left ventricular (LV) systolic and diastolic function have shown to independently determine prognosis in patients (pts) with idiopathic dilated cardiomyopathy (IDCM). The presence of myocardial contractile reserve assessed by the increase of LV ejection fraction on dobutamine echocardiography has been shown to have beneficial effect on prognosis of these pts. Since IDCM have both systolic and diastolic LV dysfunction, it could be expected that dobutamine induced changes of Tei index, as a parameter of global myocardial performance, could give more valuable prognostic information in these pts. The aim of our study was to evaluate the prognostic value of changes of Tei index before and after dobutamine challenge in pts with IDCM.

**Methods:** Nineteen (37%) patients were included in the study. The study cohort comprised 18 controls (53±10y, 35%) and NYHA functional class III or IV were included in the study. None of the patients was a candidate for revascularization either because absence of myocardial viability or because inappropriate coronary anatomy. All patients underwent stress echocardiography. Tei index was determined with a mean ± standard deviation of 0.35 ± 0.18. All the patients underwent dobutamine stress echocardiography (DSE). The amplification had no predictive value. Nineteen patients (37%) demonstrated significant increase of LAS at low-dose dobutamine infusion (LAS increase>17.6%), in the rest 32 (63%) patients, LAS did not show any significant change (LAS increase<2.5%). Patients with improved LV long-axis function during low-dose DSE had significantly lower 2-year cardiac mortality compared with the others who didn’t show any positive response to the drug (19 patients with cardiac mortality=26% vs. 32 patients with cardiac mortality=81%, p<0.001).

**Conclusions:** The response of LV long-axis function to low-dose dobutamine infusion showed a strong independent prognostic value, in CAD patients with severe heart failure. Assessment of this parameter during DSE facilitates identification of heart failure patients with extremely high mortality, for whom immediate cardiac transplantation can be lifesaving.

**Abstracts S33**

**Eur J Echocardiography Abstracts Supplement, December 2003**
333 Prognostic value of systolic and diastolic echocardiographic parameters in patients after myocardial infarction after 18-months follow-up.

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Purpose: Our aim was to assess role of wide spectrum of echocardiographic parameters in prediction of combined cardiac events (death, myocardial infarction or exacerbation of heart failure) and cardiac deaths in 18-months follow-up in 60 subjects after myocardial infarction.

Methods: We assessed classic two-dimensional and Doppler parameters, pulmonay vein flow, propagation of mitral waves and mitral annulus motion by pulsed tissue Doppler. After follow-up period combined endpoints and deaths were registered and on basis of cut-off values found by ROC analysis Kaplan-Meier survival curves were compared.

Results: The greatest accuracy for detection of patients with combined endpoint showed: left atrium (LA) >44 mm, area under curve (AUC) 0.909, ejection fraction (EF) below or equal 34%, AUC 0.784, left ventricle diastolic (LVD) >51 mm, AUC 0.811 and systydic dimensions (LVs) >43 mm, AUC 0.798, early deceleration time (ED) below or equal 130 ms and AUC 0.811 and difference of atrial reversal and atrial wave of mitral inflow duration (delta A) ≥ 23, AUC 0.781. For all above cut-off values comparison of survival curves revealed highly significant difference with p≤0.001. Relative risk and 95% confidence intervals for combined endpoint are shown in table 1. For ED below 130 ms and delta A at above 23 ms all patients experienced combined endpoint.

Multivariate analysis revealed only one independent predictor of both combined endpoint and death: LA dimension with cut-off values above 44 mm for combined endpoint (p<0.001) and above 46 mm for death, (p=0.004).

Table 1. parameter cut-off value relative risk 95% CI

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cut-off Value</th>
<th>Relative Risk</th>
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<tbody>
<tr>
<td>LA</td>
<td>&gt;44 mm</td>
<td>5 (2.5-12.3)</td>
</tr>
<tr>
<td>LVd</td>
<td>&gt;51 mm</td>
<td>3.1 (1.4-6.7)</td>
</tr>
<tr>
<td>LVs</td>
<td>&gt;43 mm</td>
<td>2.7 (1.4-5.2)</td>
</tr>
<tr>
<td>EF</td>
<td>&lt;(-34%)</td>
<td>3.1 (1.5-6.3)</td>
</tr>
<tr>
<td>Delta A</td>
<td>&gt;130 ms</td>
<td>-</td>
</tr>
<tr>
<td>Mitral inflow restriction</td>
<td>&gt;23 ms</td>
<td>2.1 (1.3-3.2)</td>
</tr>
</tbody>
</table>

Conclusions: In our study for subjects after myocardial infarction and without significant valvular insufficiency left atrium dimension emerged as the best predictor of both combined cardiac endpoint and death.

