POSTER SESSION 1

Thursday, 7 December 2006, 8:30–12:30
Location: Poster Hall

STRESS ECHO

181 Intraventricular gradients and systolic anterior movement of the mitral valve during exercise in young athletes. Fact or fantasy?
C. Cordeiro 1; M.J. Loureiro 1; G. Simoes 1; R. Miranda 1; L. Lopes 1; S. Almeida 1; P. Cordeiro 1; M. Carrageeta 1
1Hospital Garcia de Orta, Cardiology Dept., Almada, Portugal

Introduction: It is reported that the development of intraventricular gradients (IVG) on exertion seldom occurs. We performed exercise stress echocardiography (SE) in a 23-year-old athlete (AT) with a positive treadmill ECG and normal rest echocardiogram, and without angiographic coronary disease. During stress echocardiography he unexpectedly developed IVG of 105 mm Hg and systolic anterior movement (SAM) of the mitral valve. Purpose: To assess the occurrence of IVG and mitral valve SAM during exertion in athletes referred for stress echocardiography. Methods: We evaluated 67 AT, mean aged 24±10 years (age ranged 12 to 56 years old), 58 of whom were males. 1 AT had non-obstructive hypertrophic cardiomyopathy (HCM) echocardiographic phenotype. 1 hypertensive AT had left ventricular hypertrophy (LVH) and 4 AT had mild mitral valve prolapse. The other 61 had normal resting echocardiograms. Clinical reasons for performing SE in these AT were: abnormal ECG in 15 AT, symptoms on exertion in 33 AT, abnormal treadmill ECG in 11 AT and family history of sudden death in 2 AT. They all underwent stress echocardiography with 2D and Doppler echographic evaluation before, during and after treadmill exercise. The 2 AT with LVH were excluded. Results: In 26 (40%) of the AT studied the SE disclosed IVG ranging from 17 to 160 mm Hg (84±36 mm Hg). The IVG development was accompanied by SAM of the mitral valve in 19 AT (29%) and symptoms in 15 AT. These findings persist for less than 60 seconds after exercise test termination. Conclusions: A significant number of athletes referred for SE on the basis of clinical symptoms or abnormal tests develop mitral valve SAM and IVG during exercise. This finding can only be disclosed during exertion and resolves rapidly after exercise termination.

182 Stress echocardiography for the diagnosis of pulmonary artery hypertension in patients with scleroderma
E.M. Moreno 1; P.M. Martin 1; R.G.O. G Orta 1; J.L.C. Callejas 1; N.O. Ortego 1; C.C. Correa 1
1University Hospital S Cecilio, Cardiology Dept., Granada, Spain; 2University Hospital Virgen de las Nieves, Cardiology Dept., Granada, Spain

Background: Patients with scleroderma are at high risk of developing pulmonary arterial hypertension (PAH), what is known to have a major impact on outcome and survival. Recent improvements in therapy emphasize the importance of an earlier detection of PAH. Exercise induced PAH seems to be an early stage of this condition, making exercise echocardiography an interesting tool in this setting.

Aims and methods: Assess the ability of exercise stress echocardiography to evaluate PAH in patients with scleroderma. Observational study of patients with diffuse or limited scleroderma without PAH at rest. They underwent a complete echocardiographic examination with Systolic Pulmonary Artery Pressure (PAP), Doppler estimation at rest and during symptom-limited, incremental bicycle exercise. Pulmonary function tests, high resolution computed tomography scanning of chest and analysis of biochemical markers including B type natriuretic peptides were also performed.

Results: Fifty eight patients, mean age 51.98±1.5 years. 91.4% were women. All patients were in NYHA functional class I-II. Scleroderma had been diagnosed 15.7±11 months before. Maximal exercise time was 356±4.8 seconds. Severe PAH during exercise was also associated to severe Raynaud and abnormal carbon dioxide diffusing capacity (DLCO <80%).

Conclusions: Exercise stress echocardiography may unmask a latent or occult pulmonary arterial disease in scleroderma patients with normal pulmonary artery systolic pressures at rest, detecting the preclinical stage of the disease, what could have therapeutic implications for these patients.

183 Syndrome X: can the relationship between left ventricular contractility and coronary flow reserve shed light on the underlying mechanism?
F. Rigo 1; G. Ossena 1; C. Piergentili 1; M. Richieri 1; C. Zanella 1; U. Coli 1; A. Raviele 1
1Umberto I Hospital, Cardiovascular Dept., Mestre-Venice, Italy; 2Mogliano Veneto, Italy

Background: Syndrome X represents a common clinical microvascular angina even if the real underlying mechanism remains unclear to this day. Several clinical findings demonstrated that these patients show conserved left ventricular contractility while the behaviour of coronary flow reserve may be heterogeneous.

Methods: Since 2003 we have enrolled 50 pts, 32 female mean age 63±11 years, labelled as having a Syndrome X in accordance with Kemp’s triad, and matched them with 35 homogeneous normal subjects. Each of them underwent pharmacological Stress-test with Dipyridamole (0.84 mg/Kg over 6 min), evaluating left ventricular contractility (Systolic blood pressure/end systolic LV normalized) and coronary flow reserve on Left anterior descending coronary artery (CFR-LAD) obtainable by transhrocic approach. In order
to verify the relationship between the LVC and CFR we tested a new index derived from the ratio of both parameters and labelled it as contractility-perfusion index (CPI). **Results:** Syndrome X pts showed similar values in terms of LVC 6.5±1.4 vs 6.4±1.3 and lower values of CFR 2.3±0.5 vs 3.2±0.4. The Contractility/perfusion index had a lower mean value in the normal group (2.1±0.5) vs Syndrome X pts (2.9±0.8). By matching the CPI in all the study population, we were able to accurately predict the presence of a microvascular dysfunction with a higher statistical significance (t=4.944, p=0.000004), and therefore avoid coronary angiography in these cases. **Conclusion:** CPI showed normal LV contractility, quite similar to normal subjects, but lower values in terms of coronary flow reserve and therefore by matching these two parameters we can obtain a new index-CPI-capable of predicting the presence of microvascular dysfunction.

---

184 The extent of subendocardial dysfunction in hypertrophic cardiomyopathy compared with basal septal hypertrophy of similar resting gradient
D. Marasi1; R. Chung; A. Duncan; C.A. O’sullivan; M.Y. Henein
1Royal Brompton Hospital, Echocardiography Dept., London, United Kingdom

**Background:** Hypertrophic cardiomyopathy (HCM) and basal septal hypertrophy (BSH) causes a disordered outflow tract (LVO) obstruction, but BSH is known for its benign outcome with preserved LV systolic function. **Methods:** We compared the extent of subendocardial dysfunction using dobutamine stress echocardiography by studying 37 HCM and 28 BSH patients of similar age (54.5±15.6 years 24 male; 67.1±7.7 years, 9 male), and 17 controls (58±12 years, 5 male). Systolic anterior motion (SAM) of the mitral valve was present in 40% of all patients.

**Results:** At rest long axis amplitude was reduced in HCM vs BSH vs controls (1.25±0.27 vs 1.39±0.20 cm, p<0.001). LV free wall DTI myocardial velocity (Sa) was reduced significantly in HCM vs BSH vs controls (6.5±1.9 vs 7.9±2.0, p<0.008 vs 8.26±1.64 cm/s, p<0.005). Post ejection shortening (PES) was present only in HCM (0.98±0.11 vs 0.0 cm, p<0.001). QRS duration was prolonged in HCM vs BSH (103±28 vs 90±8 ms, p<0.001). Peak LVOT velocity was significantly increased in HCM vs BSH and controls (2.0±0.9 ms vs 1.43±0.63 ms (p<0.01) and 1.0±0.34 m/s, respectively).

**Conclusion:** Long peak systolic velocity was absent in HCM vs BSH vs normals, but DTI Sa was significantly lower in HCM vs BSH (8.2±2.4 vs 10.2±3.5 cm/s, p<0.09), and PE was not different significantly in HCM (0.08±0.11 vs 0.13±0.15 cm, p=0.06). QRS duration increased significantly only in HCM (103±28 vs 110±26 ms, p<0.008), reflecting ischemic changes. Peak LVOT velocities increased in HCM vs BSH vs controls (4.3±1.67 m/s; 4.5±1.2 m/s; 1.73±1 m/s, p<0.001). Mean blood pressure (MAP) decreased significantly only in BSH (9.3±1 mm Hg, p=0.02). Heart rate increased similarly in the HCM group (4±12, BSH +41, controls +43 bpm; p<0.001).

---

185 Apical ballooning syndrome: Can microvascular dysfunction have a pivotal role?
F. Rigo1; C. Piergentili2; G. Ossena1; A. Raviele1
1Umberto I Hospital, Cardiovascular Dept., Mestre-Venice, Italy; 2Umberto I Hospital, Cardiology Dept., Mestre-Venice, Italy

**Background:** The real pathophysiological mechanism at the basis of apical ballooning syndrome (ABS) is still open to debate. The absence of critical stenosis at the angiogram opens up a new hypothesis regarding the role of vasospasm or microvascular dysfunction. Important functional information about coronary flow reserve can be obtained noninvasively by transthoracic stress-test. Methods: We have studied 14 consecutive patients. 10 females mean age 64±18 years, each characterized by knoik ABS criteria. All patients underwent standard echocardiographic examination and coronary angiography in the acute phase. Within 24 hours we performed stress-echo (dobutamine 240 µg/kg min for at least 3 minutes) focusing in particular on coronary blood flow and reserve on the distal tract of Left Anterior Descending artery (LAD) and Posterior Descending Coronary Artery (PDCA), and the WMSI of the left ventricle, adopting a broadband frequency tran-

---

186 Metabolic management of heart failure with trimetazidine and mildronat: sensitivity and specificity of stress-echocardiography in patients with severe systolic dysfunction
Y. Vasyuk; A. Hadzegova; E. Yuschak; E. Shkolnik; M. Vahromeeva; N. Viko
1MSU Of Medicine And Dentistry, Moscow, Russian Federation

**Background:** Trimetazidine (TMZ) and mildronat represent antiangiinal drugs shifting myocardial metabolism from fatty acid to glucose oxidation. **Methods:** 65 patients with heart failure (>6 months after myocardial infarction) and LVEF=40% were randomly assigned to receive for a 6-month period TMZ modified release 35 mg bid (28 patients - T-group) or mildronat 500 mg bid (25 patients - M-group) additionally to standard therapy or usual drug therapy (12 patients - control group). Patients were evaluated at baseline and 6-month with clinical examination, quality of life (MLHF), low dose dobutamine stress-echocardiography (DSE). To assess myocardial perfusion and metabolism at baseline and 6-m in patients underwent 99 mTc-MIBI SPECT and F18-FDG PET.

**Results:** Treatment with TMZ and mildronat significantly improved NYHA class and 6-minute walk test in contrast to control group. Reliable improvement of MLHF and LVEF was found only in T-group [from 37 [31; 40] to 32 [28; 34] at rest p<0.03, and from 40 [32; 46] to 35 [30; 45] at peak dSE, p=0.048]. Treatment with TMZ and mildronat resulted in decrease of initially elevated level of glucose metabolism in ischemic segments of left ventricle in contrast to control group. Significantly improved regional contractility assessed by SPECT in hibernated segments of left ventricle was found at 6-months in T-group but not in M-group or control group. Special algorithm was implemented to compare viability results of DSE (any contractility improvement) and radionuclide methods (perfusion/metabolism mismatch). Original formulas were invented to convert semi-quantitative DSE results from 16-segment to 20-segment model based on the squares of the corresponding segments. Low sensitivity (50,4%) and negative predictive value (43%) of DSE was found in patients with severe systolic dysfunction and heart failure in comparison with SPECT/PET criteria. At the same time high specificity (85,7%) and positive predictive value (89%) of DSE in detecting hibernated myocardium was confirmed.

**Conclusions:** Significant functional improvement in patients with ischemic heart failure was observed both in T-group and M-group. PET with F18-FDG showed anti-ischemic action of both drugs in ischemic segments of left ventricle. But significant improvement of regional and global left ventricular function by results of SPECT and DSE was found only with therapy by TMZ. DSE showed low sensitivity in patients with severe systolic dysfunction and radio-

deficiency testing in such patients is recommended.

---

187 Evaluation of pulmonary pressure during exercise in athletes.
A. Moreti1; M.C.R. Vono1; M. Gianassi; L. Toncelli 1; P. Manetti 1; V. Di Tante1; L. Stefani 1; G. Galanti 1
1Florence, Italy

**Background:** Regular training induces morphological and functional cardiovascular modifications. The changes in pulmonary pressures during exercise were studied in a few cases, and these studies show that these pressures were higher in athletes than controls. **Objectives:** The aim of our study is the evaluation of the pulmonary pressure at rest and during exercise in a large population of athletes and un

---

**Table 1**

<table>
<thead>
<tr>
<th></th>
<th>BASELINE</th>
<th>6 MONTHS</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDV (mL/m²)</td>
<td>53</td>
<td>53</td>
<td>0.888</td>
</tr>
<tr>
<td>ESV (mL/m²)</td>
<td>36</td>
<td>34</td>
<td>0.017</td>
</tr>
<tr>
<td>EF (%)</td>
<td>45</td>
<td>53</td>
<td>0.000</td>
</tr>
<tr>
<td>LAD CFR</td>
<td>1.82</td>
<td>2.30</td>
<td>0.000</td>
</tr>
<tr>
<td>PDCA CFR</td>
<td>1.80</td>
<td>2.25</td>
<td>0.000</td>
</tr>
</tbody>
</table>

---

**Conclusions:** Our study confirmed that in the acute phase of ABS, the underlying mechanism, whatever this may be, leads to significant CFR impairment and consequently to a reduction of left ventricle EF. After 6 months, despite normalization in terms of LVEF, CFR on LAD and PDCA remains slightly impaired as an expression of intrinsic microvascular dysfunction. This is an aspect which has never been highlighted before.
188 Prognostic value of pharmacological stress echocardiography in patients with hypercholesterolemia
P. Wejner-Mik1; M. Ciesielczyk1; P. Lipiec1; J.D. Kasprzak1
1Medical University, II Chair of Cardiology, Lodz, Poland
Aim: The purpose of the study was to evaluate long-term prognostic value of pharmacological stress echocardiography (SE) in patients with and without hypercholesterolemia (HCH).
Methods: We followed 224 patients (62 men, age 55±10 yrs) who had undergone SE as the diagnostic test for ischemic heart disease. Myocardial infarction (MI) and death were defined as endpoints (MACE) during the follow-up period of 53 months (range 12 to 91). The prognostic value of the test in patients with (50%) and without HCH was compared.
Results: The prevalence of risk factors were: 44% for hypertension, 50% - hypercholesterolemia, 62% - history of smoking, 31% - previous myocardial infarction, 12% - diabetes. SE was positive for ischemia in 108 patients (48%). During their follow-up period 21 patients died (9%) and 102 (45%) experienced MACE. HCH and positive SE were independent predictors of events during the follow-up period.
Conclusions: This study, performed on a large population of conditioned patients and untrained subjects, showed no significant differences in rest and exercise TRV or in systolic and mean PAP between the two groups.

189 Usefulness of exercise echocardiography in patients with chronic obstructive pulmonary disease
E.P. Hoffer1; M. Markov1; F. Baharloo1; J. Boland1
1CHR Citadelle, Cardiology Dept., Liege, Belgium
Background: Pulmonary artery hypertension (PAH) may complicate chronic obstructive pulmonary disease (COPD). Its presence is associated with a poorer prognosis. Previous studies have shown that echocardiography can detect and quantify PAH.
Aims of the study: We thought to assess clinical, spirometric and echocardiographic parameters at rest and during a low-challenge exercise in COPD patients compared with a non-COPD control group. Moreover, in COPD patients, we would like to find relations between echocardiographic parameters and severity of the disease.
Methods: 25 COPD patients (Group A, mean age 64±8) and 16 non-COPD patients (Group B, mean age 61±11, p=NS) underwent spirometry and 6MWLT. A complete echocardiogram including tissue-Doppler analysis was performed at rest and at the end of a 4-min bicycle exercise test in semisupine position.
Results: Group A had a higher PAH at rest (36.8±1.14 vs 28.2±5.4 mm Hg, p<0.05) and during exercise (39.4±7.2 vs 28.2±5.4 mm Hg, p<0.05). Other echocardiographic parameters classically associated with PAH (tricuspid annular plane at systolic excursion, acceleration time on pulmonary flow and its ratio with pulmonary ejection time) were also statistically different in both groups. Moreover, in Group A, these parameters were also related to the severity of the pulmonary disease, defined by the GOLD classification. In Group A, the degree of PAH at exercise was related to systolic pulmonary artery pressure at rest (p<0.001), the degree of arterial O2 desaturation at exercise (p=0.009), the ratio pulmonary arterial pressure/time pulmonary ejection time at rest (p<0.001) and at exercise (p=0.01), and the tricuspid annu-

190 Arhythmic disorders and physiologic response during dobutamine stress echocardiography after acute myocardial infarction - influence of diabetes on
S. Salinger1; T. Stanislović2; Z. Perisic1; M. Tomasević1; S. Apostolović1; M. Randjelović1; N. Kesić2; M. Milić3
1Niš, Serbia and Montenegro
Possible induction of arrhythmias during the dobutamine stress echocardiography test, especially in diabetic patients, may have serious prognostic implications and also an impact on diagnostic accuracy of this procedure after acute myocardial infarction.
Aims: The purpose of this study was to examine the influence of diabetes mellitus in physiologic response and arrhythmic disorders during DSE after AMI.
Patients and methods: The investigation comprised 128 patients. 55 diabetics (D) and 73 non-diabetics (ND) all with non-complicated AMI. 90 patients (70.3%) received thrombolytic therapy. After 10-12 days all of them underwent DSE testing and during the next 3-6 months coronary angiography.
Results: Non-sustained ventricular and supraventricular tachycardia occurred in 7 D (12.7%) and in 6 ND (10.9%) (p=NS); 7 D (12.7%) and in 4 ND (6.8%) (p=NS) AV block III-II. Systolic blood pressure decrease of ≥ 40 mm Hg occurred in 6 D (10.9%) and 10 ND (13.7%). Significant coronary stenoses were found in 45 (81.8%) D and 22 (37.5%) ND. Diabetic vs non-diabetics had a higher baseline heart rate (83.1±1 vs 69±1 beats/min, p<0.001), with a higher age-predicted maximum heart rate at peak. In non-diabetic group there was no significant difference between patients with and without arrhythmias, regarding the mean number of diseased coronary arteries (1.61±0.7 vs 1.58±0.6). In diabetic group. patients with arrhythmias had greatest number of diseased coronary arteries (2.7±0.7 vs 1.52±0.4) Independent predictors of arrhythmias were: higher resting WMSI (p<0.01), and diabetes (p<0.1). Independent predictors of systolic blood pressure decrease of ≥ 40 mm Hg were: higher baseline systolic pressure (p<0.001); hypertrophic left ventricle with diastolic dysfunction; and higher resting WMSI with systolic dysfunction.
Conclusion: Physiological responses to dobutamine stress are comparable in diabetics and non-diabetics, except that a more rapid heart rate response is found in diabetics. Arhythmic disorders during DSE in diabetic patients are predicted not only by the extent of systolic or diastolic left ventricular dysfunction, but also by the presence or the extent of CAD.

191 Exercise-induced changes in the severity of mitral regurgitation among patients with chronic left ventricular ischemic dysfunction.
J.-B. Le Polain De Waroux1; P.V. Ennezat2; A.C. Pouleur1; J. Darchis1; A.M. D’Hondt1; A. Pasquet1; B.L. Gerber1; J.L. Vanoverschelde1
1Cliniques Universitaires Saint Luc, Cardiology Dept., Brussels, Belgium; 2Hôpital Cardiologique, Cardiovascualr Dept., Lille, France
Background: In patients (pts) with left ventricular (LV) ischemic dysfunction, increase in the severity of mitral regurgitation (MR) with exercise has been shown to limit exercise capacity, to trigger episodes of acute lung edema and to negatively impact on prognosis. Because exercise-induced worsening of MR is best detected by exercise echo (ExE), a broad use of this test in patients awaiting bypass surgery or recovering from acute lung edema has been advocated.
Aim: Before recommending to perform ExE in every patient awaiting coronary surgery or having suffered from an acute lung edema, we sought to determine the prevalence of significant ExE-induced worsening of MR in pts with LV ischemic dysfunction and to better precise its clinical correlates.
Method: 104 pts (90 males, mean age 62±11 years) with coronary disease, a mean LV ejection fraction of 30% and only mild MR at baseline were prospectively recruited. Thirty-eight pts were awaiting bypass surgery, 42 were in NYHA class III/IV and 26 had recently suffered from an acute lung edema. No pt had organic valve disease. During ExE, MR was quantified using the PISA method. As previously suggested, an increase in regurgitant orifice (ERO) ≥ 13 mm² was considered significant.
Results: During exercise, heart rate increased from 71±14 to 111±24 bpm and systolic blood pressure rose from 126±25 to 140±29 mm Hg (p<0.001 both). On average, MR ERO and regurgitant volume (RV) increased respectively from 7.2±6 to 10.8±3 mm² (p<0.001) and from 12.1±20 to 14.1±12 mL (p=NS). Significant ExE-induced ERO increase (≥ 13 mm²) occurred in only 9 pts (8.6%). The prevalence of such ExE-induced ERO increase was similar among
192 Longitudinal myocardial strain in right ventricular wall reduced by ...pilsicainide challenge in patients with Brugada type ECG and positive response by PIL challenge.

**Conclusion:** During exercise, significant worsening of MR is rare and only correlates with the presence of exercise-induced ischemia. Given the low prevalence of EX-induced worsening of MR in pts with LV ischemic dysfunction, it does not seem appropriate to recommend a widespread use of EX in this population.

**Method:** Thirty patients with Brugada type ECG were studied. PIL was infused to provoke an ECG response. Before and after PIL, apical 4-chamber view was recorded. Two dimensional (2D) strain imaging was used.

**Results:** Patients were subdivided into three groups according to their ECG response. Nine patients had a complete ECG response provoked by PIL, 15 had a partial ECG response (type 2a, coved), and 6 had no ECG response (type 2b, unmasked). Before PIL, there were no differences in longitudinal myocardial strain between both IVS and RV.

**Conclusion:** 2D strain imaging revealed depressed RV regional systolic function in patients with Brugada type ECG and positive response by PIL challenge.