334 Prognostic implications of cTnI elevation after elective percutaneous intervention in patients after myocardial infarction and regional left ventricular function in prospective, one-year follow-up study.

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Aim of the Study: to assess the incidence of cTnI elevation after elective PCI, with and without complications, and to examine the impact of minor myocardial injury on clinical and echocardiographic data in one-year follow-up study.

Methods: A total of 90 pts who underwent elective PCI were included into the prospective study. Serum levels of cTnI were measured before 12 and 24 hours after clinical procedure, by the use of immunoassay (OPTIMUS, Dade-Behring), cut-off point 0,10 µg/L. CK-MB was measured 12 and 24 hours after the procedure, using enzymatic activity method, (cut-off 40 U/L). Baseline global left ventricular systolic function (LVEF) and 16 segments wall motion score index (WMSI) were assessed.

One year follow-up comprised clinical and echocardiographic data assessment.

Results: No patient included into the study had abnormal marker value before the procedure. LVEF ranged from 25 to 60% (mean 50%). Calculated WMSI was 1.2 ±0.2. 12 h and 24 h after procedure, we noticed a few fold rise of cTnI serum levels in 66 pts (73%) cTnI positive group (cTnI +), being the most prominent in stenting group (0.4 ±0.2 µg/L), 24 pts (27%) presented with normal values of cTnI after PCI-cTnI negative group (cTnI -).

Only 8 of 66 cTnI positive pts had significant (>100 µg/L) postprocedural cTnI concentration, coexisting with the rise of CKMB 2-3 times upper limit of normal.

One year follow-up comprised 62 pts of cTnI (+) group and all 24 pts of cTnI (-) group. We noticed 7 MACE in cTnI (+) group, including 4 cardiac death cases, versus no MACE in cTnI(-) group, but this difference did not reach statistical significance (p=0.09).

Results of LVEF and WMSI analysis in both groups are shown in table 1.

Table 1. parameter cut-off value relative risk 95% CI

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Cut-off Value</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF &amp; WMSI</td>
<td>no change</td>
<td>baseline EF &amp; WMSI</td>
</tr>
<tr>
<td>cTnI (+) 62 pts</td>
<td>31 pts (60%)</td>
<td>9 pts (14.5%)</td>
</tr>
<tr>
<td>cTnI (-) 24 pts</td>
<td>9 pts (40%)</td>
<td>5 pts (20%)</td>
</tr>
</tbody>
</table>

Conclusions: A small rise in serum cTnI concentration is a common finding after uncomplicated, elective PCI procedures; in our study it does not significantly correlate with adverse outcome, but it may have some negative impact on global and regional left ventricular systolic function. Stenting procedures seem to be associated with higher degree of minor myocardial injury

335 Natriuretic peptides and myocardial function in chronic heart failure.

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Aim: Atrial natriuretic peptide (ANP) and brain natriuretic peptide (BNP) belong to the important humoral substances that reflect the severity of chronic heart failure. We assessed classic two-dimensional and Doppler parameters, pulmonaty wave tissue Doppler imaging at rest and during low-dose dobutamine infusion.

Methods: We assessed right atrial pressure (CVP), and pulmonary vascular resistance (PVR). Pro-ANP and BNP levels were measured by ELISA method.

Results: Patients with higher pro-ANP, group A had a higher diastolic and systolic diameters of LV, 71,0±7,1 vs 67,5±9,8 mm, p<0.05 and 60,4±7,2 vs 56,5±9,9 mm, p<0.05, lower EF of left ventricle 22,0±5,9 vs 20,1±5,8%, p<0.02 and lower Sa (which reflects the right ventricular function) 10,6±2,3 vs 11,4±2,2 cm/s, p<0.01. On the contrary the values of right heart catheterization were much higher in group A.

Table: 33 Atrial systolic and diastolic diameters of LV, EF and WMSI in groups: A cTnI (+) 62 pts, B cTnI (-) 24 pts.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A</th>
<th>Group B</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA</td>
<td>34%</td>
<td>3,1</td>
<td>0,001</td>
</tr>
<tr>
<td>DVS</td>
<td>1.9</td>
<td>2.0</td>
<td>0,04</td>
</tr>
<tr>
<td>LVd</td>
<td>51</td>
<td>51</td>
<td>0,024</td>
</tr>
<tr>
<td>LVs</td>
<td>43</td>
<td>43</td>
<td>0,024</td>
</tr>
<tr>
<td>EF</td>
<td>10,2</td>
<td>10,3</td>
<td>0,024</td>
</tr>
<tr>
<td>WMSI</td>
<td>23,5</td>
<td>23,5</td>
<td>0,024</td>
</tr>
</tbody>
</table>

Conclusions: Natriuretic peptides reflect the severity of heart failure, their levels are higher in patients with marked pulmonary hypertension, decreased ejection fraction of left ventricle and they are more increased when dysfunction of both ventricles is present.

336 Quantification of regional left ventricular function in Q-wave and non Q-wave dysfunctional regions by tissue Doppler imaging in patients with ischemic cardiomyopathy.

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Objective: To quantify myocardial regional function and contractile reserve in Q-wave and non-Q-wave dysfunctional regions in patients with previous myocardial infarction and depressed left ventricular (LV) function.

Methods: A total of 81 patients underwent echocardiography at rest and pulsed-wave tissue Doppler imaging at rest and during low-dose dobutamine infusion. LV was divided into 4 major regions (anterior, anteroseptal, posterolateral, and septal). Severely hypokinetic, akinetic, and dyskinetic regions on 2D echocardiography at rest were considered dysfunctional. Regional myocardial systolic velocity (VS) at rest and the change in VS during low dose dobutamine infusion (DVS) in dysfunctional regions with and without Q waves on surface electrocardiogram were measured.

Results: A total of 220 (69%) regions were dysfunctional; 60 of these regions corresponded to Q-waves and 160 were not related to Q-waves. VS and DVS were lower in dysfunctional than in non-dysfunctional regions [VS 6.2±1.9 cm/s vs. 7.1±1.7 cm/s (p<0.001); DVS 1.9±1.9 cm/s vs. 2.6±2.5 cm/s (p=0.009), respectively]. There were no significant differences in VS and DVS among dysfunctional regions with and without Q waves (Q-wave regions: VS 6.2±1.8 cm/s, DVS 1.6±2.2 cm/s; non-Q-wave regions: VS 6.3±1.9 cm/s, DVS 2.0±2.0 cm/s (see figure).

Conclusions: Q waves on the electrocardiogram do not indicate more severe myocardial dysfunction, and contractile reserve is comparable in Q-wave and non-Q-wave dysfunctional myocardium. Hence, in patients with LV dysfunction due to chronic coronary artery disease, non-invasive testing for the assessment of viability should be performed irrespective of the presence of Q waves.
Regional deformation imaging identifies delayed recovery of myocardial function after ischaemia induced by dynamic exercise.

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Background: There are currently no established echocardiographic tests that can reliably detect regional myocardial stunning, but these would be useful clinically to establish if patients who present with recurrent chest pain have had myocardial ischaemia. We therefore studied patients after cumulative ischaemia induced by repeated dynamic stress, using tissue Doppler echocardiography (TDE) to investigate if myocardial stunning can be detected non-invasively as delayed recovery of regional systolic or diastolic contractile function.

Methods: Patients with severe coronary disease and stable angina (>75% area stenosis in ≥2 major epicardial vessels, <2mm ST-segment depression on prior exercise testing) but no history of MI, underwent 2 symptom-limited treadmill exercise tests either 30 min apart (Group A; n=12; 10 men, age 57±12 yrs) or 1 hour apart (Group B; n=14; 13 men, age 57±9 yrs). Transthoracic echocardiograms at baseline, immediately after exercise, and at 15 minute intervals after each test, were analysed for myocardial velocities, strain-rate (SR) and strain (S).