193 Doppler-Echo assessment of diastolic function during exercise in patients with dilated cardiomyopathy

J.-H. Choi1; S.J. Kang1; H.S. Lim1; B.J. Choi1; S.Y. Choi1; M.H. Yoon1; S.J. Tahk1; J.H. Shin1
1Ajou University School of Medicine, Cardiology Dept., Suwon, Republic of Korea

**Background:** We assessed that temporal changes in Doppler indices of diastolic function during exercise in patients with dilated cardiomyopathy (DCM).

**Methods:** Sixty DCM patients (54±10 years-old; LVEF 31±8%) and 33 normal controls (40±11 years, LVEF 69±6%) were studied. Echo-Doppler transmural parameters (E velocity, A velocity, DT and IVRT) and mitral annular parameters (E' and A' velocity) were measured at rest and exercise. Percent change of E velocity during exercise (E), from baseline to 25W, and A velocity from baseline to peak) was measured.

**Results:** During exercise, E increased to 1.19±0.28 from 0.62±0.23 cm/s to in DCM group and to 1.48±0.28 from 0.75±1.4 cm/s in control group. A velocity was significantly lower in DCM than in control (71±5.85 vs 46±2.56, p=0.034). But A' velocity in each groups was not different (68±7.4% vs 100±3.3%, p=0.78). E/E' ratio (13±2.5±0.0 in DCM, 61.6±1.4±1 in control) did not change significantly during exercise in both groups because of concomitant increase of E'. While E velocity in control group was not correlated with resting E/E' ratio (r=0.201, p>0.05), significant negative correlation was detected in DCM group (r=-0.51, p=0.009, figure A).

The Table 1 shows clinical characteristics of the DCM group. In young adult RTR, our purpose was to evaluate the coronary flow reserve in asymptomatic young RTR.

**Conclusion:** In DCM patients, large fraction of augmentation of early transmural E velocity developed during early exercise stage. This might be related with elevated LA pressure in DCM. Diastolic exercise echocardiography using supine bicycle is technically feasible in DCM patient. But it has limitation in DCM with severe advanced diastolic dysfunction, especially with resting E/E' ratio >15.

194 Exercise echocardiography and cardio-pulmonary exercise testing for dilated cardiomyopathy assessment

O. Simoes1; C. Cotrim1; M.J. Loureiro1; P. Cordeiro1; D. Matos1; R. Miranda1; L. Lopes1; M. Carrageta2
1Hospital Garcia de Orta, Cardiology Dept., Almada, Portugal

**Introduction:** Isotopic exercise assessment using dobutamine stress echocardiography has proved useful in the investigation of pts with dilated cardiomyopathy (DCM). As such, and since cardio-pulmonary exercise testing (CPET) is not widely available, stress echocardiography has been proposed as an alternative to CPET. Side effects (flushing, nausea, hypotension) during dobutamine infusion are not uncommon and sometimes require the termination of the dobutamine stress test. Exercise-induced stress is more physiologic and could be better tolerated than dobutamine stress.

**Method:** A total of 16 pts with clinical diagnosis of DCM (aged 58±9 years; 14 males). All pts underwent a complete Doppler echocardiographic evaluation and exercise test in left and right side (E/E’). Quantitative analysis of exercise-induced exercise fraction (LVEF), LV outflow tract velocity time integral (VTI), systolic volume (SV) and cardiac output (CO). SV was again calculated in upright position (UP) before exercise was started. Symptom-limited CPET was started. While blood oxygen uptake, initial O2 pulse (VO2/HR), maximal oxygen uptake (VO2max) and maximal O2 pulse (VO2max/HR) were determined. SV and CO were calculated, during CPET, at the first stage (1S) of the modified Bruce protocol and again at peak exertion (PE).

**Results:** Mean ejection fraction for the 16 pts was 26±6.4%. 13 pts were in normal sinus rhythm and 3 in atrial fibrillation. EE during CPET was feasible in every pt. There was a significant correlation between LLD SV and VO2/HR, r=0.676 and p<0.003; between LV pressure and VO2/HR, r=0.736 and p<0.001; between PE SV and VO2max/HR, r=0.763 and p=0.001; between PE CO and VO2max/HR, r=0.541 and p=0.03; between PE SV and VO2max, r=0.547 and p=0.028; and between PE CO and VO2max, r=0.632 and p=0.009.

**Conclusions:** 1. Treadmill Exercise Echo for evaluation of left ventricular function parameters such as SV and CO is feasible during CPET, and presents good correlation with CPET. 2. Our experience allows us to suggest that Exercise Echo might be considered as an alternative to CPET in the assessment of DCM pts.

195 Evaluation of coronary flow reserve in young adults with renal transplant

M. Turie1; L. Delfino1; L. Tomasoni1; A. Menegotto1; G. De Biasio1; S.M. Vigan1; L. Ghio1; D. Cusi1
1Istituto Galeazzi, University Of Milan, Cardiology Dept., Milan, Italy; 2Ospedale Maggiore Policlinico, Pediatric Nephrology Dept., Milan, Italy; 3Policlinico Multimedica, Hypertension and Nephrology Prevention Unit, Sesto S. Giovanni, Milan, Italy

**Background:** Cardiovascular disease is the main cause of death and transplant loss in renal transplant recipients (RTR). End-stage renal disease, diabetes and immunosuppressive therapy after transplant are able to accelerate the development of vascular injury. In RTR older than 50 years, severe atherosclerotic lesions are frequently detectable in asymptomatic subjects. Since there are no data about the prevalence of vascular damage in young adult RTR, our purpose was to evaluate the coronary flow reserve (CFR) in asymptomatic young RTR.

**Method:** 25 young adult RTR (12 M, 13 F, aged 26±6.9 years, follow-up after transplant 89.4±27.8 months) and 17 healthy controls, matched for age and sex, were studied. Stress echocardiography was performed to measure the coronary blood flow velocity in the left descending coronary artery (LAD) at rest and after dipyridamole (0.56 mg/kg + 0.28 mg/kg in 6’) and to evaluate CFR and wall-motion analysis. The assessment of CFR has proven to be helpful to detect epicardial coronary artery disease as well as impaired microcirculation. We considered CFR >3 as normal.

**Results:** The Table 1 shows clinical characteristics of the RTR group. In young adults with renal transplant, routine echocardiography showed normal left ventricular thickness and function (EF 62±8%); stress echocardiography was negative for wall motion criteria. Mean basal diastolic flow velocity was higher in RTR compared to controls (respectively, 28.2±8.1 cm/sec vs 22.6±4.7 cm/sec, p<0.05), meanwhile mean CFR was reduced (2.8±0.6 vs 3.3±0.4, p<0.05).
Two RTR with a longer history of dialysis and transplant had CFR < 2. One RTR, who had angiia during the exam, showed a normal coronaryography.

Conclusion: CFR evaluation is important to detect impaired microcirculation in young asymptomatic adults with renal transplant. CFR assessed by this new non invasive method is a functional parameter able to find out preclinical cardiovascular disease in young adult RTR.

Table 1

<table>
<thead>
<tr>
<th>BMI</th>
<th>Smoke</th>
<th>Hyperten-</th>
<th>Ca</th>
<th>Pts with CAD</th>
<th>34.5±2.2</th>
<th>mg/kg/min</th>
<th>mg/kg/min</th>
<th>mg/kg/min</th>
<th>mg/dl</th>
<th>md/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.4</td>
<td>2/05</td>
<td>1925</td>
<td>12.9±1.8</td>
<td>38.7</td>
<td>14±4.5</td>
<td>122±88</td>
<td>85±15</td>
<td>0.2±0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤6.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

198

The value of mitral regurgitation occurrence during diagnostic dobutamine stress echocardiography

J. Kochanowski; P. Scisło; R. Pietrowski; M. Roik; P. Suwałski; D. Kosior; G. Opolski

Warsaw Medical University, Cardiology Dept., Warsaw, Poland

The aim of the study was to determine the occurrence of new or worsening mitral regurgitation (MR) in patients (pts) during diagnostic dobutamine stress echocardiography (DSE). We considered that the above-mentioned finding could be associated with ischemic response pts.

Material and methods: The study group comprised 546 pts (71.5% men; mean age 55±10 years) with suspected coronary artery disease, who were subject to diagnostic DSE. In the investigated group we observed no contractility disturbances (WMSI-1, EF=65±10%). Transhastrophic echocardiography (TTE) was performed using Philips Sonos 5500 and iE33 equipment, and recorded on a magneto-optic disc and SVHS tape for future assessment by 2 independent cardiologists. The color flow doppler imaging, venous contracta, PISA and ERO were used to determine the presence and change of MR. DSE was performed according to given standards.

Results: Prior to DSE, concerning the investigated group, there were 342 pts without MR (group I), 160 pts with mild MR (group II), and 24 with moderate or severe MR (group III). During peak dobutamine (DBX) infusion the following were noted: gr. I - without MR - 328 pts, mild - 14 pts, gr. II - without MR - 26 pts, mild - 152, moderate - 2 pts, gr. III - without MR - 0, mild - 13, moderate - 11. The group was subject to analysis depending on DSE results (tab. 1).

Conclusions: In the investigated group, during DBX infusion, in most pts we observed no new or worsening MR, independent of DSE results. MR worsening concerning the occurrence of mild MR during peak DBX infusion, being independent of DSE results.

Table 1

<table>
<thead>
<tr>
<th>DSE (+)</th>
<th>DSE (-)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change in MR (n=163)</td>
<td>96</td>
<td>67</td>
</tr>
<tr>
<td>Decrease in MR (n=39)</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td>Increase in MR (n=16)</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

199

The use of transthoracic dobutamine stress echocardiography for risk stratification in patients undergoing bariatric surgery

S. Lerakis1; A. Kalogeropoulos1; M. El-Chami1; A. Abraham1; S. Lynch1; T. Ania1; E. Velezard1; R. Martin1

Emory University, Division of Cardiology, Atlanta, Ga, United States of America

Background: The feasibility of transthoracic dobutamine stress echocardiography (DSE) as a means of preoperative risk stratification in patients undergoing bariatric surgery (BS), as well as its value in predicting cardiovascular events (CVE) in this setting, has not been yet investigated.

Methods: We studied 611 patients (86.6% female, 42.1±10 years, BMI 48±6.1 kg/m², previous CAD 7.5%, diabetes 33.4%, hypertension 58.4%, hyperlipidemia 14.7%, current smokers 17.0%) referred for DSE prior to scheduled BS. CVE were recorded during index hospitalization, 4 weeks following surgery, and at 6 months.

Results: Adequate baseline images could be obtained in 590 patients (96.6%), with use of contrast in 426 of them (72.2%). DSE was not performed in 21 patients (3.4%) due to inadequate images despite use of contrast. There were no serious adverse events during DSE. Seven patients had positive (1.2%), 38 had inconclusive (6.4%) and 545 had negative DSE (92.4%). Among 5 patients with positive study who underwent angiography, only 1 had obstructive CAD. Eventually, a total of 585 patients underwent BS, 576 with preoperative DSE and 19 without DSE. There were 3 postoperative deaths (0.5% mortality) attributed to sepsis, but no major perioperative CVE. One patient without DSE required percutaneous intervention for symptomatic CAD 1 month after BS.

Conclusion: Transthoracic DSE is feasible and safe in obese patients undergoing BS. Contrast implementation allows for adequate imaging in the majority of these patients. However, the very low rate of perioperative cardiovascular events questions the need for routine preoperative stress testing in asymptomatic patients undergoing BS.
Dip-Dob SET is one of the proposed combined protocols for the detection of myocardial ischemia. Study objective: to determine the long-term prognostic value of Dip-Dob SET in patients with hypertension and known or suspected coronary artery disease (CAD).

Material and methods: We prospectively studied 113 patients (mean age 55.2 ± 0.9 years, mean age 55.2 ± 0.9 years, men 69) who had hypertension and underwent Dip-Dob SET (dipyridamole up to 0.84 mg/kg plus dobutamine up to 40 mcg/kg/min) for evaluation of known or suspected CAD. Patients were followed for up to 8 years (mean 72.8 ± 19.42 months) for spontaneous: death, nonfatal myocardial infarction (MI), LV dysfunction for unstable angina (UA) and all cardiac events: spontaneous events plus late (>3 months) coronary revascularization. A positive test result was observed in 72 (63.7%) patients. Left ventricular hypertrophy (LVM) was detected in 50 (44.2%) patients. Baseline left ventricular wall motion abnormalities (WMA) were observed in 44 (38.9%) patients.

Results: During follow-up 73 events occurred in 55 patients: death 20, MI 10, UA 9, revascularization 34 (9 PCI and 25 CABG). In a multivariate Cox analysis for the evaluation of muscle viability and MR using semi-quantification by Doppler color flow imaging, PISA and ERO assessment. TEE-DSE was performed according to currently accepted standards and coronary angiography was performed within 2-8 weeks post AMI. In our group small and mild MR was observed in 79 pts (36%), severe MR in 25 pts (11%) respectively. Further detailed analysis was performed in 25 pts with severe MR assigned to CABG due to multiple vessel coronary disease and significant LV dysfunction (EF < 40%, WMSI 1.8 ± 0.3).

Methods: All pts prior to surgery underwent TEE examination for evaluation of mitral valve function, mitral deformation indexes (MDI) - tenting area, thickening in the context of the typical paradoxical septal motion due to several shortcomings: electrocardiographic changes are non-diagnostic and exercise nuclear studies disclose false-positive anteroseptal and septal perfusion defects due to asynchronous septal motion. Dobutamine stress echocardiography (DSE) may have the ability to detect myocardial systolic dysfunction in patients with type 2 diabetes mellitus (DM) and known or suspected coronary artery disease (CAD).

Conclusions: TEE-DSE seems to be a good diagnostic tool for selecting pts with severe ischemic MR in whom surgical revascularization should be extended with mitral apparatus plasty or valve replacement.

Long-term prognostic value of dipyridamole-dobutamine stress echocardiography in patients with systemic hypertension and known or suspected coronary artery disease

J. Milosavljevic1; M. Ostojić2; J. Marinikovic1; B. Vujicic1; L.J. Jovovic1; B. Pencic1
1Medical Center Of Jagodina, Cardiology Dept., Jagodina, Serbia and Montenegro; 2Institute for Cardiovascular Diseases, Cardiology Dept., Belgrade, Serbia and Montenegro

Background: Dipyridamole-dobutamine stress echocardiography (Dip-Dob SET) is one of the proposed combined protocols for the detection of myocardial ischemia. Study objective: to determine the long-term prognostic value of Dip-Dob SET in patients with hypertension and known or suspected coronary artery disease (CAD).

Material and methods: We prospectively studied 113 patients (mean age 55.2 ± 0.9 years, men 69) who had hypertension and underwent Dip-Dob SET (dipyridamole up to 0.84 mg/kg plus dobutamine up to 40 mcg/kg/min) for evaluation of known or suspected CAD. Patients were followed for up to 8 years (mean 72.8 ± 19.42 months) for spontaneous: death, nonfatal myocardial infarction (MI), LV dysfunction for unstable angina (UA) and all cardiac events: spontaneous events plus late (>3 months) coronary revascularization. A positive test result was observed in 72 (63.7%) patients. Left ventricular hypertrophy (LVM) was detected in 50 (44.2%) patients. Baseline left ventricular wall motion abnormalities (WMA) were observed in 44 (38.9%) patients.

Results: During follow-up 73 events occurred in 55 patients: death 20, MI 10, UA 9, revascularization 34 (9 PCI and 25 CABG). In a multivariate Cox analysis for the evaluation of muscle viability and MR using semi-quantification by Doppler color flow imaging, PISA and ERO assessment. TEE-DSE was performed according to currently accepted standards and coronary angiography was performed within 2-8 weeks post AMI. In our group small and mild MR was observed in 79 pts (36%), severe MR in 25 pts (11%) respectively. Further detailed analysis was performed in 25 pts with severe MR assigned to CABG due to multiple vessel coronary disease and significant LV dysfunction (EF < 40%, WMSI 1.8 ± 0.3).

Methods: All pts prior to surgery underwent TEE examination for evaluation of mitral valve function, mitral deformation indexes (MDI) - tenting area, coaptation height, systolic mitral annulus area and TEE-DSE examinations for the evaluation of muscle viability and MR using semi-quantification by doppler color flow imaging, PISA and ERO assessment. TEE-DSE was performed using Philips Sonos 5500 and E33 with Omniplane II and III probes. DSE was done according the standard protocol. Each test was digitally recorded for later assessment by 2 independent cardiologists. Based on TEE-DSE results pts were selected to Group I (7 pts), with severe MR reduction and LV contractibility improvement during DBX infusion qualified to CABGa or Group II, with no significant MR changes (9 pts) or MR reduction without significant influence on LV function (9 pts) and MRD addressed to CABB.

Results: In all study pts surgical revascularization was performed with mean 2.5 grafts implanted. In 4 pts valve was replaced, in additional 14 pts mitral reconstruction was performed. Echocardiographic assessments performed 2.7 days, 6 and 12 months following surgical procedure revealed MR intensity as follow: Group I: small 5/4/4, mild 2/2/2, severe 0/0/0, Group II: small 15/14/13, mild 2/3/3, severe 0/0/0. 3 pts died during follow up (group I 1 pts, group II 2 pts).

Conclusions: TEE-DSE seems to be a good diagnostic tool for selecting pts with severe ischemic MR in whom surgical revascularization should be extended with mitral apparatus plasty or valve replacement.

The role of transesophageal dobutamine stress echocardiography in patients qualification towards severe ischemic mitral regurgitation cardiac surgical treatment

J. Kochanowski1; P. Sicolo2; R. Platkowski1; P. Suwalski1; D. Kosior1; M. Roik1; G. Opolski1
1Warsaw Medical University, Cardiology Dept., Warsaw, Poland

The aim of our study was to evaluate the optimal surgical approach in patients (pts) with severe post myocardial infarction (AMI) mitral regurgitation (MR) based upon transesophageal dobutamine stress echocardiography (TEE-DSE) - coronary artery by-pass grafting alone (CABGa) or CABG with mitral reconstruction (CABGmr).

Material: The study group comprised 220 pts (F/M 84/136; mean age 64±10 year) with a history of AMI; in all study subjects echocardiography and coronary angiography was performed within 2-8 weeks post AMI. In our group small and mild MR was observed in 79 pts (36%), severe MR in 25 pts (11%) respectively. Further detailed analysis was performed in 25 pts with severe MR assigned to CABG due to multiple vessel coronary disease and significant LV dysfunction (EF <40%, WMSI 1.8±0.3).

Methods: All pts prior to surgery underwent TEE examination for evaluation of mitral valve apparatus, mitral deformation indexes (MDI) - tenting area, coaptation height, systolic mitral annulus area and TEE-DSE examinations for the evaluation of muscle viability and MR using semi-quantification by doppler color flow imaging, PISA and ERO assessment. TEE-DSE was performed using Philips Sonos 5500 and E33 with Omniplane II and III probes. DSE was done according the standard protocol. Each test was digitally recorded for later assessment by 2 independent cardiologists. Based on TEE-DSE results pts were selected to Group I (7 pts), with severe MR reduction and LV contractibility improvement during DBX infusion qualified to CABGa or Group II, with no significant MR changes (9 pts) or MR reduction without significant influence on LV function (9 pts) and MRD addressed to CABB.

Results: In all study pts surgical revascularization was performed with mean 2.5 grafts implanted. In 4 pts valve was replaced, in additional 14 pts mitral reconstruction was performed. Echocardiographic assessments performed 2.7 days, 6 and 12 months following surgical procedure revealed MR intensity as follow: Group I: small 5/4/4, mild 2/2/2, severe 0/0/0, Group II: small 15/14/13, mild 2/3/3, severe 0/0/0. 3 pts died during follow up (group I 1 pts, group II 2 pts).

Conclusions: TEE-DSE seems to be a good diagnostic tool for selecting pts with severe ischemic MR in whom surgical revascularization should be extended with mitral apparatus plasty or valve replacement.
as segmental hypokinesis or akinesis at maximal stress in any wall segments supplied by the LAD (anterior, apical-lateral and apical-inferior), other than the septum itself.

Results: 20 women and 12 men with mean age of 72±2 years were studied. 10 patients had a history of angina pectoris (>3 years) and 4 patients had cardiac bypass surgery (12%) In four patients the LBBB was rate related. The sensitivity and specificity of DSE to identify significant (>70% narrowing) LAD lesion was 92% and 88% respectively.

Conclusion: Although adenosine thallium remains the test of choice for stressing patients with LBBB to assess for CAD, our data suggest that DSE can correctly identify significant LAD lesions in patients with LBBB when the echocardiographic images at peak stress are interpreted employing all possible LAD territories but disregarding the septum.

204 Short and long stress-echo protocols compared to coronary angiography

P. Bisschops1; L.H.B. Baur2; T. Lenderink1; C. Lodewijks1
1Atrium Medical Center Parkstad, Cardiology Dept., Heerlen, Netherlands
2Bournemouth, United Kingdom; 2Poole General Hospital, Cardiology Dept., Poole, United Kingdom

Introduction: Dobutamine stress echocardiography (DSE) and SPECT imaging with exercise or pharmacologic stress are increasingly used to detect coronary artery disease in patients before vascular surgery, in diabetics, patients with heart failure and patients with angina pectoris, who are unable to exercise. The traditional DSE protocol consists after rest imaging, dobutamine in incremental doses starting at 5 microgram/kg/min [µg/kg/min] followed by 10 µg/kg/min, 20 µg/kg/min, 40 µg/kg/min. Addition of atropine is given and recovery images are performed. This protocol is time consuming and therefore limits the number of examinations which can be performed during one day. We therefore introduced a short track dobutamine stress protocol to limit the stress time and increase the number of stress echo which can be performed during one day.

Methods: The short track protocol consisted of 5 steps: rest, 20 µg dobutamine, 40 µg dobutamine, 1 mg atropine and recovery. Each step took 3 minutes. Which reduced the examination time from 45 minutes to 25 minutes. The results of this protocol were compared to coronary angiography, a traditional stress echo protocol. Fifty nine pts, underwent DSE with the short track protocol without using atropine. In 37 pts additional atropine was given. In 17 pts the normal DSE protocol was used, in 10 of these pts additional atropine was given. In 17 pts the normal DSE protocol was used, in 10 of these pts additional atropine was given. In 37 pts additional atropine was given. In all pts a coronary angiogram was performed within 20 minutes. The results of this protocol were compared to coronary angiography follow up study in 5 patients Atenolol increase the previous ischemia in 2 patients and near normal coronary arteries in the other 2 patients.

Conclusions: Assessment of wall motion abnormalities during the recovery phase after acute atenolol administration improves accuracy of DSE.

206 The diagnostic accuracy of pharmacological stress echo: a meta-analysis

E. Pasanisi1; E. Picano1
1CNR, Institute of Clinical Physiology, Pisa, Italy

Background: Recent guidelines state that dobutamine stress echo has substantially higher sensitivity than vasodilator stress echo for detection of coronary artery stenosis and - therefore - dobutamine should be the pharmacological test of choice in the era lab. Aim: To evaluate if recent, concurrent statements of US and European guidelines on stress testing reflect evidence-based approach. Methods: From PubMed search, we identified all papers with head-to-head comparison of dobutamine stress echo (40 mcg/kg/min ± atropine) versus dipyridamole stress echo performed with state-of-the art protocols (either 0.84 mg/kg in 10 plus atropine or 0.84 mg/kg in 8 without atropine). A total of 5 papers were found: Salustri et al., from Holland [Eur Heart J 1992]; Pingitore et al., from Italy (JACC 1996); San Roman et al., from Spain (Heart 1998); Loimaala et al., from Finland (Am J Cardiol 1999); Ngedjiovkv et al., from Serbia (Cardio Ultrason 2006). Results: the 5 analysed papers recruited 484 patients with angiographic verification, 344 with and 140 without angiographically assessed coronary artery disease. Dipyridamole and dobutamine showed similar accuracy (88% vs 85%, p=ns) and specificity (90% vs 86%, p=ns). The sensitivity was also similar: 86% vs 85% (see figure).

Conclusions: When state-of-the art protocols are considered, dipyridamole and dobutamine stress echo have similar accuracy, specificity and - most importantly - sensitivity for detection of CAD.

207 Stress echocardiography in the district hospital setting - A cost effective analysis

N. Wenneke1; K. Greaves2
1Bournemouth, United Kingdom; 2Poole General Hospital, Cardiology Dept., Poole, United Kingdom

Introduction: The investigation of patients with chest pain represents 40% of all admissions in the district general hospital, yet only 30% are actually cardiac in aetiology. Several methods are available for the investigation of chest pain, yet there is little data on cost-effectiveness of each technique. This study compared the cost-effectiveness of stress echocardiography (SE), angiography, nuclear imaging and exercise treadmill test (ETT) in the investigation of chest pain.

Methods: The setting was a district general hospital in the UK. 200 consecutive patients referred for SE for investigation of chest pain were recruited. The mean age was 62 (range 36-86) years, 100 male (50%). The admitting physician was asked as part of the referral form, to choose an alternative investigation (coronary angiography, myoview, ETT or none) if SE had not been available. Cost-effectiveness was calculated as the difference in the cost of investigating 200 patients if SE had not been available versus the cost of investigating 200 patients if SE had been available.
Results: The standard UK national tariffs for SE, myoview, ETT and coronary angiography are £133.00, £345.00, £82.00 and £302.00 respectively. If SE’s are available the total cost of 200 patients undergoing SE’s is £26,600. Our previous data (n=100) suggests that 26% of all patients referred for SE require subsequent coronary angiography (£15,704). Therefore the estimated total cost of providing a SE service is £24,304 (£26,600+£15,704). If SE’s were unavailable, the referring physician indicated that 78 patients (38%) would have undergone coronary angiography (£23,556), and 122 patients (61%) would have undergone a cardiac myoview (£42,090). No patients were referred for ETT. The total cost if SE service was not available is £65,646 (£23,556+£42,090).

Therefore the use of a SE service in the use of investigating chest pain represents a cost saving of £23,342 (£65,646-£42,304).

Conclusion: SE is a highly cost-effective technique for the investigation of patients with chest pain.

208 Long term mortality in patients undergoing dobutamine stress echocardiography

V. Danick1; E. Kaluski; M. Leitman1; E. Peleg1; N. Minullin; R. Krakover; 2Z. Vered
1Assaf Harofeh Medical Center, Heart Institute, Cardiology Dept., Zerifin, Israel

Background and aim of study: Limited data exist regarding the mortality and prognostic significance of dobutamine stress echocardiography (DSE) in the modern medical era. Our study examines prognosis and mortality associated with positive and negative DSE.

Methods: The database of the echocardiography laboratory at a major academic medical center was searched from 1998 to 2005, identifying 6082 patients who underwent a diagnostic dobutamine stress echocardiogram. Complete data were collected in 4378 patients. All patients had been reviewed in real time before examination for medical history. Tests were defined as either positive - any ischemia present on DSE or negative - no ischemia. The patients received an average of 38±6 mcg/min of dobutamine and 0.48±0.3 mg atropine as indicated, the target heart rate was achieved in 3413 (78%) of patients. Patients with viability only were defined as negative. Cardiac catheterization was performed based on standard clinical indications. All deaths were carefully recorded from the date of DSE until December 2005. No patient died immediately after test.

Results: In 1466 (33.5%) patients DSE was positive, vs. 2912 (66.5%) negative. 43.6% were females, average age 65 years. Risk factors included smoking (11.3%) hyperlipidemia (35.5%), hypertension (44.5%), and diabetes mellitus (20.6%). Previous myocardial infarction had been present in 21.4% of patients and previous CABG or PCI in 12.9% and 15% respectively. The mortality in five years (60 month) was 4% in patients with negative DSE and 8% in positive DSE (p<0.001) (figure).

Conclusion: In a large cohort of high risk patient group, positive DSE was associated with significantly increased long term mortality. DSE is an important tool for assessing long term risk of these patients.

209 Significance of Severe Hypotension during Dobutamine Stress Echocardiography

M. Dunkelgrun1; S.E. Karagianis1; A. Elhendy2; R. Vandomburg1; J. Bax1; H. Feringa1; O. Schouten1; D. Poldermans1
1Erasmus MC, Rotterdam, Netherlands; 2Nebraska University Hospital, Omaha, Ne, United States of America; 3Leiden University Medical Center, Leiden, Netherlands

Background: Dobutamine stress echocardiography (DSE) is used for the detection of coronary artery disease. Commonly, blood pressure remains unchanged.

Objective: To assess the prognostic value of hypotension during DSE and the benificial effect of beta-blockers (BBB).

Methods: 3381 patients (68% male, age 61±13 years) underwent DSE. Blood pressure was measured at every dose-step. A hypotensive response was defined as mild (systolic blood pressure drop of ≥20 mm Hg), or severe (systolic blood pressure drop of >20 mm Hg). DSE results were scored for the presence of ischemia using a 16-segment, 5-point scale. During follow up cardiac death (CD) and myocardial infarction (MI) were noted. Multivariate Cox proportional hazard regression analysis was used to evaluate the prognostic value of mild and severe hypotension during DSE and the effect of BBB.

Results: Mild and severe hypotension during DSE occurred in 938 (28%) and 521 (15%) patients, respectively. During a mean follow up of 4.5 years (±3.3 SD), 555 patients experienced CD and 158 a MI. Kaplan-Meier survival curves showed a significantly decreased survival in those with severe hypotension and mild hypotension. After adjustment for clinical characteristics and DSE results only severe hypotension was associated with increased incidence of late CD and MI (HR: 1.3, 95% CI: 1.1-1.7). Importantly, in these patients BBB use was associated with an improved outcome (HR:0.7, 95% CI: 0.5-0.9).

Conclusion: Severe hypotension during dobutamine stress echocardiography independantly predicts cardiac death and hard cardiac events and may improve the predictive value of cardiac testing. BBB use improved outcome in these patients.

210 Insights From Cardiac Torsion Into the Mechanism of Maintaining Cardiac Output Under Tachycardia During Dobutamine Stress Echocardiography

M. Kato1; S. Nakatani2; T. Yoshimuta1; H. Kanazaki1; M. Kitakaze1
1National Cardiovascular Center, Cardiology Dept., Suita, Japan; 2National Cardiovascular Center, Cardiovascular Dept., Suita, Japan

Background and purpose: Even in the condition of fast heart rate (HR), cardiac output (CO) has been reported to be well maintained during dobutamine stress echocardiography (DSE) despite of decreased radial strain in the healthy heart. We sought to investigate the mechanisms of maintaining CO under tachycardia by a new method, speckle track echocardiography which has been reported to provide accurate and angle-independent measurements of left ventricular (LV) dimensions and strains.

Methods: During DSE, conventional echocardiographic parameters including LV end-diastolic volume (EDV) and end-systolic volume (ESV) by modified Simpson’s method, myocardial strains and cardiac torsion were measured by speckle tracking imaging (Echo PAC, GE) at control, 5, 10 and 20 µg/kg/min in patients who were referred for the investigation of suspected coronary artery disease. Cardiac torsion was defined as the difference of LV rotation at the basal and apical short-axis LV images. Patients were excluded from this study if they had evidence of impairment of LV function on DSE testing.

Results: Finally, 20 patients (57±13 years) were evaluable. HR linearly increased from 67±15 to 144±15 bpm with dobutamine infusion. Although radial strain reached a peak at 10 µg/kg/min and decreased at 20 µg/kg/min, CO was well maintained at least up to 20 µg/kg/min. Cardiac torsion and longitudinal strain increased progressively without reaching a plateau.

Conclusion: Although radial strain reached a plateau and decreased at fast HR, cardiac torsion was enhanced in a compensatory manner. This mechanism could help maintain CO under tachycardia during DSE.
211 Dobutamine stress echo: concordance between wall motion assessment and non-invasively evaluated coronary flow reserve

F. Innocenti, C. Agresti, G.J. Baldereschi, N. Marchionni, R. Pini
Firenze, Italy

Aim: To assess consistency between left ventricular (LV) wall motion modification and coronary flow reserve in the left anterior descending coronary artery (LAD) territory during dobutamine stress-echo (DSE).

Methods: 173 patients underwent DSE, according to the standard protocol, for evaluation of known or suspected coronary artery disease and, during the test, LAD flow velocity was measured at baseline and at peak stress. Segmental kinesis was evaluated both for all LV segments then limited to LAD territory (awMSI). Coronary flow reserve (CFR) was calculated as the ratio between peak stress and baseline maximal diastolic velocity in the distal LAD. In a subgroup of 48 patients, without anterior myocardial infarction (MI), accuracy of non-invasively evaluated RFC was verified with coronary angiography data.

Results: Patients were predominantly males (122.71%), mean age was 68±11 years; 69% were hypertensive, 37% diabetics, 46% presented dyslipidemia and 53% were smokers. Fifty-two patients had a recent or previous anterior MI, in 30 treated with primary PCI. Baseline echocardiography showed normal LV internal dimensions (end-diastolic volume index 63±20 ml/m²; end-systolic volume index 34±18 ml/m²), with slightly reduced LV global systolic function (ejection fraction 47±27%). During ESD, both global wMSI then aWMSI resulted significantly and negatively correlated with RFC at baseline, after low dose and high dose dobutamine infusion; a similar correlation also existed between RFC and wMSI changes during high dose infusion, indicating extension of inducible ischemia. After exclusion of patients with anterior MI, these correlations remained significant; in the group with anterior MI, CFR was significantly and negatively correlated only with aWMSI after high dose infusion. Considering the final results of DSE and dividing patients in no or mild ischemia and extensive inducible ischemia (more than three LV segments), there was a significant difference in CFR value between the two groups (1.82 ± 2.26, p < 0.001); otherwise presence or absence of viability didn’t influence CFR value. In absence of anterior MI, there was a good agreement between CFR and angiography and non-invasively evaluated CFR (1.6 in patients with critical LAD stenosis vs 2.2 in patients with non critical lesions, p < 0.05).

Conclusion: LAD CFR evaluated during DSE demonstrates a good agreement with both LV segmental kinesis and coronary angiographic data, thus offering an adjunctive tool to improve DSE diagnostic accuracy.

212 Analysis of intraventricular and aortic gradient during dobutamine stress echocardiogram: correlation with complications

A.C. Camarozano, L.H. Weltzel, D. Bastos, C. Nascimento, L. Belém
National Heart Institute, Cardiology - Echocardiography Dept., Rio De Janeiro, Brazil

Purpose: To evaluate the behavior of the gradient in both the aortic (AO) and left ventricular outlet (LVO), as well as the presence of complications (symptoms or hemodynamic alterations) during the dobutamine stress echocardiogram and the hemodynamic difference in these outflows between the early protocol (EP) and the standard protocol (SP).

Methods: Seventy five patients with normal systolic function were studied. They were randomly divided into two groups: standard protocol (with ATR-atropine at 40 µg/kg/min of DOB-dobutamine) and early protocol (with ATR at 20 µg/kg/min of DOB). The gradients in the LVO and AO were obtained both at rest and at each stage of the test after which the evolution was analyzed. The presence of any symptoms was questioned and all hemodynamic alterations were registered. The Wilcoxon test was employed for the statistical analysis.

Results: The mean age was 60 (±10) years, 71% had a previous history of hypertension and ventricular hypertrophy was identified in 36% of the cases. Variations in the gradients at EP vs SP did occur in all stages of the test with a gradative increase. The gradients were higher at SP in relation EP (p=0.05), mainly considered the variation (peak-baseline) >20 mm Hg (p=0.022). At 40 µg/kg/min of DOB the gradients were higher in the SP compared to the EP (p=0.005), Chest pain occurred in 8.6% of the cases (negative tests), arrhythmias in 15.5% and hypotension in 5.2% of the cases. The presence of complications was more often related to the elevation of the gradients during the test and to the SP (60±22%: p=0.003).

Conclusion: The gradients in the LVO and AO showed progressive increase following the DOB-ATR doses. The SP presented significantly higher gradients and was connected to the greater complications expressed by the patients.

213 Dobutamine stress echocardiography using Tissue Doppler and tissue synchronisation in the assessment of a dysynchrony index

University of Leeds, Leeds, United Kingdom; Leeds General Infirmary, Cardiac Ultrasound Dept., Leeds, United Kingdom

Background: We set out to investigate if different methods of echocardiographic assessment of ventricular dysynchrony yield the same results.

Methods: Fifteen patients with left ventricular dysfunction underwent Dobutamine Stress Echocardiography (DSE) according to a standard incremental protocol. Images were acquired using a Vivid 7 (GE Vingmed - Horten Norway) and analyzed off-line using a dedicated PC (ECHOPAC Ver. 4.0.1). The Dyssynchrony Index DI (SD of time to peak systolic velocity of 12 myocardial segments) was calculated using 4 different methods: 2d Tissue Doppler Imaging (2DTDI), Tri-plane (3DTDI), 2d Tissue Synchronisation Imaging (2DTSI) and Tri-plane TSI (3DTSI) were calculated at both peak stress and rest. TSI measurements were optimised by manually defined aortic valve opening and closing.

Results: All the results were compared to the most validated method of 2DTDI. At rest there was variable Pearson correlation (r) with the other methods, the strongest correlation being between 2DTDI&3DTDI (r=0.844, p=0.0001) 2DTDI&2DTSI (r=0.738, p=0.002) and 2DTDI&4TDTI showed weakest correlation (r=0.559, p=0.038). A paired t-test showed no significant bias between the measurements obtained. At peak stress the correlation value reduced further (2DTDI&3DTDI r=0.706, p=0.034, 2DTDI&2DTSI r=0.569, p=0.034, and showed no correlation for 2DTDI&4TTSI r=0.402, p=0.196).

Conclusion: Although 3DTDI and TSI are appealing in terms of time efficiency, the indices derived do vary from the most validated method of 2DTDI. The variation is higher for TSI and higher still when heart rate is increased and the time saved by using these methods is realized at the expense of accuracy.
214 Can stress echocardiography with tissue characterization evaluate non-coronary stenosis? A validation study against simultaneous measurement of fractional flow reserve
T.C. Poerner 1 ; S. Vilardi 2 ; B. Goebel 2 ; D. Wagner 1 ; P. Lancellotti 3 ; F. Robert 1
1University Of Jena, 1St Dept. Of Medicine, Jena, Germany; 2University Hosp Stratford, 1St Dept. Of Medicine, Mannheim, Germany

Background: Fractional flow reserve (FFR) is accepted as gold standard for the functional assessment of coronary stenosis. The typical marker of acute myocardial ischemia by tissue Doppler echocardiography with strain rate imaging (TDE/SRI) is postystolic shortening (PSS). The study evaluated different echocardiographic modalities for detection of myocardial ischemia due to non-coronary critical stenosis.

Material and methods: We investigated 22 consecutive patients presenting with stable angina, negative exercise tests and coronary 1- vessel disease with 50-75% diameter stenosis. TDE/SRI was performed at baseline and at peak hyperemia during 0.14 mg/kg/min adenosine infusion simultaneously with intracoronary FFR measurements. Angioplasty was carried out if FFR <0.75, repeating TDE/SRI during first balloon inflation. Visual wall motion score, peak systolic values for myocardial velocity (Vs), strain rate (SRs), strain (Ss) and the peak overall strain (Smax) were determined in the region of interest. PSS was defined as (Smax - Ss)/Smax >0.3, with reduced Ss <15%.

Results: Pathologic FFR <0.75 was found in 11 patients, who underwent angioplasty. Myocardial contractility reflected by SRs increased during hyperemia only in the patient group with FFR >0.75 and decreased markedly during balloon inflation, but Ss was not robust enough to predict pathologic FFR (Fig. 1). PSS was identified in 10 of 11 patients during vessel occlusion, but had a low sensitivity (2 of 11 patients with FFR <0.75) for the more subtle changes during hyperemia.

Conclusion: Although TDE/SRI enhances the diagnostic accuracy of adenosine stress echocardiography, it still cannot serve as a reliable noninvasive alternative to FFR for the functional assessment of moderate-to-severe coronary stenosis.

215 Stress-induced pulmonary edema assessed by chest ultrasound during exercise echocardiography: correlation with severity of ischemia and wedge pressure
E. Agricola 1 ; E. Picano 1 ; M. Oppizzi 1 ; M. Pisanì 1 ; A. Meini 1 ; A. Marognato 1
1University Hospital, IRCCS, Division of Nuclear Medicine, Milan, Italy; 2CNR, Institute of Clinical Physiology, Pisa, Italy

Background: The increase of extravascular lung water (EVLW) is mirrored by the appearance of ultrasound lung comet images (ULC) detectable with a cardiac ultrasound probe positioned over the chest.

Objectives: We investigated if the modification of EVLW during stress echocardiography was an expression of severity of ischemia and left ventricular dysfunction and if was related to an increase of noninvasively determined pulmonary capillary wedge pressure (PCWP).

Methods: A total of 72 patients (mean age 66.4±8.4 years) with mean ejection fraction of 41.2±14.4% underwent symptom-limited exercise echocardiography. The sum of the ULC yielded a score of EVLW. PCWP was calculated using the ratio of early diastolic mitral inflow velocity to early diastolic velocity of the mitral annulus (E/Em)±1.9. The severity of ischemia was evaluated by the wall motion score index (WMSI) in a 16-segment model. All variables were evaluated at baseline, peak stress and in post-exercise phase.

Results: The ULC increased significantly from baseline to post-exercise (5.9±14.9 vs 11±20.7, p=0.0001). The variation between post-exercise and baseline ULC score correlated significantly with the variation between peak stress and rest PWV (r=0.62, p=0.0005), systolic pulmonary artery pressure (r=0.44, p=0.0001), WMSI (r=0.30, p=0.01), and peak stress E/Em (r=0.71, p=0.0001), whereas no significant correlations were found between variations of ULC score and ejection fraction.

Conclusions: This study shows that ULC represents a simple way to assess the presence of stress-induced pulmonary edema. Increased EVLW is associated with estimated PCWP, extent of ischemia and indices of diastolic dysfunction. The evaluation of EVLW could be useful to further stratify patients who undergo stress echocardiography.

216 Comparison of clinical usefulness of three dimensional echocardiography and strain rate assessment during stress echocardiography
P. Scislo 1 ; S. Chajnowski 1 ; R. Piatkowski 1 ; G. Opolski 1
1University Of Jena, 1St Dept. Of Medicine, Jena, Germany

The aim of the study was to compare ability of the new echocardiographic techniques: strain rate analysis (SR) based on tissue doppler imaging (TDI) and three dimensional echo (VF3D) to make clinical interpretative examinations. We analyzed consecutive 50 diagnostic dobutamine stress echocardiography tests (850 segments) made on Philips iE33 system with s5 and x3 probes. Retrospectively, two independent observers analyzed: three segment curve mode SR TDI of all wall and iSlice (9 tomographic slices of LV) and 3DQ Advance (3D LV reconstruction) VF3D. SR analysis was made in apical 4, 3, 2 chambers views. VF3D analysis was made in full volume apical acquisition. We assessed ability of interpretation of each segment of the left ventricle using described methods. Results As segment with excellent ability of interpretation we established ones with >90%, good 90-75% and poor <75%.

Conclusion: We did not find statistically relevant significance between ability of interpretation dobutamine stress echo made by strain rate based on tissue doppler imaging and three dimensional analysis.

Table 1. Comparison of visualization - 2D-3D TI

<table>
<thead>
<tr>
<th></th>
<th>Excellent</th>
<th>Good</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D</td>
<td>782 (92%)</td>
<td>17 (2%)</td>
<td>51 (6%)</td>
</tr>
<tr>
<td>SR/TDI</td>
<td>731 (86%)</td>
<td>34 (4%)</td>
<td>85 (10%)</td>
</tr>
<tr>
<td>VF3D</td>
<td>714 (84%)</td>
<td>34 (4%)</td>
<td>102 (12%)</td>
</tr>
</tbody>
</table>

P | NS | NS | NS

217 Multiplanar exercise echocardiography: feasible in daily clinical practice?
F. Lebrun 1 ; A. Saberin 2 ; D. Wagner 1 ; P. Lancellotti 3 ; F. Robert 1
1Clinique St Therese, Cardiology (Tholab) Dept., Luxembourg, Luxembourg; 2ChU, Liege, Belgium

Purpose: Two-dimensional exercise echocardiography (2D Ex Echo) is used clinically to detect myocardial ischemia and requires acquisition of standard imaging planes at each stage (parasternal long- and short-axis, apical 4-, and 2-chamber views). We hypothesised that multiplanar exercise echocardiography (Multi Ex Echo) is feasible in daily clinical practice.

Methods: Exercise echocardiography was performed in 100 consecutive patients between March 1, 2006 and April 30, 2006 in our lab. Rest and exercise studies were performed on a GE Vivid 7 imaging device equipped with a 3D matrix-array transducer (3V, 1.5-4.0-MHz) to obtain a 4-, 3- and 2-chamber views from the apical transducer position at the same cardiac cycle (Triplane imaging) and a parasternal long- and short-axis views from the parasternal transducer position at the same cardiac cycle (Biplane imaging). Patients underwent a symptom-limited, graded, semi-supine bicycle exercise using a table that could be tilted up to 45° in the left lateral decubitus position. The initial workload was 25 W for 2 min, with 25 W increments every 2 min.