Results: On average, patients exercised for longer during the second exercise test (p<0.02; no difference between Gps) but all tests provoked ischaemia (ST depression -1.7±1.0mm in Gp A. compared with -2.6±1.1mm in Gp B, p<0.05; similar subnormal (i.e. ischaemic) peak velocity responses in both Gps). After the second exercise test, systolic and diastolic myocardial velocities in segments supplied by stenotic arteries did not differ between Gps; they had returned to baseline values by 15 mins after exercise and remained normal thereafter. However, peak systolic SR was still reduced in Gp A after 30 and 60 mins (increment -0.16±0.16% and 0.01±0.11% respectively) whereas it increased in Gp B (0.33±0.18% and 0.21±0.14%; p<0.05).

Peaksystolic S was also reduced in Gp A compared with Gp B (increments -2.6±2.5 vs 4.2±2.2mm at 15 mins, and -4.1±2.1 vs 0.8±1.7mm at 60 mins; both p<0.05). Diastolic strain was higher in Gp A than in Gp B (increments -3.3±1.4% at 15 mins, and 3.26±1.2% vs 1.7±1.4% at 60 mins; both p<0.05). These changes in SR imaging persisted for 60 mins after the second exercise test.

Conclusions: Myocardial systolic strain, but not velocities, demonstrate preserved diastolic regional function after cumulative myocardial ischaemia induced by maximal exercise tests 30 mins apart. These changes may be caused by myocardial stunning, and so abnormal contractile function may be useful as a marker of prior ischaemia in patients who present with chest pain.

Left ventricular remodelling after single acute myocardial infarction in long term follow-up estimated by new echocardiographic method.

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Little is known about natural history of left ventricle (LV) after single Q wave acute myocardial infarction (AMI) in long term observation (FU).

Aim: To evaluate new echocardiographic (ECG) method of infarct size estimation for assessment of LV remodelling in patients (pt-s) with single Q wave AMI, to evaluate differences in systolic and diastolic LV remodelling dependent on the location.

Material: 51 pts-of consecutive 155 with first Q wave AMI who completed 10 years FU and who had neither successive AMI nor coronary intervention. 20 of them underwent coronary angiography and 31 were intact. Method: baseline ECHO was done in-hospital, FU after 1 year and 10 years. Estimation of AMI size: anterior AMI area surface was obtained in 4 chamber apical view (A1) as a region of impaired LV contractility. Relation between infarct size and LV was expressed as a ratio: IV1DAD_sax. Results: There were no differences between parameters of a global LV function between in-hospital examination and after 1 year. However significant differences were found after 10 years LV increased with deterioration of a global function.: EDV 89.2±34 vs 112.6±89 ml, (p<0.02), ESV 42.2±23 vs 53.2±38 ml, (p<0.04) and WMS (1.6±3 vs 1.7±4, p<0.05). Localisation dependent differences were found in AMI size after 10 years. In anterior AMI A1 significantly diminished from 8.95±7 to 8.6±.cm3 (p<0.01) and A1/IV1DAD_ap4 ratio from 0.24±0.1 to 0.21±0.1(NS), while in inferior AMI I1 increased from 6.1±3 vs 8.9±5 cm3, (p<0.01) and ratio I1/IV1DAD_sax also increased from 0.29±0.1 to 0.35±0.1(NS). At baseline ECHO higher degree of LV remodelling was found in pt-s with anterior AMI than in inferior AMI: ESV 50 vs 37 ml, (p<0.05), WMS 1.48±.2 vs 1.78±.4(=p<0.001) and greater infarct size (A1 9.0 vs 11.6±1.5, p<0.05). Almost all differences disappeared during FU. After 10 years both groups were equal in respect of LV function and infarct size.

Conclusions: New ECHO method of the LV assessment in patients with AMI is useful in the evaluation of LV remodelling. Slow LV remodelling develops even in unique and uncomplicated AMI. In this particular group of pts-in long term FU in anterior AMI remodelling was related mainly to the remote LV with signs of reverse remodelling of the infarct scare. In contrary, in inferior AMI LV remodelling concerned mostly the infracted area.

Prediction of late left ventricular dysfunction after surgical correction of mitral regurgitation.


Left ventricular dysfunction (LVD) is the most important predictive factor of long-term morbidity and mortality after surgery for mitral regurgitation (MR).