Results: Heart rate increased from 71±15 to 120±14 beats/min. In 13 patients (13%), multiplanar imaging was of poor quality at rest because of narrow intercostal spaces and a large footprint of the 3D probe, leading to switch to classical 2D acquisitions. A total of 1392 segments were analysed at rest and peak exercise. Of these, 139 segments (10%) at baseline and 167 (12%) at peak stress could not be analysed (most in the anterior et lateral walls). Of the 67 multiplane studies, 9 required intravenous injection of a contrast agent (Sonovue, Bracco) at baseline and peak stress providing interpretable images in 94% (1309 segments) and 92% (1281 segments), respectively, WMSI at baseline and peak exercise was 1.07±0.22 and 1.09±0.25 respectively. Scanning time at peak exercise was 25.4±10.2 min.

Conclusion: Multi Ex Echo is simple, feasible and quick in daily clinical practice. Its accuracy for detecting myocardial ischemia and viability needs to be tested.

218 Efficacy of angiotensin II antagonists in treatment of essential hypertension associated with ischemic heart disease
V.K. Taschuk 1 ; V.K. Tashchuk 2 ; T. Ilashchuk 2
1Chemivitry, Ukraine; 2Bukovinian State Medical University, Cardiology Dept., Chernivtsy, Ukraine

The aim of the investigation was to study the effect of irbesartan (a highly selective angiotensin II antagonist) and its influence on coronary reserve and functional state of myocardium in patients with essential hypertension in combination with stable angina pectoris. Stress-echocardiography (EchoCG) under the conditions of transoesophageal electrocardiostimulation (TEES) was performed and 24-hour Holter ECG monitoring (HM) was recorded in 172 patients (98 men, mean age 52±2.8 years) before and after 4 week treatment period with irbesartan (80 mg/day orally). Under the irbesartan action the frequency of the cessation of TEES increased from 50.1±1.0 to 58±0.8% (p<0.001). The decrease of EF at peak of TEES was -10.5% at the beginning and -3.2% at the end of irbesartan treatment period. According to the data of HM, irbesartan significantly reduced the frequency (from 2,1±0.3 to 1.3±0.1 episodes, p<0.01) and the total duration of painful ischemic episodes from 37.3±5.5 to 31.6±4.6 minutes (p<0.02). The same tend was registered for silent ischemic episodes: the frequency decreased from 3,3±0.5 to 2,5±0.4 episodes (p>0.02) and total duration from 51.7±6.4 to 42.1±4.8 minutes (p>0.2). Thus, the results show...
that isradipan treatment has positive effect on coronary reserve and im-
proves myocardial contractility in patients with essential hypertension asso-
ciated with ischemic heart disease.

219 Influence of age, hypertension and diabetes on cardiac reserve in a rat model
M. Scharin Tang1; E. Haugen1; A. Isic1; M. Fu2; B. Andersson2
1Institute Of Medicine, Metabolism And Cardiovascular Research Dept.,
Gothenburg, Sweden
Assessment of cardiac reserve could be used to disclose silent heart dis-
ease and to predict outcome in humans. We used low-dose dobutamine stress echocardiography (DSE) to study the influence of age, hypertension and diabetes on cardiac reserve.

Aim: To evaluate whether assessment of cardiac reserve, using DSE, could be applied to evaluate cardiac function in the rat model.

Method: DSE was performed in four groups; 10 young, 10 middle-aged and 10 diabetic (D) Whistar Kyoto (WKY) rats, and 10 spontaneously hyperten-
sive (SHR) rats. Low doses of dobutamine (10-20 µg/kg/min) were infused intravenously in the tail vein.

Results: There were no differences in cardiac function at rest between younger and older rats. SHR had lower circumferential fiber shortening (Vcf c), compared to WKY. All functional variables were impaired in WKY+D, compared to healthy age-matched controls. Younger rats had significantly larger cardiac reserve during DSE. SHR and WKY+D rats had significantly impaired cardiac reserve in comparison with healthy rats.

Conclusion: Cardiac reserve in rats decreases with age and is impaired both in a hypertensive and a diabetic disease model. Measurements of cardiac function at rest provide limited information to detect early and silent myocardial dysfunction or age related changes. We show that low-dose DSE in rats is a feasible and reliable method that could provide en-
hanced possibility to study the heart during disease development.

Table 1. Echocardiography data

<table>
<thead>
<tr>
<th>Measurement</th>
<th>WKY 16w</th>
<th>WKY 26w</th>
<th>SHR</th>
<th>WKY+D</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVEDd (mm)</td>
<td>7.22±0.42</td>
<td>7.23±0.29</td>
<td>7.43±0.52</td>
<td>7.90±0.39</td>
</tr>
<tr>
<td>LVESd (mm)</td>
<td>3.18±0.56</td>
<td>3.03±0.18</td>
<td>3.66±0.63</td>
<td>4.32±0.67</td>
</tr>
<tr>
<td>LVWpd (mm)</td>
<td>1.59±0.13</td>
<td>1.34±0.16</td>
<td>2.26±0.22</td>
<td>1.35±0.12</td>
</tr>
<tr>
<td>FS (%)</td>
<td>56.1±5.2</td>
<td>50.8±6.1</td>
<td>45.4±7.1</td>
<td>47.4±7.1</td>
</tr>
<tr>
<td>Vcf c (cm/s)</td>
<td>3.29±0.45</td>
<td>3.29±0.22</td>
<td>2.82±0.48</td>
<td>2.40±0.4</td>
</tr>
<tr>
<td>20µg/kg/min</td>
<td>6.69±0.39</td>
<td>6.62±0.28</td>
<td>6.48±0.56</td>
<td>7.32±0.53</td>
</tr>
<tr>
<td>FS (%)</td>
<td>90.5±2.8</td>
<td>52.0±1.8</td>
<td>1.41±0.48</td>
<td>2.14±0.55</td>
</tr>
<tr>
<td>Vcf (cm/s)</td>
<td>5.12±0.35</td>
<td>5.66±0.32</td>
<td>4.41±0.27</td>
<td>4.30±0.27</td>
</tr>
</tbody>
</table>

220 Cavity obliteration during dobutamine stress echocardiography is reduced by intravenous fluid
B. Lowe1; A. Scott1; C. Edwards1; H. Hart1; G. Armstrong1
1The Cleveland Clinic Foundation, Cleveland, United States of America;
2North Shore Hospital, Auckland, New Zealand

Introduction: Left ventricular cavity obliteration (LVCO) occurs in 20% of patients undergoing dobutamine stress echocardiography (DSE) and lowers the sensitivity of the test. We sought to determine whether intravenous fluid (IVF) would reduce LVCO during DSE.

Methods: 435 consecutive patients undergoing clinically indicated DSE were enrolled. Only patients with low gradient aortic stenosis were excluded (n=19). 416 eligible patients were randomised to receive either IVF at the start of the resting study. LVCO was def-
ined as endocardial apposition of ≥2/3 LV cavity length in any standard echocardiographic view. LVCO was assessed independently by a reader blinded to randomization status and clinical data.

Results: Baseline clinical, echocardiographic, and haemodynamic stress parameters were similar in patients who received IVF loading and those who did not. 52/210 (25%) patients who did not receive fluid developed new-onset LVCO during DSE. IVF resulted in a 44% RR reduction in the inci-
dence of LVCO in multiple standard plane views. 27% of patients who re-
cieved IVF had a history of heart failure, yet there was no difference in complica-
tions (arrhythmia, decompensated heart failure, acute coronary syn-
drome, death) within 30 days of the DSE (p=0.263). Small LVESD, increased LV wall thickness, absence of prior myocardial infarction or resting wall mo-
tion abnormalities, were identified as independent predictors of LVCO.

Conclusions: Routine administration of 500 mL intravenous fluid bolus is safe and significantly reduces the incidence of LVCO during DSE.

Table 1. Incidence of LV Cavity Obliteration

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>REST</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td>210</td>
<td>4 (2%)</td>
<td>0.188</td>
</tr>
<tr>
<td>REST</td>
<td>206</td>
<td>1 (1%)</td>
<td>0.003</td>
</tr>
</tbody>
</table>

221 Chronotropic incompetence vs. echocardiographic ischemia
D. Orlic1; M. Ostojić2; A. Djordjevic-Dikic3; J. Stepanovic1; B. Beleslin1; G. Stankovic1; V. Vulcovic1
1Institute for Cardiovascular Disease, Clinic, Belgrade, Serbia and Montenegro

Objectives: The predictive value of chronotropic incompetence (CI) for re-
peat revascularization (TVR) among patients (pts) referred for stress echocardiography (stress-Echo) following the first coronary intervention (PCI).

Background: Although CI has been shown to be predictive of an adverse prognosis, its importance as a predictor of TVR was not explored.

Methods: Consecutive pts (129 men and 44 women; mean age 53.5 years) who were not taking beta blockers and were referred for symptom-limited treadmill stress-Echo from September 2003 to August 2004 were followed at a mean time of 6.2±3.2 months, after the first PCI of left anterior descending coronary artery (LAD). Chronotropic incompetence was assessed as failure to achieve 85% of the age-predicted maximum heart rate, and a low chronotropic index, a measure of exercise heart rate response that accounts for influences of age, physical fitness and resting heart rate. Angiographic follow-up was clinically indicated and TFR if diameter stenosis was 50%.

Results: TFR was performed in 27 pts. Failure to reach 85% of the age-
predicted maximum heart rate was found in 17 (11.6%) pts with no TVR and in 16 (59.3%) pts with TVR, and was predictive of TVR in univariate analysis (RR 11.04, 95% CI 2.27 to 51.58, p=0.003). A low chronotropic index was found in 59 (40.0%) pts with no TVR and in 25 (93.0%) pts with TVR, and was associated with TVR (RR 5.96, 95% CI 2.27 to 15.68, p=0.003). TVR was predicted in Echo+ECG+(p=0.0047) and Echo + ECG+ pts (p=0.002), and not in Echo-ECG+ pts (p=NS). In multivariate analysis, TVR was predicted in Echo + ECG+ and Echo+ ECG+ pts (p=0.0018 and p=0.0021, respectively) and in pts with failure to reach 85% of the age-predicted maximum heart rate (p=0.0002).

Conclusion: Chronotropic incompetence and echocardiographic ischemia (angiographic evidence of echo-stress) were predictive of repeat revascularization fol-
lowing the first PCI. Echocardiographic ischemia was better predictor of TVR than failure to reach 85% of the age-predicted maximum heart rate, and both were better predictors than a low chronotropic index.

222 Inferior vena cava collapsibility during exercise is a marker of abnormal cardiopulmonary response to exercise
S. Pouwels1; T. Le Toureau1; A. S. Pole1; A. Duchemin1; V. Rachen1; A.A. Yameogo1; PV. Ennezat1; G. Deklunder1
1Cardiologic University Hospital, Ultrasound Dept., Lille, France

Purpose: The resting inferior vena cava (IVC) collapsibility and morphology are usually used to estimate right atrial pressure (RAP). This evaluation pro-
vides useful therapeutic, functional and prognostic information as IVC col-
lapsibility is a marker of right ventricular overload. The aim of this study was to evaluate IVC collapsibility at exercise as a marker of cardiopulmonary adaptation to exercise.

Methods: 139 consecutive patients (67 men, mean age 57±16 years, mean two-ventricular ejection fraction (FEV) 61±10%) underwent a semi sup-
ine symptom-limited exercise echocardiography (EE). The main indication for EE was mitral valve disease (stenosis: 36 pts, regurgitation 10 pts), aortic valve disease (4 pts), unexplained dyspnea (31 pts), detection of pulmonary artery hypertension (42 pts), hypertrophic cardiomyopathy (18 pts), and vari-
ous diseases.

Results: Two groups were defined: group 1 with 63 pts who had IVC without respiratory collapse at peak exercise and group 2: 76 pts with preserved IVC collapsibility. There were no differences in sex ratio (p=0.33) or mean age (57±17 vs 56±15 years, p=0.65), but patients without respiratory col-
lapse were more symptomatic (NYHA class 2.07±0.66 vs 1.77±0.67, p=0.029). Baseline left ventricular ejection fraction was lower in group 1 compared with group 2 (59±11% vs 64±8%, p=0.001). However, there were no differences between groups with regard to maximal exercise level
(82±2.7 Watts vs 88±2.9 Watts, p=0.02) and exercise time (7±2 min vs 7±2 min, p=0.12). In group 1, systolic pulmonary artery pressure (sPAP) at peak exercise was significantly lower (78±19 mm Hg vs 49±16 mm Hg, p=0.0001) compared with group 2. Collapsibility was strongly associated with cause of exercise limitation; dyspnea was the main limitation of exercise (62%) in group 1, whereas patients of group 2 stop for muscular exhaustion (79%), (p<0.0001).

Conclusion: NIC without collapse at peak of exercise is strongly associated with dyspnea during exercise. IVC collapsibility during exercise can be used as a marker of abnormal cardiopulmonary response to exercise.

223 Heart frequency at which cardiac index starts its descending limb can identify ischemic wall motion abnormalities

A. Bobrov1; S. Shulenin1; L. Bobrov1
1Military Medical Academy, Propaedeutics Dept., Saint Petersburg, Russian Federation; 2Saint Petersburg, Russian Federation

Background: In healthy men the exercise leads to increasing of the heart rate and cardiac output right up to the cardiopulmonary threshold. Decreasing of cardiac output during heart rate growth identifies the decompensation of the heart work.

Aim: To assess the feasibility and prognostic value of noninvasive estimation of cardiac index (CI) during the exercise stress echo.

Methods: We enrolled 47 patients with mild stable angina (males, age 52.5±1.3 years, ejection fraction =53.2±1.5%, without wall motion abnormalities) referred for the exercise stress-echo with cycling. During the exercise with the help of continuous wave Doppler the blood flow in the ascending aorta was registered. CI was calculated on the heart rate 70, 80, 90, 100, 110, 120, 130, 140 bpm. Ischemic wall motion abnormalities of left ventricle were detected. Cardiac frequency at which CI starts its descending limb called critical heart rate.

Results: 26 patients (age 52.7±1.5 years, ejection fraction =53.2±1.7%) had abnormal biphasic and 21 patients (age 52.4±2.2 years, ejection fraction =54.3±1.7%) had normal unsloping CI (figure). Ischemic wall motion abnormalities of the left ventricle were registered in 76.9% patients of biphasic CI group and in 14.3% patients of unsloping CI group, p<0.05. Ischemic wall motion abnormalities index were 1.354±0.056 in biphasic CI group and 1.076±0.033 in unsloping CI group, p<0.05. Critical heart rate in biphasic CI group was 112.6±2.7 bpm, submaximal heart rate in unsloping CI group was 131.0±3.4 bpm, p<0.05.

Conclusion: Noninvasive estimation of cardiac output is feasible during the exercise stress-echo. A biphasic CI pattern during the exercise stress echo identifies more frequent ischemic wall motion abnormalities of the left ventricle.6

224 Adenosine induced perfusion defects versus dobutamine contraction abnormalities for diagnosis of myocardial ischemia: a comparative exer-echocardiography study with contrast echocardiography and 2D strain

P. Reant1; S. Shulenin1; L. Labrousse1; S. Lafitte1; K. Serri1; L. Tariosse2; B. Beauvoit2; R. Roudaut1; P. Dos Santos1
1Cliniques Universitaires Saint Luc, Cardiology Dept., Brussels, Belgium; 2Saint Petersburg, Russian Federation

Background: For the clinical diagnosis of myocardial ischemia, perfusion analysis (i.e. SPECT) has been demonstrated to be more sensitive than regional function evaluation (stress echocardiography). Recently, quantitative analysis of myocardial regional function based on speckle tracking (2D strain) has been used as an alternative to perfusional systems and has encouraging preliminary results.

Objectives: To compare adenosine induced defects by myocardial contrast echocardiography (MCE) to dobutamine induced contraction abnormalities by 2D strain for the diagnosis of myocardial ischemia.

Methods: 10 open-chest pigs were studied at baseline and at 4 stages of ischemia: mild and moderate LAD stenoses (non flow limiting stenosis (NFLS) at rest, but decreasing hyperemia by 30% and 50%, respectively), severe stenoses (flow limiting stenosis (FLS) at rest by 30% and 50%, respectively). Strain was studied at rest and during dobutamine infusion. Myocardial perfusion was performed by real-time MCE flash-replenishment method (A.b) with Sonovue® (Bracco) at rest and during adenosine infusion. References methods were sonomicrometry and microspheres, respectively.

Results: At baseline, myocardial blood flows and strain values were not significantly different between the different segments. During adenosine stress, significant perfusion defects appeared in presence of 30% NFLS in risk area (anterior and antero-septal walls). During dobutamine stress, circumferential strain significantly decreased in presence of 30%NFLS. Longitudinal strain decreased in presence of 50% NFLS. In contrast, radial strain was only significantly reduced in presence of 50% FLS.

Conclusions: MCE perfusion analysis during adenosine stress and function analysis with 2D strain during dobutamine stress allow early detection of ischemia at similar levels.

Table 1. Perfusion and function in risk area

<table>
<thead>
<tr>
<th></th>
<th>A.b Rest</th>
<th>A.b Adenosine</th>
<th>Circumferential Strain (%)</th>
<th>Dobutamine</th>
<th>Radial Strain (%)</th>
<th>Dobutamine</th>
<th>Longitudinal Strain (%)</th>
<th>Dobutamine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BaseLine</td>
<td></td>
<td>6.7±1.3</td>
<td>12.8±2.3</td>
<td>-27.4±2.2</td>
<td>74.7±5.7</td>
<td>-20.3±2.1</td>
<td>73.9±4.1</td>
</tr>
<tr>
<td></td>
<td>30% NFLS</td>
<td>6.5±1.2</td>
<td>10.0±2.0*</td>
<td>33.4±2.4**</td>
<td>-23.4±2.4*</td>
<td>73.9±4.1</td>
<td>19.9±2.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50% NFLS</td>
<td>6.4±1.0</td>
<td>8.1±3.1**</td>
<td>-21.7±2.4**</td>
<td>69.6±9.2</td>
<td>-17.7±2.7*</td>
<td>50% FLS</td>
<td>6.3±1.0*</td>
</tr>
<tr>
<td></td>
<td>30% FLS</td>
<td>5.0±1.0</td>
<td>4.4±1.8**</td>
<td>-20.4±3.2*</td>
<td>61.1±1.9</td>
<td>14.0±1.1**</td>
<td>30% FLS</td>
<td>4.3±1.7*</td>
</tr>
<tr>
<td></td>
<td>50% FLS</td>
<td>3.4±1.8**</td>
<td>-15.4±6.4*</td>
<td>46.6±16.7**</td>
<td>12.1±1.6**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

225 Myocardial contractile reserve as an indicator of exercise tolerance in ischaemic heart failure patients

P. Podolec1; P. Rubis1; L. Tomkiewicz-Pajak1; W. Plazak1; M. Pieculewicz1; G. Kopeck1; W. Tracz1
1John Paul II Hospital, Cardiac and Vascular Diseases Dept., Krakow, Poland

Aim: To assess the usefulness of myocardial contractile reserve (deltaEF), determined by supine bicycle exercise echocardiography (ex-echo), in ischaemic heart failure (HF) patients (pts) subjected to cardiological exercise test (CPX).

Material and methods: We studied 50 adult pts (32 male and 18 female), mean age of 62±1.9±0.5 (46-79) years, mean left ventricle ejection fraction (EF) 30.6±13.4 (11-45%). All pts underwent baseline echocardiography and ex-echo (25-Watts, 3-min increments) and CPX. Myocardial contractile reserve was assessed as left ventricle EF during peak exercise minus left ventricle EF at rest. The critical level of deltaEF is defined as an increase of at least 5% in global EF during exercise. EF was calculated by modified Simpson’s biplane method. Peak oxygen uptake (VO2peak) was measured on CPX. Pts were divided into two groups according to the VO2peak value: group 1 (<14 ml/kg/min) and group 2 (>14 ml/kg/min).

Results: Rest values of EF were similar in both groups. However, there was a significant increase in peak exercise EF only in group 2. Pts from group 1 showed reduced deltaEF <5%, while pts from group 2 showed normal left ventricle response to exercise deltaEF >5%.

Conclusions: Evaluation of deltaEF, which reflects residual myocardial contractile reserve, provides valuable information about exercise capacity in ischaemic HF pts. Measurement of rest EF does not predict left ventricle contractile response to physical activity. DeltaEF >5% is related to better exercise tolerance in ischaemic HF pts.

Table 1

<table>
<thead>
<tr>
<th>VO2 peak (ml/kg/min)</th>
<th>&lt;14</th>
<th>&gt;14</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pts</td>
<td>19</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>EF rest (%)</td>
<td>28%</td>
<td>32%,</td>
<td>NS</td>
</tr>
<tr>
<td>EF ex-echo (%)</td>
<td>31.5</td>
<td>40.2</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>deltaEF (%)</td>
<td>3.2</td>
<td>7.4</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

226 Diverging response of stress-induced mitral regurgitation to exercise and dobutamine

J.-B. Le Polain De Waroux1; A.C. Pouleur1; D. Vancraeynest1; C. Goffinet1; A. Pasquet1; B.L. Gerber1; J.L. Vanoverschelde1
1Cliniques Universitaires Saint Luc, Cardiology Dept., Brussels, Belgium

Background: In patients with left ventricular (LV) dysfunction, exercise-induced mitral regurgitation (MR) is an important determinant of exercise capacity and has been associated with a poor outcome.

Aim: The present study was designed to test if, in patients with coronary disease, dobutamine stress-echocardiography (DSE) can induce similar worsening of MR than exercise echocardiography (EVE), and to explore possible relationship with ongoing ischemia.

Method: 29 patients (pts) (26 males, mean age: 64±15 years) with coronary disease and a LV ejection fraction <45% underwent DSE and EVE on 2 separate day rates. 8-blockers were withdrawn 24 hours before each test. MR was quantified using the PISA method at rest and at each stage of both tests. Ischemia was identified as new or worsening of regional wall motion abnormalities (RWMA).

Results: Heart rate increased similarly during both tests (to 81±11% and 82±12% of max, p=ns). By contrast, systolic blood pressure (SBP) increased only with EVE (by 27±22 mm Hg) but decreased during DSE (by 9±22 mm Hg).