The aim of our study was the analysis of factors predisposing to LVD in the late postoperative period. The data of 207 consecutive patients (99 men, 108 women, mean age 57±4 years) were analysed, who underwent surgery for MR and had M-mode echoes before surgery (I.), and after the 6th postop.month (II.) (mean follow-up 34±26 months). The evaluation of left ventricular function (LVF) was based on the end-systolic diameter (Ds) and ejection fraction (EF), the EF was calculated from the end-diastolic (Dd) and Ds diameters on M-mode echo. The patients were divided into subgroups: a) etiology: 114 prolapse or chordal rupture (PR), 61 rheumatic (R), 32 ischaemic (I), b) preop.echocando: Ds≤45 mm: EF>60%: 95 cases, Ds>45 mm: EF<60%: 62 cases, Ds>45 mm: EF>60%: 48 cases, Ds≤45 mm: EF<60%: 72 cases, c) type of surgery: 62 valvuloplasty (V), 81 valve implantation with preservation of the posterior leaflet (P), 64 valve implantation with total resection (T). Analysis was made by paired and unpaired t test and with correlation analysis. The Dd, Ds and EF decreased in the whole group (W) at the II. measurement (Table). There was correlation between preop. EF, Ds and postop.EF (EF I. vs. EF II. r=0.64, p<0.001; Ds I. vs. EF II. r=-0.62, p<0.001). The EF in groups PR and R was higher than in group C before and after surgery (Table). In case of preop. Ds≤45mm EF>60% the EF II. was 58,92%, in case of Ds>45 mm EF<60% the EF II. was 51,06%, while in case of preop.Ds<≤45 mm EF>60% the EF II. was 39,73%, the difference between these three groups was significant, p<0.0001. There was no difference in I. and EF II. between groups V, P and T.

Conclusion: Myocardial strain, but not velocities, demonstrate preserved diastolic regional function after cumulative myocardial ischaemia induced by maximal exercise tests 30 mins apart. These changes may be caused by myocardial stunning, and so abnormal contractile function may be useful as a marker of prior ischaemia in patients who present with chest pain.

Can tissue Doppler detect early diastolic left ventricular dysfunction in patients with coronary artery disease?

W. L1, Q. M. Chen1, C. O’Sullivan2, D. J. Gibson1, M. Henein2. 1Royal Brompton Hospital, London, United Kingdom; 2Royal Brompton Hospital, Echocardiography, London, United Kingdom

Background: Peak early diastolic velocity (E wave) measured by tissue Doppler imaging (TDI) has been used to detect diastolic ventricular dysfunction particularly in patients with coronary artery disease (CAD). We aimed to assess this proposition.

Methods: We studied 51 patients with CAD and compared them with 33 age and gender matched controls. Ventricular long axis function was studied from left and right ventricular annular motion recorded with M-mode and TDI techniques. Systolic long axis incoordination was measured by post ejection shortening velocity and time. Reduced systolic amplitude was taken as ~95% lower normal limit. Results: In normals but not CAD, E wave velocities correlated with age (r=0.54, p<0.002). In CAD the main determinant of E velocity was systolic amplitude (r=-0.71, P<0.001). E wave velocity and systolic amplitude were both normal in 31 patients, while in 12 systolic amplitude and velocity were both reduced. Of the 8 patients with reduced E velocity but normal systolic amplitude, i.e. those in whom primary diastolic dysfunction might have been present, 7 had systolic incoordination compared with 9 of the 31 in whom amplitude and velocity were both normal (Fisher’s exact, p=0.003).

Conclusion: In coronary artery disease, TDI E wave velocity depends almost exclusively on systolic events; reduced amplitude and systolic incoordination. Thus, in clinical practice changes in E wave velocity should be considered in the context of the cardiac cycle events as a whole.
Abstracts

341 Quantification of regional myocardial function by tissue Doppler in patients with first ST-elevation myocardial infarction early and late after reperfusion.

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Objectives: To evaluate the myocardial velocity, strain rate and Tissue Tracking in reperfusion after acute non-Q-wave myocardial infarction (AMI) by using Doppler tissue imaging (DTI). Reperfusion was assessed either by restoration of TIMI 3 flow by percutaneous coronary intervention (PCI) or clinically by complete relief of chest pain and full resolution of ST segment elevation within 90 minutes after thrombolyis.

Patients and Methods: 25 patients (58±7 years) with first AMI presented within 6 hours from initial symptoms. 15 patients received thrombolysis and 10 PCI. 25 age-matched healthy individuals served as a control. Wall motion score was analysed in 16 segments. DTI was acquired before, 90 minutes and 3 months after the intervention. The longitudinal and radial myocardial systolic and diastolic velocities as well as strain rate were acquired in all segments. Peak systolic wave during ejection phase (S), peak early and late diastolic wave (E) and (A) respectively. Tei index and CK-MB were serially measured. Stress imaging with Technetium 99m-Sestamibi was done at 3 months to assess the extent of infarct and perfusion.

Results: The longitudinal and radial systolic velocities were consistently lower in the infarct segments (3.4±1.9 vs 1.45±1.2 cm/sec) compared to control group (5.6±1.8 and 3.8±1.3 cm/sec respectively: p < 0.001 and to non-infarct segments (5.2±1.8 and 3.1±1.4 cm/sec): p < 0.01. The radial strain (S) increased after intervention to 2.7±1.5 cm. P < 0.01. There was no significant changes in longitudinal (S) before and after intervention. A relaxation dysfunction with reversed E/A ratio was observed in infarct segments before 0.56±0.15 compared to after intervention 0.93±0.44. p < 0.003. There was a negative correlation between (S) and wall motion score(r=0.58, p<0.05). There was a concordance between (S) and isolette study at 3 months.

Conclusion: Longitudinal cardiac muscle-fiber shortening is scavenged in patients after non-Q-wave AMI even after reperfusion, only the radial muscle fiber function can be restored. The longitudinal muscle fiber is mostly found in the subendocardial layer and thus firstly attacked by ischemia compared to the radial fibers which are mostly arranged in middle and outer layer near the epicardium. TDIs seems to be a sensitive method in detection and quantification of AMI with a good concordance with wall motion index.

342 The value of Tei-index for the echocardiographic diagnosis of heart failure.

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Introduction: Tei-index is a new echocardiographic parameter to assess global myocardial performance. It is calculated as the quotient: (isovolumic relaxation time + isovolumic contraction time)/ejection time.

The aim of this study was to evaluate the diagnosis role of tei-index in patients with heart failure with reduced ejection fraction and preserved systolic function.

Methods: Forty-nine consecutive patients (mean age 64±18 years) submitted for echocardiographic study due to signs or symptoms of heart failure were included. They were divided into three groups: 18 controls without evidence of heart disease (group A), 15 heart failure and ejection fraction < 45% (group B) and 16 with heart failure and ejection fraction < 45% (group C). Tei-index and echocardiographic-derived parameters indicative of left ventricular end-diastolic pressure (Doppler parameters of left ventricular filling, tissue Doppler parameters of the left lateral mitral annulus and pulsed Doppler of the pulmonary veins) were calculated.

Results: Tei-index was transformed to its logarithmic value (Ln-T) because it did not follow a normal distribution. By ANOVA test and Scheffe post-test comparison between groups, we found a significant difference between groups (F=18.7; P<0.001). Group B had lower Ln-T value than group C (-0.63±0.36 vs -0.36±0.04, P<0.04). The difference was also statistically significant between groups A and B: 1.03±0.35 vs -0.63±0.36,P<0.008 and between groups A and C: 1.03±0.35 vs -0.29±0.36,P<0.0001. There was a significant linear trend between groups. We found a significant linear regression relationship between Ln-T and ejection fraction (r=0.67, P<0.001), but we did not find any relationship between Ln-T and Doppler indexes of left ventricular end-diastolic pressure.

Conclusion: Tei-index is a useful parameter to evaluate patients with signs and symptoms of heart failure. This index is higher in patients with clinical heart failure, even if sistolic function is preserved. The index increases as ejection fraction decreases.

343 Effects of carvedilol on diastolic and systolic function assessed by Doppler tissue imaging during long term follow-up: also good news.

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The beneficial effects of carvedilol on clinical status and left ventricular systolic parameters are well established. However there are limited data about the effects on diastolic performance.

Objective: To examine the effects of carvedilol on diastolic and systolic parameters in patients(pts) with a diminished left ventricular ejection fraction (LVEF) using conventional Doppler indexes and Doppler tissue imaging(DTI).