Eur J Echocardiography Abstracts Supplement, December 2006
227 Detection of coronary artery disease during recovery phase of stress echocardiography

S.E. Karagiannis,1 J.J. Ba4,1 A. Elhendy,1 H.H. Feringa,1 D.V. Kokkinos1; R. Van Domburg2; M. Simoons1; D. Poldermans4
1Rotterdam, Netherlands; 2Leiden, Netherlands; 3Omaha, Nebraska, United States of America; 4Athens, Greece

Objective: Dobutamine stress echocardiography (DSE) has a modest sensitivity in single vessel coronary artery disease (CAD). Aim of this study was to assess the additional diagnostic value of new or worsening wall motion abnormalities (NWMA) during the recovery phase after acute administration of beta-blockers.

Methods: The study population consisted of 200 patients (mean age: 59±11 years; 144 men), who underwent DSE. Images were acquired at rest, low dose, peak dose, and recovery phases. Patients received intravenous metoprolol (1-5 mg/min). The dose was adjusted to achieve a recovery heart rate, within a 10% range of the resting heart rate. Coronary angiography was performed within 2 months.

Results: Inducible new wall motion abnormalities were observed in 168 (84%) patients at peak stress. An additional 14 patients (7%) experienced NWMA during the recovery phase. CAD was detected in 182 patients (86% had single vessel CAD). Sensitivity, specificity and accuracy of DSE were 88%, 65%, 73% at peak stress and 97%, 65%, 74% at recovery. Sensitivity was particularly higher during recovery than peak stress in patients with single vessel CAD (98% vs 81%, p<0.001). Single- and multi- vessel disease patients with new wall motion abnormalities at recovery are shown in the figure.

Conclusion: The assessment of wall motion abnormalities during the recovery phase after acute beta blockade improves sensitivity of DSE particularly in patients with single vessel CAD.

228 Incremental benefit of SRI to the accuracy of novice and expert interpreters of dobutamine stress echocardiography

L. Hanekom1, N.V. Mai2; J. Hare3; K. Daubert1; J. Harker1; T.H. Manwick1
1University of Queensland, Medicine Dept., Brisbane, Australia

Background: Dobutamine stress echo (DSE) is accurate for the detection of coronary artery disease (CAD), but interpretation is subjective and accuracy is dependent on observer experience. Strain rate imaging (SRI) offers a qualitative technique for identification of CAD, but it is unclear whether this could improve the results of less expert readers.

Methods: We studied 121 patients (42 female, age 64±10 yrs) who underwent DSE with simultaneous SRI, and coronary angiography. Segmental peak systolic SR (SR) was measured independently and previously derived cutoffs were applied to categorize segments as normal or abnormal. The accuracy of WMS by novice, experienced and expert readers, and SRI were compared with quantitative coronary angiography (Significant CAD=QCA diameter stenosis >50%).

Results: The accuracy of WMS by novice (57%, AUC 0.59) and experienced echocardiographers (67%, AUC 0.63) was less than experts in DSE (89%, AUC 0.67, p<0.0001). By applying a cutoff of <−0.9s, the accuracy of SR in the diagnosis of CAD was 89% (AUC 0.69), which added incremental value to the sensitivity of WMS by experienced readers, and significantly improved the sensitivity and specificity of WMS by novice readers (Table). SRI added specificity to the diagnosis of LAD territory disease by experienced and novice readers (88% vs 47%, p<0.0001 and 41%, p<0.0001). SRI did not add to the accuracy of expert readers.

Conclusion: SRI offers an improvement in accuracy of WMS to less expert echocardiographers.

<table>
<thead>
<tr>
<th>Table 1. Accuracy of WMS vs SRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRI Expert</td>
</tr>
<tr>
<td>Sensitivity</td>
</tr>
<tr>
<td>Specificity</td>
</tr>
</tbody>
</table>

229 Assessing left ventricular diastolic function: back to time intervals?

M. Hisu;1 C. Ginghina;1 A.C. Popescu;1 F. Antonini-Cantarini;1 G.L. Nicolisii;2 D. Deleanu1; B.A. Popescu1
1Institute Of Cardiovascular Diseases, Cardiology Dept., Bucharest, Romania; 2Elias Hospital, Cardiology, Cardiology Dept., Bucharest, Romania; 1ARC, Ospedale Civile, Cardiology Dept., Pordenone, Italy

Background: Recently, the time interval between the onsets of mitral inflow E and mitral annulus velocity E’ by TDI: TE-E, has been described as an index of left ventricular (LV) diastolic filling allowing identification of patients (pts) with LV diastolic dysfunction (DD) and, combined with isovolumic relaxation time (IVRT), prediction of LV filling pressures (FP). However, its clinical validity has been questioned.

Purpose: We sought to assess the feasibility, predictors, and relation of this index with LVDD, as assessed by a comprehensive Doppler study.

Methods: We studied consecutively 600+14 years) pts. who underwent DSE in sinus rhythm, without significant valvular disease. TE-E was calculated as the difference between time from peak R (ECG) to E’ onset and time from peak R to mitral E onset, measured in cardiac cycles of very similar length. A comprehensive echocardiographic study was performed, measuring mitral: E, A, E/A, E/E’sep, E/E’sep>15, E/Vp: 1.5-2); grade 2 DD (E/A<0.75, Edt>250, Ar-A<30, E/E’sep>10, E/E’sep>1.5, Edt>140, Ar-A<30, E/E’sep>10-15, E/E’sep>1.5-2); grade 3 DD (E/A>1.5, Edt>140, Ar-A<30, E/E’sep>10-15, E/E’sep>2 >23 msec).

Conclusions: TE-E was a strong, direct correlation with LVDD. This time interval could be used for identifying pts with advanced degrees of LVDD.

230 Atrial strain (S) and strain rate (SR) identifies elevated pulmonary artery wedge pressure and diastolic dysfunction grade in diabetic patients with coronary artery disease

P.C. Caso Piò; S.C.P. Comenale Pinto Salvatore; R.A. Ancora Roberta; S.S. Severino Sergio; D.G.P. De Gregorio Paola; F.A. Fusco Angela; L.P.R. Lo Piccolo Rosalia; R.C. Calabro’ Raffaele
1A.O. Monaldi, Cardiology Dept., Naples, Italy

Background: Cardiovascular impact of diabetes mellitus (DM) accounts for the greatest morbidity and mortality associated with this disease. Macrovascular and microvascular complications result in heart failure, from both systemic dysfunction and specific diastolic dysfunction that occurs independently of coronary artery disease (CAD). Precise assessment of cardiac abnormalities is mandatory in order to allow aggressive therapeutic intervention and to reduce cardiovascular morbidity and mortality in DM patients.

Atrial strain (S) and strain rate (SR) echocardiography are emerging ultrasound techniques that improve the accuracy and reproducibility of conventional echocardiography studies.

Aim of this study: To test the ability of atrial strain to identify diastolic dysfunction grade and heart failure functional signs.

Materials and methods: We studied 50 subjects: 25 (15 M, 10 F, mean age: 61 years) with CAD assessed by coronary angiography with DM and without vascular disease, hypertension, dilated cardiomyopathy and 25 (13 M, 12 F) controls. By Echocardiography System Seven GE equipped with TVI function we studied left and right ventricular systolic and diastolic function, pulmonary artery wedge pressure (PCWP), calculated by E/Ea and we measured left and right atrial (LA/RA) S and SR. Peak systolic tissue
atrial S and SR were evaluated in 4 and 2 chambers view at the level of the apical segment of the septal, lateral, anterior and inferior LA walls, and at the apical segment of the RA free wall.

Results: A significant direct correlation was found between PCWP and LA/RA diameters (p=0.005; R=0.63), LA/RA volumes (p=0.004; R=0.73), early diastolic velocity (E wave) and late diastolic velocity (A wave) (p=0.003; R=0.64). A direct correlation was found between diastolic reverse flow dura-
tion (Ar dur) and LA telediastolic and telesystolic Volumes (p=0.001; R=0.74). The myocardial atrial S and SR were found to be significantly (p=0.002) lower for each wall (both LA/RA) in patients with DM than in controls. A sign-
ificant inverse correlation was found between LA/RA S and SR (p=0.03; R=0.71) and PCWP and LA/RA ejection fraction (EF). An inverse correlation was found between PCWP and PV (p=0.003; R=0.63) and a direct correla-
tion with mitral forward A wave (A) (p=0.004; R=0.72).

Conclusions: Atrial S and SR and different Tissue Doppler parameters identify elevated PCWP and diastolic dysfunction grade in DM patients with CAD and authorizes aggressive therapeutic intervention in such patients.

231

Diastolic dysfunction: correlation of invasive measurement with echocardiographic evaluation

N. Dervaux 1; F. Bauer 1; M. Lemercier 1; A. Troniou 1; D. Brunet 1; A. Cribier 1

1Yonsei Cardiovascular Center, Cardiology Division, Int. Medic. Dept., Seoul, Republic of Korea; 2Yonsei University College of Medicine, Seoul, Republic of Korea

Background: In the absence of easy and objective parameter of diastolic function, diastolic heart failure is defined by clinical or laboratory arguments of elevated left ventricular end-diastolic pressure (LV EDP) with normal ejec-
tion fraction. Doppler equations for LV EDP are usually correlated to pulmo-
nary wedge pressure instead of true LV pressure recordings. The purpose of this study was to compare LV EDP to transmitral and tissue Doppler calcula-
tion of LV preload.

Methods: Left-sided heart catheterisation and echocardiography were per-
formed in 35 consecutive patients with or without heart disease. LV EDP was invasively measured. At the same time, patients underwent conventional 2-Dimensional/Doppler echocardiography along myocardial Doppler inter-
rogation. We measured transmural flow peak early (E) and late (A) velocity, transmural color M-mode flow propagation velocity (Vp) and left lateral an-
ulus early diastolic peak displacement (Ea). We calculated E/A, E/Ea and E/Ea ratio as surrogate for LV preload and compared them to LV EDP.

Results: Patients were 62±12 years old. Left ventricular ejection fraction was 60±16% and LV EDP was 19±8 mm Hg. By linear regression analysis, LV EDP was not correlated to transmitral E/A ratio (in patients <60 years, r=0.128; p=0.61; in patients >60 years, r=0.32, p=0.22), neither to E/Vp (r=0.24, p=0.02) nor to E/Ea ratio (r=0.16, p=0.38).

Conclusions: Doppler equations of LV preload do not correlate to real LV EDP. Those equations are questionable when we investigate diastolic function and heart failure. In the future, we should focus on accurate echocardiographic parameters of LV relaxation and compliance instead of preload.

232

Time course of recovery of left ventricular filling pressure after exercise in healthy subjects

J.-W. Ha 1; J.F. Forteza 1; H. Martinez 1; A. Rossello 1; A. Rodriguez 1; P. Pericas 1; M. Acena 1; C. Fernandez Palancea 1

1Hospital Universitari Son Dureta - IUNICS, Cardiology Dept., Palma De Mallorca, Spain

Valsalva maneuver (VM) causes changes in the mitral filling pattern due to a temporary drop in left chambers inflow. If these changes are different in patients with normal (normal pattern) or increased (pseudonormal pattern) filling pressures are controversial.

The aim of this study was to determine if the VM is able to detect mitral filling pattern changes between patients with normal or pseudonormal pattern.

Methods: Valsalva maneuver was performed in 68 patients with sinus rhythm, and mitral ratio E/A=1:2, able to undergo the VM successfully. Left cham-
bers filling pressures were defined by V mitral/E annulus ratio (E/E'). Group I was defined as E/E'<12 (n=38) and Group II E/E'>12 (n=30). Other dias-

tolic parameters were also studied, as E mitral/early diastolic left ventricular inflow propagation velocity ratio (E/Vpe).

Results: Similar results were obtained when both groups were analyzed ac-

cording to the E/Vp ratio (>or<1.5) (table 1).

Conclusions: 1. In our serie, the VM was not able to differentiate changes in mitral filling pattern between patients with normal and increased filling pres-

\textbf{Table 1}

<table>
<thead>
<tr>
<th>E(cm/s)</th>
<th>A(cm/s)</th>
<th>E/A</th>
<th>E VM</th>
<th>A VM</th>
<th>E/Vp</th>
<th>E/E VM/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>89±15</td>
<td>59±13</td>
<td>13±6,34</td>
<td>16</td>
<td>17±8±17</td>
<td>±55±11</td>
</tr>
<tr>
<td>Group II</td>
<td>122±29</td>
<td>74±22</td>
<td>1,5±0,76</td>
<td>76±27</td>
<td>74±3</td>
<td>1,7±0,75</td>
</tr>
</tbody>
</table>

233

Is the Valsalva maneuver able to differentiate between patients with normal and abnormal filling pattern?

B. Tocado 1; J.F. Forteza 1; H. Martinez 1; A. Rossello 1; A. Rodriguez 1; P. Pericas 1; M. Acena 1; C. Fernandez Palancea 1

1Hospital Universitari Son Dureta - IUNICS, Cardiology Dept., Palma De Mallorca, Spain

Is the Valsalva maneuver able to differentiate between patients with normal and abnormal filling pattern? The Valsalva maneuver was performed in 68 patients with sinus rhythm, and mitral ratio E/A=1:2, able to undergo the VM successfully. Left cham-
bers filling pressures were defined by V mitral/E annulus ratio (E/E'). Group I was defined as E/E'<12 (n=38) and Group II E/E'>12 (n=30). Other dias-
tolic parameters were also studied, as E mitral/early diastolic left ventricular inflow propagation velocity ratio (E/Vpe).

Results: Similar results were obtained when both groups were analyzed ac-

cording to the E/Vp ratio (>or<1.5) (table 1).

Conclusions: 1. In our serie, the VM was not able to differentiate changes in mitral filling pattern between patients with normal and increased filling pres-

\textbf{Table 1}

<table>
<thead>
<tr>
<th>E(cm/s)</th>
<th>A(cm/s)</th>
<th>E/A</th>
<th>E VM</th>
<th>A VM</th>
<th>E/Vp</th>
<th>E/E VM/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>89±15</td>
<td>59±13</td>
<td>13±6,34</td>
<td>16</td>
<td>17±8±17</td>
<td>±55±11</td>
</tr>
<tr>
<td>Group II</td>
<td>122±29</td>
<td>74±22</td>
<td>1,5±0,76</td>
<td>76±27</td>
<td>74±3</td>
<td>1,7±0,75</td>
</tr>
</tbody>
</table>

234

Echocardiographic predicting left ventricular filling pressures and noninvasive hemodynamic monitoring by tissue Doppler echocardiography in intensive cardiac care

M. Hutyra 1; T. Skala 1; J. Ostransky 1; J. Lukí 1

1University Hospital Olomouc, 1ST Dept. Of Internal Medicine, Olomouc, Czech Republic

Background: Based on published results of large studies, hemodynamic

monitoring using pulmonary artery catheters (PAC) is not associated with

improved prognosis of critically ill patients. Moreover, this examination may be associated with some specific complications. This method is therefore recently being abandoned and there has been an effort to develop some other techniques of hemodynamic monitoring of critically ill patients.

Aims: The purpose of this study was to evaluate the usefulness of tissue Doppler echocardiography (TDE) parameters for the evaluation of invasive measurement of PCWP. We compared examined echocardiographic parameters (E, DTE, E/DTE, E/Em, tau=30±7*TE(Em)), (E/Em)/log tau in the prediction of PCWP. Further, we examined the usefulness of TDE param-

eters for noninvasive monitoring of PCWP.

Methods: Total of 52 patients underwent a right heart catheterization with PAC and a simultaneous TDE. The whole set of patients was subsequently divided for statistical analysis according to the value of PCWP to the group 1 (PCWP ≤15 mm Hg, n=22), group 2 (PCWP >15 mm Hg, n=30) and 14 patients were examined repeatedly for estimation of TDE noninvasive of PCWP monitoring capability.

Results: Significant correlations of PCWP with E (r=0.714; p<0.0001), DTE (r=0.505; p<0.0001), E/DTE (r=0.732; p<0.0001), E/Em (r=0.833; p<0.0001), I (r=0.407; p<0.003), (E/Em)/log tau (r=0.792; p<0.0001) were found by the assessment of values of the whole set of patients. Significant differences were found in the values of E (71.0±15.67 vs 108.87±31.28), DTE (197.5±37.0 vs 134.6±68.8), E/DTE (0.372±0.096 vs 0.94±0.309), E/Em (9.05±3.4 vs 21.17±6.41) a (48.8±13.04 vs 34.9±13.12), (E/Em)/log tau (5.47±2.25 vs 14.42±5.52) comparing groups 1 and 2. The cut-off value of E/Em=14 has in this model 90.3% sensitivity, 90.9% specificity in predic-

PERIOPERATIVE/INTENSIVE CARE
Load-dependency of color M-mode flow propagation velocity and
doppler tissue imaging in assessment of left ventricular diastolic
function: comparison with transmural and pulmonary venous flow
M.F. Elnoaman y1; H. Mahfouz1; H. Kabil2
1Shebin Elkom, Egypt; 2Cardiology Dept., Banha, Egypt

Background: Standard Doppler transmitral (TM) and pulmonary venous flow
(PVF) velocity measurements are pre-load/afterload dependent. Pulsed-wave
Doppler tissue imaging (PWDTI) and color M-mode flow propagation veloc-
ity (CMM FPV) are new Doppler methods for left ventricular (LV) diastolic
function assessment. To date, few studies have compared the data obtained
by these methods in the same series of patients and compared them to the

Objectives: To determine whether PWDTI&CMM FP velocities are influenced by
alterations in preload/afterload compared to (TM)&(PVF). Patients and
Methods: The study enrolled 130 patients with systolic dysfunction (Ejection
fraction <50%), age and sex matched healthy normal volunteers as a
control group (I). Patients divided into two groups: Group (II) comprising
72 patients with E/A <1 (early transmural filling velocity/atrial contraction
velocity) and Group (III) comprising 58 patients with E/A >1. All patients underwent
under measurement of, E velocity, its deceleration time (DT), A velocity,
isovolumic relaxation time (IVRT), (PVF) velocities (S, D&AR), CMM FPV,
early and late diastolic lateral mitral annular DTI velocities (Em and Am,
respectively) at baseline, during Valsalva’s manoeuvre (VM) and at maximum
isometric handgrip strength (MIHS).

Results: In each of the three groups, no significant change existed between
baseline, during VM and at MIHS as regard CMM FPV and PWDTI velocities.
In group (I), a significant decrease in E, E/A and increase in IVRT was noted
during MIHS, while during VM there was a significant decrease in E&A (<p<0.05
for all) but E/A did not change significantly (p>0.05). In group (II) significant
increase in E, E/A, S/D and decrease in IVRT&DT was noted during MIHS
(p<0.05 for all); while during VM, T&M&PV Doppler indices did not change
significantly (p>0.05). In group (III), a significant decrease in E/A and
increase in AR was noted during MIHS, while during VM, a significant
decrease in E, E/A&S/D and increase in AR was detected(<p<0.05 for all).

Conclusion: In contrast to standard conventional (TM and PVF) Doppler
indices, new diastolic indices (CMM FP velocities and DTI velocities) are not
significantly affected by physiological pre and after load altering maneuvers.
Therefore having more clinical diagnostic utility as load independent tools for
assessment of LV diastolic function in patients with LV systolic dysfunction.

237

238

Left ventricular function in early hypertension; are there reliable
echocardiographic measures of diastolic function?
I. Almuntaser1; A. Brown2; P. Crean1; G. King1; A. Mahmud1; J. Feely1
on behalf of: no
1St James’s Hospital, Crest Directorate, Cardiology Dept., Dublin 8, Ireland

Background: Diastolic dysfunction identifies patients at risk of developing
heart failure and may be common in hypertension. We compared the preva-
ience of diastolic dysfunction in early hypertension using criteria provided by
the Canadian consensus, American Medical Association, and European
guidelines.

Methods:102 patients (62 men, 58 women; mean age 46.9±2.1 years), with
normal diagnosed hypertension (>140/90 mm Hg clinic and >135/85 mm Hg
day time ambulatory) underwent comprehensive echocardiography using a
Philips Sonos 5500. Trans mitral valve inflow (E/A) was measured using PW
Doppler with and without Valsalva manoeuvre, and tissue Doppler velocities
(e'/a') were measured and an average from four sites calculated. Analyses
used JMPIN statistical software.

Results: The ejection fraction (Simpson’s rule) was normal in all patients.
The prevalence of diastolic dysfunction varied according to the criteria used.
There was a high prevalence 59% (n=71) using Canadian consensus guide-
lines (E/A <1 with or without valsalva) of whom 27% (n=32) had a pseudo-
normal pattern unmasked with valsalva and 32% (n=39) had impaired relax-
ation at rest. Significantly fewer 10% (n=12) patients were diagnosed using
European guidelines (E/A <1 <50 years, <0.5>50 years), or American Medi-
cal Association guidelines 23% (n=27) (impaired relaxation pattern; E/A
<0.75, and pseudonormal pattern; E/A >0.75, and Ee'/Ee >0.10 despite
the additional use of Ee'. Inclusion of the deceleration time or isovolumic
relaxation time was not additive. Using tissue Doppler imaging (e'/a' <1) the
prevalence of diastolic dysfunction was 59% (n=71) in keeping with our findings using the Canadian consensus guidelines.

Conclusions: Our findings question the reliability of commonly used echocardiographic criteria to diagnose diastolic dysfunction in early hypertension. Assessment of diastolic function should be based on a comprehensive echocardiographic study integrating all available data including tissue Doppler imaging which may alleviate the need to mask a pseudo normal pattern with the valsava manoeuvre.

239 Early diastolic velocity of the mitral annulus in relation with segmental diastolic dysfunction and remodelling in hypertension

H. Pavlopoulos1; R. Showkathali1; M. Tayebye1; E. Philippou1; D. Dawson1; P. Nihoyannopoulos1
1Hammersmith Hospital, Cardiology Dept., London, United Kingdom

Background: Spectral tissue doppler imaging (TDI) is a widely used modality in optimizing the assessment of left ventricular diastolic function. Septal mitral annular early diastolic velocity Ea is considered a marker of diastolic dysfunction (DD). Strain rate echocardiography can depict segmental relaxation with high spatial accuracy.

Aim: To investigate the relationship of early septal annular relaxation velocity (Ea) with diastolic parameters, segmental diastolic dysfunction (DD) and remodelling in hypertension.

Material and methods: We evaluated 52 hypertensive and 24 controls, matched for age (69.7±5.7 vs 45.5±4.1 yrs), BSA (19.0±0.1 vs 19.6±0.2 m²) and normal EF (66.2±5.2 vs 64±3.3 NS). All subjects had 2D, TDI of the mitral annulus at the septal wall and color doppler myocardial imaging of basal, mid and apical LV segments (18) in the longitudinal axis. Systolic BP, DT, IVRT, E/A ratio of mitral inflow and SR E/A in each segment were measured. Abnormal relaxation was defined as E/A<1. For assessing the remodelling, LVMass index (LVM), wall thickness (WT) and relative wall thickness (RWT) were estimated.