Methods: Twenty-three consecutive pts(mean age 66±10 years, 14 male) with a LVEF <40%(mean 27±9, range 14–40)were included in the study. Eight Pts had ischemic heart disease and 15 Pts nonischemic cardiomyopathy. All of them were treated with the highest tolerated carvedilol dose after a careful titration (mean high dose/day 32±18 mg). The echocardiographic examination used were: LVEF (simplified Simpsons method), ml/min inflow velocities by pulsed Doppler and pulsed DTI velocities at the mitral annulus(septal and lateral wall). All of them were evaluated at baseline and after 6 months of therapy.

Results: Three Pts died during follow-up and 3 Pts did not tolerate carvedilol at any dose. One Pt was excluded because of pacemaker resynchronization therapy and another because of the development of persistent atrial fibrillation. In the remaining 15 Pts the changes in different measurements are shown in table 1. Mean LVEF increased significantly after 6 months of therapy. There were a significant increase in the early and late diastolic pulsed-DTI velocities ratio(Ees/Aes) at the septal mitral annulus.

Data presented as mean ± SEE: E; an early and late diastolic mitral inflow velocities; Ees; and Aes; early and late diastolic pulsed-DTI velocities at septal mitral annulus, E and A; early and late diastolic pulsed-DTI velocities at lateral mitral annulus; *: p<0.05 vs baseline by t-test.

Conclusions: After 6 months of treatment wit carvedilol the effects on systolic performance results in a significant improvement in the LVEF. The diastolic function is also improved and Doppler tissue imaging is very useful in the evaluation of the Pts.

344 Longitudinal myocardial shortening does not explain the improvement of the systolic performance in heart failure.

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Introduction: It is well known that beta-blocker therapy with carvedilol improves systolic function in patients (P) with heart failure (HF) and poor left ventricular ejection fraction (LVEF). Moreover, Doppler tissue imaging (DTI) is an established technique to study the mechanics of the systole and diastole in left ventricle. The role of longitudinal shortening in the increase of LVEF after beta-blocker therapy has not been established.

Objective: To assess the role of longitudinal shortening in the increase of LVEF after beta-blocker therapy.

Methods: Patients with heart failure (NYHA functional class 2.0±0.51, LVEF<40% and without contraindications for beta-blocker therapy were included in the study. Carvedilol was initiated without roll-up period and titrated as recommended. A complete echocardiographic examination was performed at baseline and after 6 months. Variation in LVEF was quantified using Simpson's rules modified method for 2D-echocardiography and longitudinal myocardial shortening with pulsed Doppler tissue imaging (DTI) at septal and lateral mitral annulus.

Results: Twenty-three Pts were included in the study. Eight Pts were lost during follow-up: three Pts died, three developed HF due to carvedilol, one developed refractory atrial fibrillation and was excluded due to cardiac resynchronization therapy. 2D-echocardiographic examination and pulsed DTI exam was available in the remaining 15 P (age 64.1±10 and 9 male). Mean dose of carvedilol was 33.7±18.7mg. LVEF improved from 28.8±6.2% to 35.1±9.7%(P<0.05). Nonetheless, peak systolic velocity measured with DTI was unchanged: septal mitral annulus 8.4±4.1cm/s vs 7.3±1.8 cm/s (p=NS) and lateral mitral annulus 7.8±3.1cm/s vs 6.9±2.4cm/s (p=NS).

In conclusion, changes in longitudinal myocardial shortening does not account for the improvement of the LVEF with carvedilol therapy in heart failure due to systolic dysfunction. These results point out a predominant role of radial and circumferential myocardial shortening in the mechanics of left ventricular performance with carvedilol therapy.

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Pro-BNP 77
TDI:
E/A ratio 1.3
DT ms 190

Madrid, Spain

Previous MI 2.3 1.4 - 3.8 0.0017
Hyperlipemia 1.9 1.04 - 3.4 0.036
Smoking 2.9 1.7 - 4.9 0.0001

Cardiology 5.4 2.9 - 10.0

.offer an incremental and safer guide for early detection of ACT.

Markers for ACT, specially when considering TDI. Finally, pro-BNP samplings may

±

= 5). Table 1 (part A) shows data both at baseline and at ET for all 36 pts and (part B) data from the 4-CM pts. At ET time, we observed mean normal values of LVEF, also in 4 pts developing late CM, otherwise, Doppler indexes and pro-BNP mean values were already abnormal in the same time.

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR  95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.95 (0.94 - 0.97)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hospitalization days</td>
<td>1.04 (1.02 - 1.06)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>0.68 (0.50 - 0.93)</td>
<td>0.015</td>
</tr>
<tr>
<td>Smoking</td>
<td>2.9 (1.7 - 4.9)</td>
<td>0.001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.9 (1.04 - 3.4)</td>
<td>0.036</td>
</tr>
<tr>
<td>Previous MI</td>
<td>2.3 (1.4 - 3.8)</td>
<td>0.0017</td>
</tr>
<tr>
<td>LBBB</td>
<td>2.2 (1.3 - 3.8)</td>
<td>0.006</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>2.1 (1.4 - 3.1)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Conclusion: Patients admitted with heart failure and no echo have different clinical profile and higher long-term mortality.

Evaluation of myocardial performance after administration of a novel calcium sensitizing agent.

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Introduction: Positive inotropy by calcium sensitization is an evolving approach for the treatment of congestive heart failure (CHF). Levosimendan, a novel calcium-sensitizing agent, improves myocardial contractility without increasing myocardial oxygen demand and is indicated as supplementary therapy of CHF when conventional drugs - diuretics, ACE inhibitors, b-blockers or digitals - are insufficient. The rate of left ventricular (LV) pressure rise (dP/dt), measured by continuous wave Doppler echocardiography, is a new marker of LV contractility. The purpose of this study is to estimate the effect of levosimendan on myocardial performance on patients (P) with CHF.

Methods: 31 consecutive P (25 males and 6 females of mean age 69.39±7.46 years) with CHF - NYHA functional class II or IV and LV ejection fraction (LVEF) less than 30% - and moderate to severe mitral regurgitation were eligible for the study for a six-month period (from April to October 2002). 17 P were treated with conventional drugs, whereas 14 P received levosimendan in addition. The two groups did not differ regarding sex and age. LV function was evaluated by LVEF and by LV dP/dt on admission and 24-48 hours after the administration of levosimendan. LVEF was measured by 2-D echocardiography using the Teicholz method. LV dP/dt is derived from the continuous wave Doppler mitral regurgitation signal by dividing the amplitude of LV-left atrial pressure gradient rise (dP) between 1 and 3 m/sec of the mitral regurgitation velocity signal by the time taken for this change (dt). Data were expressed as "mean value ± standard deviation", statistical analysis was performed using the student's t-test method and p<0.05 was considered statistically significant.

Results: LVEF and LV dP/dt in P who received levosimendan were increased from 18.50±6.86% to 23.60±5.96% (p<0.05) and from 532.50±178.70 mmHg/sec to 669.63±166.75 mmHg/sec (p<0.05) respectively, while the indices of P treated with conventional therapy did not change significantly - from 21.76±3.77% to 24.26±4.27% (p=NS) and from 605.12±155.99 mmHg/sec to 698.24±169.859 mmHg/sec (p(=NS) respectively. Furthermore, LV function of P who received P with conventional therapy was improved (NYHA class from 3.75±0.51 to 3.05±0.68, p<0.01) compared to that of P with conventional therapy (NYHA class from 3.23±0.44 to 2.88±0.60, p<NS).

Conclusions: Levosimendan may prove advantageous for patients who suffer from congestive heart failure, because it seems to enhance myocardial contractility and improve functional status.

Reduction of myocardial blood flow reserve is associated with impairment in contractility in patients with idiopathic dilated cardiomyopathy.

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In idiopathic dilated cardiomyopathy (IDC), also in the early stage, myocardial blood flow (MBF) during pharmacological vasodilatation is depressed. This abnormality, which is independent of LV ejection fraction (EF), predicts the progression of LV dysfunction.

Aim of this study was to evaluate the relationship of MBF with Doppler derived index of LV contractility (RPR) as a non-invasive and simple measure of LV contractility. MBF reserve was defined as MBF at dipyridamole/resting MBF ratio. Two pts were discarded due to incomplete data. MBF values were obtained using the student’s t-test method and p<0.01 was considered statistically significant.

Results: MBF of IDC P was lower and MBF reserve of IDC P was lower compared to CC P. RPR was lower in IDC P compared to CC P and MBF reserve was lower in IDC P compared to CC P.

Conclusions: Reduction of myocardial blood flow reserve is associated with impairment in contractility in patients with idiopathic dilated cardiomyopathy.