Results: Global diastolic dysfunction was evident in 64% of hypertensive and 16.7% of control subjects. The hypertensives with global DD had an average of 11 segments with abnormal relaxation, with a maximum of 18 segments. The controls with global DD had an average of 9 segments with abnormal relaxation with a max 12 out of the 18 segments. The hypertensives had lower Ea (5.9±1.8 vs 9.5±1.4 cm/s, p<0.001) compared with the control. Ea was correlated with E/A (r: 0.62, p<0.001), IVRT (r: -0.38, p<0.05), DT (r: -0.34, p<0.05), LVM (r: -0.34, p<0.05), age (r: -0.72, p<0.001), systolic BP (r: -0.62, p<0.001), WT (r: -0.58, p<0.001), RWT (r: -0.57, p<0.001) and was higher in the hypertensive subjects. Subjects with Ea<8 cm/s had higher LVMI (99.4±27.9 vs 80.7±26.5 g/m², p<0.005). The hypertensive patients had greater systolic BP (140±17.9 vs 121±7.7 mm Hg, p<0.05) for LVM (99.2±26.9 vs 70.9±19.6 g/m², p<0.005) and WT (11.1±1.7 vs 9.2±1.4 mm, p<0.001), systolic BP (143±17 vs 125±13 mm Hg, p<0.001), and lower mean systolic longitudinal S and SR (1.8±0.9 vs 1.5±0.1/s, p<0.001) and mean S (18.2±2.5 vs 19.6±2.0%, p<0.05) compared to controls. Global diastolic dysfunction was evident in 64% of hypertensive and 16.7% of control subjects. HTN patients had lower Ea (5.9±1.8 vs 9.5±1.4 cm/s, p<0.001) and lower mean systolic longitudinal S and SR (1.8±0.9 vs 1.5±0.1/s, p<0.001) and mean S (18.2±2.5 vs 19.6±2.0%, p<0.05) compared to controls.

Conclusions: The hypertensive (HTN) patients had greater systolic BP (140±17.9 vs 121±7.7 mm Hg, p<0.05) LVM (99.2±26.9 vs 70.9±19.6 g/m², p<0.005) and WT (11.1±1.7 vs 9.2±1.4 mm, p<0.001), systolic BP (143±17 vs 125±13 mm Hg, p<0.001), and lower mean systolic longitudinal S and SR (1.8±0.9 vs 1.5±0.1/s, p<0.001) and mean S (18.2±2.5 vs 19.6±2.0%, p<0.05) compared to controls. Global diastolic dysfunction was evident in 64% of hypertensive and 16.7% of control subjects. HTN patients had lower Ea (5.9±1.8 vs 9.5±1.4 cm/s, p<0.001) and lower mean systolic longitudinal S and SR (1.8±0.9 vs 1.5±0.1/s, p<0.001) and mean S (18.2±2.5 vs 19.6±2.0%, p<0.05) compared to controls.

241 Relational of early relaxation velocity of mitral annulus with systolic longitudinal strain and strain rate in hypertension and in diastolic dysfunction

H. Pavlopoulos1; M. Tayebye1; R. Showkathali1; E. Philippou1; D. Dawson1; P. Nihoyannopoulos1
1Hammersmith Hospital, Cardiology Dept., London, United Kingdom

Background: Spectral tissue doppler imaging (TDI) is a widely used modality in assessing of left ventricular (LV) systolic and diastolic function. Septal mitral annular early diastolic velocity Ea-(cm/s) is considered a marker of diastolic dysfunction (DD). Strain (S) and strain rate (SR) parameters seem to be promising in the quantitative evaluation of LV function.

Aim: To investigate the relation of early relaxation velocity of mitral annulus (Ea) with systolic longitudinal strain estimated by TDI in hypertensive and control subjects.

Method and materials: We evaluated 52 hypertensive and 24 controls, matched for age (49.7±5.7 vs 45.5±4.1 yrs), BSA (1.90±0.1 vs 1.96±0.2 m²) and normal EF (66.2±5.2 vs 64±3.3 NS). All subjects had 2D, TDI of the mitral annulus at the septal wall and color doppler myocardial imaging of basal and mid LV segments (12) in the longitudinal axis. Mean systolic (S) and SR (Ea) were averaged from each of the 12 segments assessed. Systolic BP, LV mass index (LVM), wall thickness (WT) and Ea/A ratio were estimated.

Results: The hypertensive (HTN) patients had greater systolic BP (140±17.9 vs 121±7.7 mm Hg, p<0.05) LVM (99.2±26.9 vs 70.9±19.6 g/m², p<0.005) and WT (11.1±1.7 vs 9.2±1.4 mm, p<0.001), systolic BP (143±17 vs 125±13 mm Hg, p<0.001), and lower mean systolic longitudinal S and SR (1.8±0.9 vs 1.5±0.1/s, p<0.001) and mean S (18.2±2.5 vs 19.6±2.0%, p<0.05) compared to controls. Global diastolic dysfunction was evident in 64% of hypertensive and 16.7% of control subjects. HTN patients had lower Ea (5.9±1.8 vs 9.5±1.4 cm/s, p<0.001) and lower mean systolic longitudinal S and SR (1.8±0.9 vs 1.5±0.1/s, p<0.001) and mean S (18.2±2.5 vs 19.6±2.0%, p<0.05) compared to controls.

Conclusions: Global diastolic and longitudinal systolic dysfunction are inter-related. Depressed early relaxation velocity of mitral annulus is accompanied with decreased systolic longitudinal function, estimated by deformation parameters, in hypertension.

242 Segmental diastolic dysfunction in normal and hypertensive patients.colour doppler myocardial imaging

H. Pavlopoulos1; R. Showkathali1; M. Tayebye1; E. Philippou1; I. Grapsa1; P. Nihoyannopoulos1
1London, United Kingdom; 2Hammersmith Hospital, Cardiology Dept., London, United Kingdom

Background: Diastolic dysfunction (DD) is a common finding in hypertension and older individuals. Strain rate echocardiography can detect segmental changes of relaxation not possible with conventional methods.

Aim: To investigate the presence of segmental diastolic dysfunction in normal and hypertensive patients.

Method and materials: We evaluated 52 hypertensive and 24 controls, matched for age (49.7±5.7 vs 45.5±4.1 yrs), BSA (1.90±0.1 vs 1.96±0.2 m²) and normal EF (66.2±5.2 vs 64±3.3 NS). All subjects had 2D and color doppler myocardial imaging of basal, mid and apical LV segments (18) in the longitudinal axis. LVMass index (LVM), wall thickness (WT), relative wall thickness (RWT), DT, IVRT, E and A wave, E/A ratio of LV inflow and SR Ea/A in each segment were estimated. Abnormal relaxation was defined as EA<1.

Results: The hypertensive patients had greater systolic BP (140±17.9 vs 121±7.7 mm Hg, p<0.05) but similar diastolic BP (82±9.2 vs 80±3.3 mm Hg, NS) with the control. Global diastolic dysfunction was evident in 64% of hypertensive and 16.7% of control subjects. The hypertensive without DD had an average of 6 segments with abnormal relaxation, with a maximum of 11 out of 18 segments. Those with DD had an average of 12 segments with abnormal relaxation with a maximum of 18 segments. From the control group, those without DD had an average of 4 segments with abnormal relaxation with a maximum 10 out of 18 segments. With global DD had an average of 9 segments with abnormal relaxation with a maximum of 12 out of 18 segments.

Segmental diastolic dysfunction was correlated with systolic S (r: 0.59, p<0.001) and RWT (r: 0.54, p<0.001), Ea/A (r: 0.63, p<0.001) and age (r: 0.73, p<0.001).

Conclusions: LA enlargement is closely associated not only with LVM but also with signs of LV diastolic dysfunction even in the early course of essential hypertension.
243 Early stages of left ventricular diastolic dysfunction in hypertensives: time to redefine diagnostic criteria?
T. Baron1; P. Hoffman2; T. Grodzicki3
1 Jagiellonian University, Medical College, Internal Medicine and Gerontology Dept., Cracow, Poland; 2 Institute Of Cardiology, Congenital Heart Disease Dept., Warsaw, Poland

Aim: To assess treated hypertensives with no symptoms of heart failure at rest with respect to presence of diastolic dysfunction (DD), identified on the basis of either European or Canadian criteria with subsequent comparison of the achieved data.

Methods: In all pts we performed blood pressure (BP) measurements and echocardiography with use of classical Doppler and novel parameters of diastolic function. Patients were divided into 3 groups: with normal diastolic function (H), with DD according to Canadian criteria (CC) and according to both Canadian and European criteria (CE). The average age of 150 participants (57.3% women) was 63.4±10.4 years, BP averaged 144.9±18.7 mm Hg/88.8±13.0 mm Hg. A normal diastolic function was observed in 26% of pts, DD according only to Canadian criteria in 28.7%, both Canadian and European fulfilled 34.7% of pts. 10.7% of pts presented DD on the basis of European criteria alone, therefore those were excluded from the further analysis. The significant differences between analyzed groups are shown in the table. There was no significant difference between the groups when sex, BMI, BP, LVEF, LVMI, or RWT were compared. Vp, though still not in existence in current diagnostic protocols, seems to be single, sensitive and reliable indicator of early diastolic impairment, especially whether the diagnosis of DD remains unclear when different protocols have been employed.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>H</th>
<th>CC</th>
<th>CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>(H vs CC)</td>
<td>(H vs CE)</td>
<td>(CC vs CE)</td>
</tr>
<tr>
<td>age, yr</td>
<td>56.9±10.5</td>
<td>65.2±9.2</td>
<td>63.4±8.7</td>
</tr>
<tr>
<td>E/A</td>
<td>1.26±0.32</td>
<td>0.83±0.11</td>
<td>1.26±0.11</td>
</tr>
<tr>
<td>DT, ms</td>
<td>219.5±38.2</td>
<td>246.8±37.6</td>
<td>245.6±43.5</td>
</tr>
<tr>
<td>IVRT, ms</td>
<td>86.1±12.5</td>
<td>88.5±14.1</td>
<td>91.6±6.9</td>
</tr>
<tr>
<td>Vp, cm/s</td>
<td>53.3±11.0</td>
<td>48.5±11.6</td>
<td>39.1±9.9</td>
</tr>
<tr>
<td>pSP/D</td>
<td>1.31±0.23</td>
<td>1.64±0.29</td>
<td>1.80±0.37</td>
</tr>
<tr>
<td>aP/aS</td>
<td>0.25±0.04</td>
<td>0.30±0.04</td>
<td>0.31±0.10</td>
</tr>
<tr>
<td>pkDur, ms</td>
<td>148.9±22.2</td>
<td>144.6±22.0</td>
<td>162.3±24.6</td>
</tr>
</tbody>
</table>

Conclusion: Patients with GH exhibit differences in selected indices of LV diastolic function compared to healthy pregnant women, possibly reflecting some degree of LV diastolic dysfunction. Echocardiographic study of LV diastolic function could aid in the diagnostic evaluation and follow-up of these patients. Further studies are required to assess possible prognostic implications.

245 Echocardiographic parameters and b-type natriuretic peptide level in predicting thromboembolism in patients with atrial fibrillation and preserved systolic function
S.H. Lee1; S. Choi1; W.J. Chung1; S.Y. Byun1; S.K. Ryu1; W.B. Pyun2; S.J. Rim2
1 Kangnam Sacred Heart Hospital, Internal Medicine Dept., Seoul, Republic of Korea; 2 Gil Medical Center, Division of Cardiology, Incheon, Republic of Korea

Purpose: To assess treated hypertensives with no symptoms of heart failure at rest with respect to presence of diastolic dysfunction (DD) as compared with European ones, mostly due to the diagnosis. The significant differences between analyzed groups are shown in the table. There was no significant difference between the groups when sex, BMI, BP, LVEF, LVMI, or RWT were compared. Vp, though still not in existence in current diagnostic protocols, seems to be single, sensitive and reliable indicator of early diastolic impairment, especially whether the diagnosis of DD remains unclear when different protocols have been employed.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>H</th>
<th>CC</th>
<th>CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>(H vs CC)</td>
<td>(H vs CE)</td>
<td>(CC vs CE)</td>
</tr>
<tr>
<td>age, yr</td>
<td>56.9±10.5</td>
<td>65.2±9.2</td>
<td>63.4±8.7</td>
</tr>
<tr>
<td>E/A</td>
<td>1.26±0.32</td>
<td>0.83±0.11</td>
<td>1.26±0.11</td>
</tr>
<tr>
<td>DT, ms</td>
<td>219.5±38.2</td>
<td>246.8±37.6</td>
<td>245.6±43.5</td>
</tr>
<tr>
<td>IVRT, ms</td>
<td>86.1±12.5</td>
<td>88.5±14.1</td>
<td>91.6±6.9</td>
</tr>
<tr>
<td>Vp, cm/s</td>
<td>53.3±11.0</td>
<td>48.5±11.6</td>
<td>39.1±9.9</td>
</tr>
<tr>
<td>pSP/D</td>
<td>1.31±0.23</td>
<td>1.64±0.29</td>
<td>1.80±0.37</td>
</tr>
<tr>
<td>aP/aS</td>
<td>0.25±0.04</td>
<td>0.30±0.04</td>
<td>0.31±0.10</td>
</tr>
<tr>
<td>pkDur, ms</td>
<td>148.9±22.2</td>
<td>144.6±22.0</td>
<td>162.3±24.6</td>
</tr>
</tbody>
</table>

Conclusion: This study suggests the tissue Doppler derived index of LV filling pressure, E/E’, is a significant predictor of thromboembolism in patients with preserved LV systolic function and non-valvular AF.

246 Evaluation of therapeutic effect for diastolic heart failure by ratio of early diastolic transmural velocity to early diastolic mitral annular velocity (E/E’) in patients with atrial fibrillation
T. Tawasab1; M. Iwai-Takano2; H. Yabola1; Y. Maruyama1
1 Health Coop, Watari Hospital, Cardiology And Internal Medicine Dept., Fukushima, Japan; 2 Fukushima Medical University, First Department of Internal Medicine

It has been reported to assess left ventricular (LV) diastolic dysfunction by a ratio of early diastolic transmural velocity to early diastolic mitral annular velocity (E/E’) in patients with sinus rhythm or atrial fibrillation (AF). In patients with AF, however, it remains to be clarified whether it is possible to evaluate the therapeutic effect for diastolic heart failure (HF) by E/E’ and E/E’ differs from the indices of HF such as brain natriuretic peptide (BNP) or enlargement of left atrium (LA). To clarify this, we examined 73 non-valvular disease patients with AF with preserved LV ejection fraction (>50%), accompanied with NYHA functional class I-IV, suggesting diastolic HF (n=32, HF group) and without HF (n=41, non-HF group). No patients showed dyspnea due to anemia, renal failure, lung disease and other disease states except HF. We evaluated E, E’ and E/E’ by Doppler echocardiography, and left atrial area (LAA) in apical four chamber view by 2D-echocardiography. The averaged value of five beats at steady-state was used in each index. Serum BNP levels were also examined. E/E’, LAA and BNP were higher in the HF group than the non-HF group (E/E’: 15±5 vs 9±2.2, LAA: 24±6 vs 20±4 cm², BNP: 32±10 vs 140±140 pg/ml, each p<0.01). In the same group, the diastolic HF with NYHA II-IV, the area under curves were; E/E’: 0.96 (95% CI 0.91-1.0), LAA: 0.77 (0.64-0.84), BNP: 0.85 (0.75-0.95). In HF group, 18 patients were repeated those examination at 17±5 weeks after treatment, and the decrease of LAA correlated with the decrease of E/E’ (r=0.48, p<0.05) probably reflecting the decrease of LA pressure. These patients were divided into two groups, depending on the improvement of NYHA functional class, i.e., improved group (n=10) and unchanged group (n=8). In the first examination, there were no differences in E/E’, LAA and BNP between the improved group and unchanged group. In follow-up period, E (11±2±0 to 94±2±1 cm/s), E/E’ (17±5±3 to 13±1±3) and LAA (28±5 to 24±4) but not E/E’ decreased in the improved group (each p<0.05). In unchanged group, any indices did not change. In conclusions, E/E’ seemed to be useful to identify the diastolic HF and evaluate the functional state in the process of HF in patients with AF, and might also relate to the grade of LA remodeling.
Doppler echo evaluation of left atrial and ventricular function after catheter ablation of paroxysmal and persistent atrial fibrillation. A prospective 5 m
A. Drzewiecka-Gerber 1 ; A. Mwik-Wojnar 2 ; T. Wozniak-Skowska 2 ; J. Krauze 1 ; A. Rybicka-Musial 1 ; C. Czerwinski 2 ; A. Hoffmann 1 ; M. Trusz-Gluz 2
1 Klinika Kardiologii, SPiK nr 7; 2 Zoława, Katowice, Poland 2

Methods: Hemodynamics of isolated atrial fibrillation (AF) has not been widely investigated, but it is believed to be associated with slight enlargement of left atrial (LA) size and minor degree of left ventricular (LV) diastolic dysfunction, that is presumed rather to be a result than a cause of so called "Ionen AF". Positive impact of sinus rhythm restoration by catheter ablation on LA size and LV function remains unclear.

Aims: To evaluate the possible reverse remodeling of LV and LA after successful ablation procedure of AF and its relationship with arrhythmia recurrence in prospective 5 months follow-up study with transthoracal and transesophaegal echocardiographic examination (TTE and TEE).

Methods and results: Sixty two patients, with refractory to antiarrhythmic agents and highly symptomatic episodes of paroxysmal and persistent AF underwent circumferential pulmonary vein RF catheter ablation according to Pappone technique. 3-dimensional electroanatomic CARTO system was used. In all patients TTE and TEE were performed before and 5±3 months after procedure in order to assess LA size and (LAA) area and flow as well as certain systolic/diastolic LV function parameters (mitral flow A/E ratio, E-wave deceleration time, Tei index, ejection fraction). The influence of LA and LV function parameters change on maintenance of sinus rhythm was studied and conversely, the impact of sinus rhythm restoration on LA function and LV function was determined.

Seventeen patients reported symptoms of arrhythmia, whereas 45 remained asymptomatic. No major clinical nor echocardiographic data affecting ablation success rate. We found significant difference as far as LVFE was concerned before and after ablation procedure (62±3%, 64±4% vs p<0.01), with no significant change but still a positive trend (p=0.06) in sub-group presenting with no arrhythmia recurrence at follow-up. We found evident correlation between certain, but not all LV systolic/diastolic parameters at the time of follow-up and the recurrence of arrhythmia. The most significant parameter for arrhythmia recurrence in our study was Tei index, that deteriorated significantly in patients with unsuccessful ablation.

Conclusions: Five months follow-up after CPVI, with echo performance shows good clinical results, with significant improvement of some but not all LV systolic/diastolic function parameters.

The relationship between flow mediated dilatation and left ventricular function in type 2 diabetic patients with microalbuminuria
M.R.S. Mehri Baykan 1 ; M.R. Omer Gedikli 1 ; M.R. Cihan Orem 1
1 Istanbul University Cerrahpaşa School of Medicine, Istanbul, Turkey

Background: It was found that left ventricular diastolic function and FMD are positively correlated with EF (r=0.43, p=0.02) and negatively correlated E/Em (r=0.41, p=0.04) and significantly higher serum creatinine (1±0.33 mg/dL vs 0.7±0.19, p=0.001). In logistic regression analysis, FMD was the only variable independently related to microalbuminuria. FMD was positively correlated with EF (r=0.43, p=0.02) and negatively correlated E/Em (r=0.41, p=0.04) and E/A ratio (r=0.40, p=0.03) in patients with paroxysmal AF.

Conclusion: It was found that left ventricular diastolic function and FMD are impaired in type 2 diabetic patients with microalbuminuria. FMD may related to LV diastolic dysfunction only in patients with microalbuminuria.
251

Atrial strain (S), strain rate (SR) and diastolic function study in diabetic population without coronary artery disease

C.P. Caso Pio 1; C.P.S. Comenale Pinto Salvatore 1; R.A. Ancosta Roberta 1; D.R.M. De Rimini Maria Luisa 1; S.S. Severino Sergio 1; P.F. Piscane Francesca 1; M.A.M. Macrino Mariangela 1; R.C. Calabro Raffaele 1

1 cardiology Department, Naples, Italy

Background: Abnormalities in diastolic function are considered to be an early sign of diabetic (DM) cardiomyopathy in patients without systolic ventricular dysfunction. Echocardiography with Doppler measurements of transmitial and trascuspidial flow, together with myocardial tissue Doppler (TTD), Strain and Strain rate (SR) are means to evaluate diastolic function noninvasively.

Aim of study: To compare left (LV) and right (RV) ventricular systolic and diastolic function, assessed by conventional echocardiography and by DTI and atrial function assessed by SR and S, in DM patients without coronary artery disease (CAD) and non-diabetic subjects.

Methods: We studied 30 subjects: 15 diabetic patients (7 M, 8 F, mean age: 54 years) without CAD, assessed by negative coronary angiography or myocardial scintigraphy and 15 controls. By Echocardiography System Seven GE equipped with TVI function we studied LV and RV systolic and diastolic function, pulmonary artery wedge pressure (PCWP), calculated by E/Ea and PCWP (11.87 vs 10.21 mm Hg).

Results: LV systolic LV function (EF=60% vs 64%), IVRT (91 vs 90 msec), propagation myocardial atrial S and SR were found to be significantly (p=0.002) lower for diabetic patients and a significantly longer mitral valve DT (245 versus 195 msec).

Conclusions: LA/RAS and SR are compromised in DM patients. Left and right diastolic function abnormalities in DM population with normal systolic function, without DM complications, hypertension and CAD, has been suggested as an earliest functional effect of a specific DM cardiomyopathy. Thus, diastolic LV and RV function in DM population are impaired independently of CAD.

252

The influence of left atrial volume and function on doppler transmirtal flow pattern in patients with primary dilated cardiomyopathy

E. Michalka1; Z.T. Bilinska1; J.M. Michalka1; W. Ruzyllo2; P. Hoffman1

1 Warsaw, Poland; 2 Institute Of Cardiology, Warsaw, Poland; 3 Central Clinical Hospital, Warsaw, Poland

Restrictive pattern of doppler transmirtal flow (MF) is a marker of advanced left ventricular diastolic dysfunction. The influence of left atrial (LA) myopathy on transmirtal flow pattern is not fully understood. The aim of the study was to evaluate the relationship between LA volume (LAV) and function and doppler transmirtal flow parameters in 30 patients with primary di- lated cardiomyopathy with left ventricular ejection fraction 24.5±8.0% and without significant mitral regurgitation (8 pts with MR<2). The following LA parameters were assessed by two-dimensional echocardiographic acoustic quantification method from apical four-chamber view using the modified Simpson rule: maximal LAV (LAVmax), LA volume change during rapid/early emptying (dLAV-RE) and atrial contraction (dLAV-AC), and total LA emptying fraction (LAEF%). Pulsed doppler MF measurements included: maximal flow velocity during early filling (Emax) and atrial contraction (Amax), ratio Emax/Amax EE and time deceleration of early filling wave (tdec E).

Results: In table. LAVmax was 117.4±48.4 ml and LA EFs was 34.2±17.5.

Conclusion: There is significant correlations between left atrial strain and doppler transmirtal flow parameters found in patients with dilated cardiomyopathy. Left atrial myopathy has an important influence on doppler transmirtal flow pattern, so left atrial function should be assessed routinely and taking into consideration during echocardiographic left ventricular filling examination.

Table 1

<table>
<thead>
<tr>
<th>Emax</th>
<th>Amax</th>
<th>Emax/Amax</th>
<th>tdec E</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAVmax</td>
<td>0.67***</td>
<td>-0.50**</td>
<td>0.66***</td>
</tr>
<tr>
<td>dLAV-RE</td>
<td>0.69***</td>
<td>-0.44*</td>
<td>0.55***</td>
</tr>
<tr>
<td>dLAV-AC</td>
<td>-0.43**</td>
<td>0.69***</td>
<td>-0.64***</td>
</tr>
<tr>
<td>LA EF%</td>
<td>0.57***</td>
<td>-0.62***</td>
<td>-0.68***</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01, ***p<0.005, ****p<0.001

253

Assessment of the temporal relationship between left ventricular diastolic filling and mitral annular motion in patients with diastolic dysfunction; evaluated by two dimensional tissue tracking system

Y. Wada 1; K. Murata 1; H. Kunichika 1; E. Akagawa 1; T. Tanaka 1; Y. Nose 1; M. Matsuzaki 1

1 Yamaguchi University Graduate School Of Medicine, Medical Bioregulation Dept, Ube, Japan

Background: Analysis of longitudinal mitral annular motion (L-MAM) has been used for evaluating left ventricular (LV) diastolic function. However, there are few reports concerning MAN-MAM along LV short axis (S-MAM).

Methods: We evaluated MAN-MAM along LV short axis as well as LV long axis, and assessed the temporal relationship between LV filling and MAN-MAM. LV apical 2- and 4-chamber images and Doppler-derived transmirtal flow (TFM) were obtained in 14 patients with dilated cardiomyopathy (DCM) and seven normal subjects (C). The patients with DCM were subdivided into two groups according to their TFM pattern: 7 with abnormal relaxation (ANR) and 7 with pseudonormal pattern (PN). Using newly developed two dimensional tissue tracking (2DTT) system (HITACHI EUB-5500) which tracked objects from one frame to the next frame based on pattern matching algorithm, tracking points were placed on the apex and 4 points (septal, anterolateral and inferior side) on the mitral annulus. The distance between each point was automatically measured frame by frame using 2DTT. The mean values of the distances between apex and 4 points were used as an index of L-MAM, and those of antero-poste- rior and septal-lateral as S-MAM. Time intervals from end-diastole to the onset of TFM (E/Ea) and to the timing of the onset of expansion of S-MAM (S) and L-MAM (T) were obtained, and corrected by R-R intervals.

Results: There are no differences in tE and tS among 3 groups. In contrast, tL in ANR and PN was prolonged compared with that in C (474±71 and 509±73 vs 347±11 msec, 0.5, both p<0.01). Especially, tL in PN was longer than that in C.

Conclusions: The temporal relation of LV filling to S-MAM was different from that to L-MAM. The longitudinal expansion of MAN followed by the onset of LV filling may play a important role for the early completion of the rapid filling period in patients with DCM and pseudonormal TFM pattern.

254

Echocardiographic estimation of left ventricular mass in children: the impact of the method on normal values

I. Germakouli 1; P. Parthenakis 1; R. Perakakis 1; A. Pavloukou 1; P.E. Vardas 1; M. Kalmanidis 1

1 University Hospital, Pediatric Cardiology Unit, Pediatrics Dept., Heraklion Crete, Greece

Several models have been proposed for the estimation of left ventricular mass (LVM) based either on M-Mode or 2D left ventricular measurements. Aim: To evaluate the impact of the method used, on the resulting normal values of LVM in a group of healthy children.

Patients-Methods: A group of 125 consecutive children (62 boys, 63 girls, median age 8.8 years, range 8.2-10.2 years) participating to Cretan Pediat- ric Cardiology Survey (CPCS), were enrolled in the study. In CPCS, school age children undergo a detailed echocardiographic evaluation. Off-line LVM measurements were performed, using digital refreshed raw data and appropri- ate software (EchoPack PC workstation GE). LVM was estimated by M-Mode as: a) LVM = 1.04*Vtdif+3.6 and b) LVM-ASE = 1.04* Vtdif+0.8+0.6, where Vtdif = (IVSDd+LVd+PWWd+LVI-Vtdif). The 2D LVM was estimated as c) LVM = 0.37* 0.56* (LVGl+ LVA) (apical) and d) LVM = 0.37* (LVGl+ LVA) (apical)/1000, where t = sqrt(LV(dia.esp))/3.14159-sqrt (LVd (dia.esp))/3.14159 + sqrt (LVd (dia.esp)). The absolute and indexed LVM values were calculated as: a) 37.4±11 mm Hg, 0.5, both p<0.01). Especially, tL in PN was longer than that in C.

Conclusions: There are no differences in tE and tS among 3 groups. In contrast, tL in ANR and PN was prolonged compared with that in C (474±71 and 509±73 vs 347±11 msec, 0.5, both p<0.01). Especially, tL in PN was longer than that in C.

Conclusions: The temporal relation of LV filling to S-MAM was different from that to L-MAM. The longitudinal expansion of MAN followed by the onset of LV filling may play a important role for the early completion of the rapid filling period in patients with DCM and pseudonormal TFM pattern.

Eur J Echocardiography Abstracts Supplement, December 2006
255

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

W. Braksator 1 ; W. Krol 1 ; A. Mamcarz 1 ; K. Krol 1 ; K. Wrzosek 1 ; M. Kuch 1 ; M. Dluzniewski 1 ; H. Krysztof 1

1Warsaw, Poland

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

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

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

Results: There was no single case of impaired LV diastolic function in examined group, however some parameters exceeded normal values for healthy people (CCDS). E/A ratio <1 was not observed but in 56.7% of examined it exceeded 2. In 50.6% examined with E/A ratio >2 E/A ratio >2 was noted but with normal velocities of mitral annulus in TDI it may indicate diastolic dysfunction, paradoxically. Early E was longer then 92 ms in 24% cases and DT exceeded 92 ms (150-220 ms) in 56% examined but without reversed E (<) this alteration does not indicate impaired relaxation. In examined with high E/A ratio (>2) LVDD (2.8 cm/m² vs 2.67 cm/m² p<0.02), IVSd (0.58 vs 0.55 cm/p<0.02) and LV mass (128.5 g/m² vs 118.4 g/m² p<0.05) was significantly higher. LVH. Aim of this study is to evaluate the potential role of pulsed wave Tissue Doppler Imaging (TDI) and mitral flow Propagation Velocity (FPV) to identify pathological from physiological LVH in middle-aged population.

Methods: We have selected a group of 70 master athletes and a group of 70 sedentary subjects affected by essential hypertension but with a normal diastolic function on standard echocardiography. The subjects of the two groups were comparable by sex, age (50.6±9.7 vs 51.4±7.8 years; p>0.05), increased left ventricular wall thicknesses and mass index (138±3±16.4 vs 137.9±7±2.0 g/m²; p>0.05). The diastolic function indexes by PW technique were in the range of normality for both groups (E/A 1.2±0.4 vs 1.0±0.2; p>0.05).

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

In our study TDI appeared more statistically significant than FPV.

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

258

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

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

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

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

Methods: 77 nonconsecutive but unselected subjects were studied (age 30-84; ejection fraction 6-72%). The subjects were ineligible if they had atrial fibrillation or valvular heart disease. Mitrval inflow indices and mitral annular velocities were used to group the subjects as normal (n=28), abnormal relaxation (n=32), pseudonormal (n=10) and restrictive (n=10). The color Doppler ultrasound data sets in the apical long axis view were used to generate flow velocity vector maps with the newly developed software. The momentum (M) of LV blood flow was calculated frame by frame as M = the sum of (blood density * pixel area * velocity vector). M was corrected for LV area (M/LVA) and UI. To evaluate the degree to which the flow was unidirectional, the unidirectional index (UI) was calculated which was defined as follows: UI = the magnitude of the sum of the velocity vectors/the sum of the magnitude of the velocity vectors.

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

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

Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Normal (n=28)</th>
<th>Abnormal relaxation (n=32)</th>
<th>Pseudonormal (n=10)</th>
<th>Restrictive (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (g/s)</td>
<td>614±158</td>
<td>427±142</td>
<td>597±173</td>
<td>551±163</td>
</tr>
<tr>
<td>M/LVA (g/s/cm²)</td>
<td>21.3±6.0</td>
<td>16.0±7.5</td>
<td>14.2±2.6*</td>
<td>10.4±3.0*</td>
</tr>
<tr>
<td>UI</td>
<td>0.92±0.05</td>
<td>0.92±0.06</td>
<td>0.88±0.06</td>
<td>0.77±0.08*</td>
</tr>
</tbody>
</table>

*denotes p<0.05 vs normal group

259

Influence of hypertrophy location on diastolic function in hypertrophic cardiomyopathy

G. Avegliano 1 ; C. Moure 1 ; M. Huguet 1 ; A. Evangelista 1 ; J. Palet 1 ; J. Lleidat 1 ; A. Jornet 1 ; M. Petit 1

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

Introduction: Hypertrophic cardiomyopathy (HCM) has great phenotypic, clinical and prognostic heterogeneity. The aim of the study was to relate
diastolic function and clinical status between patients with asymptomatic apical and septal HCM.

Methods: AHCMD, 25 men, mean age 58 ± 19 years, 10 apicals (AHCMD), 16 obstructive asymmetrical septal (OAS) and 14 non-obstructive asymmetrical septal (NOAS) groups were studied. NYHA I: 70%, II: 22% and III 8%. Diastolic function was studied, assessment of mitral patterns and pulmo-

Results: LV ejection fraction was similar in b-thal and controls. NT pro BNP levels were higher in thalassemic patients compared with the controls (465 ± 176 vs 279 ± 46 fmoI/ml, p < 0.001). This increase becomes evident in b-thal patients in the 3rd and 4th decade of life (1st 339 ± 115, 2nd 316 ± 142, 3rd 502 ± 158, 4th 505 ± 158, 5th 537 ± 165 fmoI/ml, Anova 0.003, 2nd vs 3rd, p < 0.01). E/E' ratio was also significantly higher in b-thal pts (10.6 ± 4.0 vs 6.6 ± 1.0, p < 0.001) well correlated with NT pro BNP levels (r = 0.49, p < 0.001). This increase becomes significant only during the 4th decade of patients' life (1st 6.9 ± 0.8, 2nd 8.5 ± 1.5, 3rd 10.3 ± 4.3, 4th 11.2 ± 2.6, 5th 14.2 ± 6.2, Anova 0.008, 1st vs 4th p = 0.04).

Conclusion: AHCMD presents lesser diastolic function involvement than asym-

260 Early impairment of left ventricular diastolic function in patients with non-end stage idiopathic pulmonary fibrosis

G. Pitsou 1 ; C.E. Papadopoulou 2 ; T.D. Karamitros 1 ; G. Giannakoulou 1 ; E.G. Dalamaga 1 ; H.I. Karvounis 1 ; P. Argiropoulou 1 ; G.E. Parharidis 1 ; E.G. Dalamaga 1 ; H.I. Karvounis 1 ; P. Argiropoulou 1 ; G.E. Parharidis 1

Purpose: To investigate the prevalence of diastolic dysfunction in patients with non-end stage IPF.

Methods: Forty HCM, 25 men, mean age 58 ± 19 years, 10 apicals (AHCM), 14 non-apicals and septal HCM.

Results: 80% of patients with AHCMD had normal diastolic function assessed by all the echocardiographic parameters. In the OAS group, no patient had normal diastolic function, and in the NOAS group only 35% had completely normal diastolic function. The AHCMD group had significantly lower left ventricular filling pressures and higher tissue E velocities than the other groups (AHCM E/E': 10, vs 17 in OAS vs 13 in NOAS and AHCMD: E: 8 cm/sec vs 5.2 in OAS and 5.6 in NOAS). Regarding presence of symptoms, only 20% of AHCMD had symptoms unlike the other groups which exceeded 40%.

Conclusion: AHCMD presents lesser diastolic function involvement than asym-

262 Levosimendan improves diastolic functions in patients with ischemic heart failure

H. Duygu 1 ; F. Ozerkan 1 ; A. Akilli 1 ; S. Nalbantgil 1 ; U. Turk 1 ; B. Kılıçmaz 1 ; M. Alın 1

Purpose: Unlike the conventional positive inotropics, it is suggested that levosimendan does not impair diastolic functions since it does not increase intracellular calcium levels. However, the effects of levosimendan on diastolic functions were not supported with objective echocardiographic evidence comparing them with other positive inotropics. In this prospective, random-

Methods: Patients with having an acute heart failure attack with ischemic cardiomyopathy and with a LVEF <40% were included to the study. Patients were randomized to levosimendan (12-24 µg/kg loading, 0.1 µg/kg/min 24-hours IV infusion, mean age: 64 ± 10 years, n=30, 63% male) and to dobutamine groups (5-10 µg/kg/min 24-hours infusion, mean age: 66 ± 8 years, n=32, 54% male). From the mitral inflow before and 24 hours after the treatment E and A wave velocities, E/A ratio, deceleration time (DT) of the E wave and isovolumetric relaxation time (IVRT) were measured by PW Doppler and mitral lateral annulus Em wave velocities were measured by tissue Doppler.

Results: All of the baseline diastolic parameters, age, gender, concomitant medications were similar in both groups (p>0.05). After the treatment E/A ratio were significantly lower in levosimendan group whereas E and A wave velocities and IVRT were found to be higher (Table). There was no significant change in DT after levosimendan (Table). There were no significant difference in all of the diastolic parameters after treatment in dobutamine group.

Conclusions: Levosimendan improves diastolic functions as it exerts positive inotropic effects in ischemic heart failure patients with restrictive filling pattern

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levosimendan (before/after, p value)</th>
<th>Dobutamine (before/after, p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E (cm/s)</td>
<td>101.5±21/89.16 (p=0.004)</td>
<td>107±30/92.32 (p&gt;NS)</td>
</tr>
<tr>
<td>A (cm/s)</td>
<td>46.7±19.3/15.7±1.7 (p=0.001)</td>
<td>56.1±35.4/38.1±0.3 (p&gt;NS)</td>
</tr>
<tr>
<td>E/A ratio</td>
<td>2.3±1.0/1.4±0.5 (p=0.001)</td>
<td>2.1±0.8/2.4±1.3 (p&gt;NS)</td>
</tr>
<tr>
<td>DT (ms)</td>
<td>132±36/140±30 (p&gt;NS)</td>
<td>130±34/136±32 (p&gt;NS)</td>
</tr>
<tr>
<td>IVRT (ms)</td>
<td>88±23/95±7.2 (p=0.003)</td>
<td>92±17/87±9.13 (p&gt;NS)</td>
</tr>
</tbody>
</table>

263 Right ventricular index is an independent predictor of left ventricular diastolic dysfunction in dilated cardiomyopathy

J. Silva Marques 1 ; C. David 2 ; M. Fiuza 1 ; A.G. Almeida 1 ; M.G. Lopes 2

1Faculdade de Medicina de Lisboa, Lisboa, Portugal; 2Hospital de Santa Maria, Cardiology Dept., Lisboa, Portugal

Background: Patterns of transmirtal inflow can predict heart failure and the E/A ratio is the most useful parameter of left ventricular filling dysfunction. Brain natriuretic peptide increases in patients with diastolic dysfunction, however when no data are available regarding patients with b-thal. In this study new diastolic filling indexes and NT pro BNP levels are used to assess the incidence of LV diastolic dysfunction in patients with b-thal with preserved LV systolic function.

Material and methods: NT pro BNP levels were measured in 52 patients with b-thal (4 days following transfusion) and 35 healthy controls. A thor-...
and if there were records of the left ventricular inflow by Doppler. Restrictive pattern was defined as E/A > 1.5 and E-wave deceleration time (EDT) < 200 ms, normal as E/A < 0.75 and EDT > 200 ms, and normal/ pseudonormal as 0.75 < E/A < 1.5 and EDT > 150 ms being pseudonormal if there was left atrium dilatation.

**Results:** Echocardiograms of 535 patients were studied, 78% male, aged 64±14. Normal pattern was present in 84 (16%), 65 (12%) had abnormal relaxation, 257 (48%) had a pseudonormal pattern and 129 (24%) had restrictive filling pattern. Coronary heart disease was more prevalent in the abnormal relaxation group than in the pseudonormal group (p<0.03). Patients with a restriction pattern had a higher probability of being hospitalised than those with normal (p=0.001) and pseudonormal patterns (p=0.006). They had higher LVEDV (p=0.0007) and LV end-systolic volume (p<0.0001), higher right ventricle end-diastolic volume (p<0.0001) and bigger left and right atrium dimensions (p<0.0001), higher right ventricle end-diastolic volume (p=0.0007) and the only independent predictor of DTE.

**Conclusions:** In DCM patients a restrictive filling pattern in a common finding especially in hospitalized patients. It relates to worse LV systolic function and to findings that may traduce higher filling pressures. Right ventricular dimension was the best predictor of the low DTE that characterizes restrictive filling pattern. This finding brings the focus on the possible role of ventricular interaction as a contribution to worse filling of the left ventricle in DCM.

264 Diastolic dysfunction in pediatric renal transplant patients

D.J. Ten Hake1 ; K. Cransberg1 ; M. Van Osch-Govers1 ; W.A. Helbing1; 1Erasmus MC-Sophia, Pediatrics Dept., Rotterdam, Netherlands; 2Erasmus MC-Sophia, Nephrology Dept., Rotterdam, Netherlands

Introduction: Mortality from end-stage renal disease is often due to cardiac causes. These include cardiomyopathy, arrhythmias and cardiac arrest from unknown origin. It is, however, unknown if differences in cardiac function can be found at an early stage. We therefore performed extensive echocardiographic studies in a group of pediatric renal transplant patients.

Methods: Twenty-eight consecutive patients (10±3 years) were investigated and compared to 58 normal controls (12±1 years). Echocardiography was performed using a commercially available machine (Philips Sonos 5500). Echocardiograms were aquired in consecutive patients before and after renal transplantation (age on study date 12±4 years) and were not significant differences in LV diastolic dysfunction rates for the two groups. LV relaxation abnormalities (LVRA) were observed in 36 (38.7%) children and small atrium dimension (p<0.001) and big right atrium dimension (p<0.001). A multiple linear regression model (R2=0.114; p<0.0001) determined that right ventricular end-diastolic volume (p=0.0007) was the only independent predictor of DTE.

**Conclusions:** In young patients after renal transplantation left ventricular mass was significantly increased. Although left ventricular systolic velocities (E and A, cm/sec), E/A ratio and E-wave deceleration time (DTE, msec) were not significant differences in LV diastolic dysfunction rates for the two groups. LVRA were observed in 15 (16.1%) pts and normalisation occurred in 10 pts after 6 months of treatment in 10 (11.1%). Conclusion: LV diastolic dysfunction rate significantly reduced in both groups. In asymptomatic children after the successful surgical repair of aortic coarctation left ventricular diastolic dysfunction is impaired. 2. Left ventricular diastolic dysfunction is caused by the affected active relaxation of myocardium. 3. Children after aneurysm operation had further echocardiographic follow-up examination is recommended despite good result of the surgery.

**Table 1**

<table>
<thead>
<tr>
<th>E (cm/sec)</th>
<th>A (cm/sec)</th>
<th>E/A</th>
<th>EDT (ms)</th>
<th>DT (msec)</th>
<th>IVRT</th>
<th>Ar</th>
<th>A'VTI</th>
<th>ArVTI</th>
<th>Tau (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>80.70±56.58</td>
<td>1.50</td>
<td>11.55</td>
<td>5.25</td>
<td>2.42</td>
<td>176.7</td>
<td>6.47</td>
<td>24.94</td>
<td>2.29</td>
</tr>
<tr>
<td>Group</td>
<td>±10.94±12.28</td>
<td>±0.38</td>
<td>±1.60</td>
<td>±1.52</td>
<td>±0.39</td>
<td>±34.0</td>
<td>±8.23</td>
<td>±16.29</td>
<td>±0.59</td>
</tr>
<tr>
<td>Control</td>
<td>87.20±42.51</td>
<td>1.97</td>
<td>17.13</td>
<td>4.33</td>
<td>3.17</td>
<td>160.5</td>
<td>73.18</td>
<td>25.26</td>
<td>2.39</td>
</tr>
<tr>
<td>Group</td>
<td>±11.05±7.30</td>
<td>±0.49</td>
<td>±1.84</td>
<td>±0.37</td>
<td>±0.46</td>
<td>±11.3</td>
<td>±15.3</td>
<td>±3.42</td>
<td>±1.71</td>
</tr>
<tr>
<td>p</td>
<td>&gt;0.05</td>
<td>&gt;0.01</td>
<td>&gt;0.01</td>
<td>&gt;0.01</td>
<td>&gt;0.01</td>
<td>&gt;0.01</td>
<td>&gt;0.01</td>
<td>&gt;0.01</td>
<td>&gt;0.01</td>
</tr>
</tbody>
</table>

NS - non significant

266 Volumetric assessment of diastolic function in elite athletes

K.H. Byun1; L.Y. Eun1; L.W. Park1; D.K. Cho1; P.K. Min1

1Myongji Hospital, Cardiology Dept., Goyang, Republic of Korea

**Background:** Athlete’s heart is known to adapt to accommodate requirement of increase of cardiac output during exercise. Left ventricle remodelling is preceded to augment ventricular systolic function. The aim of this study was to investigate the possible impact of ventricular remodelling on diastolic function.

**Methods:** Conventional transthoracic echocardiography was performed in 16 elite soccer players and age matched 16 normal volunteers. We measured the volume of left ventricle (LV) and left atrium (LA) by tracing endocardial border of LV and LA at end-diastolic and end-systolic phases using Simpson’s method in both groups. The delta LA volume fraction=(LV volume-LA diastole)/LA systole (LV systole-LA diastole)/LV systole was calculated and compared between athletes and normal volunteer group by student’s t-test. Correlation of delta LA volume fraction with E, A, E/A ratio and DT were also evaluated.

**Results:** LV and LA end-diastolic volumes and dimensions were significantly higher (p<0.001). Although conventional E, A, E/A, DT, and PHT were not significant differences, but delta LA volume fraction was significantly larger in athletes than normal volunteer group (p<0.001).

**Conclusion:** The volumetric measurement can be helpful for diastolic function assessment with conventional spectral Doppler measures. Diastolic function of elite soccer player is certainly better than normal volunteer group in terms of delta LA volume fraction.

**Table 1. Echocardiographic data**

<table>
<thead>
<tr>
<th>Echo measures</th>
<th>Soccer Player</th>
<th>Control</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVEDD (mm)</td>
<td>53.06±6.68</td>
<td>48.81±3.46</td>
<td>0.001</td>
</tr>
<tr>
<td>LVEDV (ml)</td>
<td>151.99±19.38</td>
<td>122.77±26.29</td>
<td>0.000001</td>
</tr>
<tr>
<td>LAV (ml)</td>
<td>24.27±7.61</td>
<td>15.11±3.98</td>
<td>0.000001</td>
</tr>
<tr>
<td>LAV systole</td>
<td>0.60±0.08</td>
<td>0.48±0.12</td>
<td>0.01</td>
</tr>
<tr>
<td>E (cm/sec)</td>
<td>0.69±0.11</td>
<td>0.77±0.15</td>
<td>0.05</td>
</tr>
<tr>
<td>A (cm/sec)</td>
<td>0.38±0.11</td>
<td>0.44±0.08</td>
<td>0.01</td>
</tr>
<tr>
<td>E/A ratio</td>
<td>1.91±0.44</td>
<td>1.77±0.43</td>
<td>0.01</td>
</tr>
<tr>
<td>DT (msec)</td>
<td>192.5±19.78</td>
<td>191.4±13.38</td>
<td>0.01</td>
</tr>
<tr>
<td>PHT (msec)</td>
<td>56.68±5.51</td>
<td>57.57±3.86</td>
<td>0.01</td>
</tr>
</tbody>
</table>

LVEDD: left ventricular end-diastolic dimension; LVEDV: left ventricular end-diastolic volume; LAV: left atrial volume

267 Effect of digitalis on left ventricular diastolic function in patients with chronic heart failure

R. Napetvaridze1 ; T. Emkhvari1

1Tbilisi State Medical University Clinic #1, Cardiology Dept., Tbilisi, Republic of Georgia

The purpose of this study was to evaluate the effect of digitalis on left ventricular (LV) diastolic function in patients (pts) with chronic heart failure (CHF) treated with enalapril and diuretics.

**Methods:** Before and after 6 months of the treatment early and atrial peak velocities (E and A, cm/sec), E/A ratio and E-wave deceleration time (DT, msec) were studied in 93 pts (mean age 59.6±8.7 yrs) with CHF (NYHA II-III, LVEF<40%). 61 pts had previous myocardial infarction and 32 dilated cardiomyopathy. 32 pts were treated with enalapril and furosemide (Group A) and 40 pts with enalapril, furosemide and digoxin (Group B). Mean dose of furosemide, enalapril and digoxin was 44 mg, 17.4 mg and 0.22 mg.

**Results:** LV relaxation abnormalities (LVRA) were observed in 36 (38.7%) and restrictive type of diastolic dysfunction (RDD) in 30 (32.3%) pts.There were non significant changes of diastolic function parameters for the two groups. LV diastolic function rate significantly reduced in both groups after treatment. LVRA were observed in 15 (16.1%) pts and normalisation and pseudonormalisation of LV diastolic filling patterns developed in
abnormal values ZAo >5 mm Hg/ml/m², effort E/Ea >10, increase in SV
ZAo = systolic arterial pressure / (SV/body surface area). We considered
calculated the aortic impedance (Zao) in a non invasive manner as follows:

Patients underwent symptoms limited exercise echocardiography. EF,
disease, and patients with known extracardiac possible causes of dyspnea.
36 quality of life questionnaire) and rest abnormal relaxation on Doppler
22 women) with EF >55%, referred dyspnea during effort (evaluated by LV

Material and methods: Twenty-four patients with ESRD (mean age 69±12
years, 14 males) and 22 healthy age- and sex-matched control subjects were
assessed by conventional Doppler echocardiography and TDI. The scans of
the renal disease patients were performed one hour after a dialysis ses-

Results: The two study groups did not differ concerning LV systolic perfor-

Some patients with normal ejection fraction (EF) develop dys-
ence during pressure. This has been attributed to the possible ap-
pearance of diastolic dysfunction during the effort. Aim of the study is to evalu-
ate whether exercise dyspnea during effort is really caused by diastolic dysfun-
cion or by any other mechanism.

Material and methods: We enrolled 28 patients (age 67±7 years, 6 men,
22 women) with EF >55%, referred dyspnea during effort (evaluated by LV
36 quality of life questionnaire) and rest abnormal relaxation on Doppler
transmitral pattern. We excluded patients with ischaemic or valvular heart
disease, and patients with known extracardiac possible causes of dyspnea.
Patients underwent symptoms limited exercise echocardiography. EF,
transmitral Doppler E wave and tissue Doppler E wave ratio (E/Ea), and
stroke volume (SV) were evaluated at rest and stress peak. Moreover, we
calculated Zao (in a non invasive manner as follows: ZAo = systolic arterial
pressure / (SV/body surface area). We considered abnormal values ZAo >5 mm Hg/ml/m², effort E/Ea >10, increase in SV
<5 ml. Exercise capacity was assessed comparing effective METS with
values predicted by age and sex. Results: Among 28 patients, 14 patients (50%)
reached age and sex predicted exercise capacity, 14 (50%) did not. Among 14 patients with reduced exercise capacity, 4 (29%) interrupted the stress for muscular exhaustion,
Can early diastolic left ventricular blood-to-tissue timing expose evidence of ‘suction’ in the normal young heart?

C. Wallentin Guron1; A.-M. Edvardsson1; M. Mellander1; B. Soderberg1; I. Ostman-Smith1
1Clinical Physiology Dept., Goteborg, Sweden

Background and purpose: The presence of left ventricular (LV) diastolic suction is still a matter of debate. Even though frequently discussed, it has only rarely been elucidated with modern ultrasonic technique. Hypovolemia is thought to reveal evidence of suction (1). The high sampling rate/temporal resolution of both blood pool- and tissue pulsed Doppler enables tissue timing. The aim of this study was to test the hypothesis that a preceding early diastolic LV tissue lengthening to the mitral inflow might indicate LV suction. We sought to investigate this - at rest and during a preload reduction in normal individuals.

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

Results: With a presumed preload reduction (standing up), the LV IVRT increased (from 52±13 to 81±17 ms, p<0.006). The ‘E-e’ interval was slightly positive at rest (7±7 ms), but no change in E-E with a preload reduction became significant for all 12. However, two kinds of reactions might be distinguishable. The onset of LV tissue shortening was further advanced in relation to that of the mitral inflow in 9/12 individuals (from 8±8 to 25±11 ms, p=0.008). The remaining 3, who failed to exhibit this, displayed a greater increase in RV E max (-6.5±2.2 vs -3.0±1.7 cm/s, p<0.012) as well as a slightly increased LV mean e max (5.3±1.9 vs -5.0±1.5 cm/s, p=0.026) at standing up suggesting that a more pronounced preload reduction might have been induced. These 3 did not differ in height (174±4 vs 174±9 cm, p=NS), but had a lower BMI (18.9±1.0 vs 23.6±3, p<0.02) and also reported of a habitual orthostatic tendency.

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

Diastolic stress echocardiography: usefulness of new generation hand held devices in the ergometry laboratory

M. Hirata1; A. Takagi2; K. Shimamoto1; S. Ihara1; H. Watanabe1; K. Mizuochi1; M. Endo1; M. Kawana3
1Institute of Geriatrics, TWMU, Cardiology Dept., Tokyo, Japan; 2Tokyo Women’s Medical University Hospital, Cardiology Dept., Tokyo, Japan; 3TWMU Aoyama Hospital, Cardiology Dept., Tokyo, Japan

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

Patients and Methods: We investigated 69 patients with CTD [poly-myositis/DM/dermatomyositis (DM): 9 patients; systemic sclerosis (SSc): 16 patients, systemic lupus erythematosus (SLE): 14 patients, rheumatoid arthritis (RA): 30 patients] who did not show obvious heart disease, systemic hypertension or ECG signs of left ventricular hypertrophy, comparing to 20 control subjects. E/A ratio and deceleration time (DCT) of transmural 13 flow were recorded. E/Ea ratio was also recorded.

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

Conclusion: Late diastolic dysfunction could be caused by tissue velocity imaging in PM/ DM and SSc, not in SLE and RA.

Table 1. E/Ea in CTD

<table>
<thead>
<tr>
<th>E/Ea</th>
<th>p value (compared to control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>7.8±0.5</td>
</tr>
<tr>
<td>PM/DM</td>
<td>16.3±2.1</td>
</tr>
<tr>
<td>SSc</td>
<td>13.1±2.1</td>
</tr>
<tr>
<td>SLE</td>
<td>8.0±0.6</td>
</tr>
<tr>
<td>RA</td>
<td>8.9±0.5</td>
</tr>
</tbody>
</table>

Early impairment of left and right ventricular diastolic function in systemic sclerosis

M. Czyruszky1; P. Bierias1; M. Gilska-Wielochowska1; B. Lichodziejewska1; K. Kurnicka1; K. Jankowski1; M. Kurzyna1; D. Liszewska-Pfejfer1
1Medical University of Warsaw, Internal Medicine and Cardiology Dept., Warsaw, Poland; 2National Institute of Lung Diseases, Chest Medicine Dept., Warsaw, Poland

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

Methods: We prospectively studied 45 consecutive patients (41F, 4M, mean age 54±15 yrs) with SSc (mean disease duration 9±4 yrs) and the group of 15 age-matched healthy subjects (13F, 2M, mean age 48±10 yrs). In addition to conventional evaluations, transthoracic echocardiography (TTE) for assessment of LV and RV diastolic function and 6-minute walking test (6-MWT) were performed.

Results: LV ejection fraction did not differ between SSc patients and controls (64.1±6 vs 66.2±3%, NS). 23 (51%) SSc patients resulted to have an inverted mitral E/A ratio (Mit E/A <1) indicating an abnormal left ventricular filling. The mean value of Mit E/A in SSc-patients was lower than in controls (0.9±0.3 vs 1.2±0.3, p=0.02). An abnormal right ventricular filling, as expressed by an inverted tricuspid E/A ratio (Tr E/A <1) was detected in 13 SSc patients (29%) and in none of the controls (p=0.001). The mean value of Tr E/A in SSc-group was lower than in controls (1.0±2.1 vs 1.2±0.3, p=0.02).

The mean value of Tei index for the right ventricle was higher in SSc patients than in controls (0.34±0.07 vs 0.29±0.03, p=0.02). In multiple regression analysis Tr E/A ratio resulted to be independently correlated to Mit E/A ratio (r=0.65, p=0.01). The mean 6-MWT distance was shorter in SSc patients (0.34±0.07 vs 0.29±0.03, p=0.02). An abnormal right ventricular filling, as expressed by an inverted tricuspid E/A ratio (Tr E/A <1) was detected in 13 SSc patients (29%) and in none of the controls (p=0.001). The mean value of Tr E/A in SSc-group was lower than in controls (1.0±2.1 vs 1.2±0.3, p=0.02).

The mean value of Tei index for the right ventricle was higher in SSc patients than in controls (0.34±0.07 vs 0.29±0.03, p=0.02). In multiple regression analysis Tr E/A ratio resulted to be independently correlated to Mit E/A ratio (r=0.65, p=0.01). The mean 6-MWT distance was shorter in SSc groups when compared with controls (520±105 vs 617±47 m, p=0.001) and the mean capillary blood saturation after the 6-MWT was lower in SSc patients (91.8±4 vs 96.7±1.7%, p<0.001). Interestingly, Tr E/A ratio and Mit E/A ratio correlated positively with 6-MWT distance (r=0.49, p=0.01 and r=0.48, p=0.02).

Conclusions: Impaired RV and LV diastolic function is observed in a significant percentage of SSc-patients and is independently correlated with exercise capacity. This finding may be useful to early identify SSc patients at higher risk of cardiac impairment and warrant further investigation to assess their prognostic significance.
276
Arterial stiffness and diastolic dysfunction in patients with systemic sclerosis
J. Bozo1; R. Faludi1; G. Kumanovics1; L. Czirjak1; A. Cziraki1; T. Simon1; L. Papp1
1Univ. Pecs, Heart Institute, Faculty of Med., Pecs, Hungary

Objectives: Vascular abnormalities are hallmarks of almost all systemic sclerosis patients. Impaired relaxation of the left ventricle is also characteristic for scleroderma heart disease. The aim of our study was to determine whether parameters of arterial stiffness correlate with echocardiographic indices of left ventricular relaxation impairment.

Material: 21 patients with limited and diffuse scleroderma (18 women, mean age: 55.9 years) were studied.

Methods: Parameters of local and systemic arterial stiffness (pulse wave velocity: PWV; augmentation index: Aix) were determined by automatic brachial pulse wave analysis (Aloka ProSound SSD60). Indices of diastolic function were also determined with the same ultrasound system: in addition to the conventional Doppler parameters of the transmirtal flow - early (E) and late (A) diastolic velocities, deceleration time (DT), isovolumic relaxation time (IVRT) - myocardial early (Ea) and late (Aa) diastolic velocities were measured at the lateral border of the mitral annulus using tissue Doppler Imaging. E/A, Ea/Aa, E/Ea, and E/Aa ratios were calculated. Simple associations between the variables were estimated by Pearson’s method.

Results: Carotid Elp showed significant correlations with both A (r=0.537, p<0.05) and E/A and correlated with IRVT also significantly (r=0.489, p<0.05). Carotid F showed a correlation with A (r=0.479, p<0.05), E/A (r=0.548, p<0.05) and IRVT (r=0.564, p<0.01). Carotid AC correlated with A (r=0.512, p<0.05), E/A (r=0.551, p<0.05) and IRVT ratios (r=-0.436, p<0.05). Carotid PWV and Aix showed similar significant correlations with A, E/A, IRVT and with A and E/A values, respectively. E, F and PWV determined by pulse-wave analysis and brachial artery echo-tracking did not correlate with the echocardiographic parameters of the left ventricular diastolic function. Brachial AC showed a significant correlation with A (r=0.478, p<0.05) and DT (r=0.469, p<0.05). Significant correlation was found between Aix measured by pulse-wave analysis and Aa (r=0.560, p<0.05).

Conclusion: Distensibility of elastic arteries correlates well with the echocardiographic indices of the left ventricular diastolic function, but stiffness of muscular type arteries is less useful to predict the degree of diastolic impairment. Selected parameters of arterial stiffness are good predictors of diastolic dysfunction in scleroderma patients.

277
Tissue Doppler analysis of regional myocardial dysfunction in patients with systemic sclerosis
M. Hrita1; A. Takagi1; K. Shimamoto1; S. Ibara1; H. Watanabe1; K. Mizoguchi1; M. Endou1; M. Kawana3
1Institute of Geriatrics, TWMU, Cardiology Dept., Tokyo, Japan; 2Tokyo Women’s Medical University Hospital, Cardiology Dept., Tokyo, Japan; 3TWMU Aoyama Hospital, Cardiology Dept., Tokyo, Japan

Objectives: Tissue Doppler Imaging (TDI) permits the identification of early diastolic byphasic movements in the left ventricle. Tissue Doppler Imaging (TDI) may be useful in the early detection of regional myocardial dysfunction. The aim of this study is to estimate the early myocardial diastolic parameters by using TDI in patients with systemic sclerosis.

Methods: Twenty patients with SSCs without obvious wall motion abnormalities were compared to 25 age-matched control subjects. E/A ratio and deceleration time (DCT) of transmitral inflow were recorded. Peak systolic strain (A) and diastolic strain at the first 30% of diastolic duration (B) were measured on strain curve at mid-ventricular septum. Strain diastolic index was calculated as (A-B)/A×100 (%).

Results: There was no difference between the two groups in E/A, DCT and peak systolic strain. Impaired strain- and diastolic index in SSCs was significantly lower than those of control (p<0.01) (Table 1).

Conclusion: TDI derived strain diastolic index appeared to be useful in early detection of diastolic dysfunction in patients with SSCs.

Table 1

<table>
<thead>
<tr>
<th>SSc</th>
<th>Control</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCT (msec)</td>
<td>200.7±46.9</td>
<td>196.8±33.3</td>
</tr>
<tr>
<td>E/A</td>
<td>1.0±0.2</td>
<td>1.1±0.2</td>
</tr>
<tr>
<td>Peak systolic strain</td>
<td>-25.9±5.1</td>
<td>-24.9±5.8</td>
</tr>
<tr>
<td>Strain diastolic index (%)</td>
<td>26.6±8.9</td>
<td>46.9±23.5</td>
</tr>
</tbody>
</table>

278
Relation between capillary wedge pressure measured by echocardiography using Tissue Doppler Imaging(TDI) method and catheterism in patients with mitral valve stenosis
A. Fazlinezhad1; FARVEH. Vakilian1; HOMA. Falsoleiman1; M. Dehghani1
1Ghaem University Hospital, Echocardiography Laboratory, Mashhad, Iran (Islamic Republic of); 2Ghaem Hospital, Cardiology Dept., Mashad, Iran (Islamic Republic of)

Background: This study is evaluation of the relation between pulmonary capillary wedge pressure (PCWP) measured by tissue Doppler imaging (TDI) using flow velocity of mitral valve and mitral annulus motion considering suggested formula in the references and PCWP measured by catheterism. Previous studies showed that E/Em have a good correlation with wedge pressure in ischemic Heart Disease but this parameter in Isolated severe mitral stenosis (MS) is partially unknown.

Method and material: 52 cases of severe MS were admitted for Balloon Mitral Valvulotomy (BMV), included in this study. Mean age was 35.5±5.5 years. Mean PAP was 56.8±12.3 and Dmax and Dmin 2.5±1.5, respectively.

Results: There was a significant correlation between PAP in echocardiography and catheterism. E/Em ratio were increased in severe MS cases. Mean PAP was 53.9±7.8 in echocardiography and PAP was 57.3±11.8 in catheterism. There wasn’t any correlation between PWP (PAP) in echocardiography and catheterism (p=0.33) and no relation between PCWP and mitral valve area (MVA) or LA size also (p=0.2).

Conclusion: E/Em ratio and suggested formula would be overestimate the wedge pressure; so echocardiography is not a reliable method to predict PCWP in severe MS but may be an alternative for catheterism in PAP estimation. Em velocity and E/Em ratio may be used in the estimation of MS severity.

Table 1. Demographic and echo data

<table>
<thead>
<tr>
<th>Age</th>
<th>MVA</th>
<th>E</th>
<th>LA</th>
<th>E/EM</th>
<th>PA.</th>
<th>PCWP</th>
<th>ECHO</th>
<th>CATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>36.9</td>
<td>90.2</td>
<td>13.6</td>
<td>6.42</td>
<td>56.7</td>
<td>53.9</td>
<td>53.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Std</td>
<td>10.3</td>
<td>1.8</td>
<td>1.3</td>
<td>1.2</td>
<td>2.8</td>
<td>53.9</td>
<td>53.9</td>
<td>4.4</td>
</tr>
</tbody>
</table>

279
Usefulness of tissue doppler imaging in the detection of residual constriction post-pericardiectomy
P. Mahia1; JF. Rodriguez1; R. Aguilar1; M.T. Gonzalez-Alujas1; S. Cordova1; M. Teixido1; M. Alvarez1; A. Evangelista1
1Hospital Universitari Vall d’Hebron, Cardiology Dept., Barcelona, Spain

Residual constriction after pericardiectomy is not well known and the diagnosis may be limited using classical echocardiographic parameters. Tissue Doppler Imaging (TDI) permits the identification of early diastolic byphasic movement accompanied by “recoil” waves in the septum in this situation (Figure). Aim: To ascertain whether the use of this new parameter by TDI can improve echocardiographic diagnostic performance for detecting residual constriction. Methods: 19 patients after pericardiectomy (55.9±3.8 years) followed at our center were studied. Median of follow-up: 8.7 years (1.2-18.3 years). Owing to persistence of systemic venous congestion, 7 patients (37%) required diuretic treatment. Classic signs of constriction and presence of “recoil” by TDI were assessed by echocardiography. In 14 patients the presence and extension of residual pericardial calcification was evaluated by CT. Sensitivity, specificity, and area under the ROC curve were related to clinical systemic venous congestion. Results: Table. Conclusion: Clinical residual systemic venous congestion is not infrequent. The presence of inferior vena cava dilatation and tissue doppler abnormal recoil waves in the septum are the variables more useful to define this suboptimal result post-pericardiectomy.
Eur J Echocardiography Abstracts Supplement, December 2006

MYOCARDIAL VELOCITY IMAGING (DMI) – FUNCTION

280
Mitral annular motion as a surrogate for left ventricular function: Correlation with brain natriuretic peptide levels
M.F. Elnoamany 1 ; A. Kilany 2

Background: Pulsed-wave (PW) Doppler tissue velocities of the mitral annulus correlate well with Left Ventricular (LV) diastolic (D) and systolic (S) functions. Brain natriuretic peptide (BNP) levels have been shown to be elevated in patients with symptomatic LV dysfunction (Dys) and correlate to the severity of symptoms and prognosis.

Objectives: To validate the accuracy of mitral annular motion (MAM) assessed by Doppler Tissue Imaging (DTI)& mode Echocardiography (MME) as a surrogate for determination of LV function in comparison with BNP.

Methods: A series of 133 patients with a variety of cardiac pathologies referred for echocardiography and 20 healthy age&sex matched volunteers as a control group were included in the study. Ejection fraction (EF) of LV, Doppler recordings of the mitral inflow, MME and PWDTI data (from each of 4 mitral annular sites, inferior, anterior, septum and lateral) were obtained. Mean peak (S) MAM velocity (Sm), mean annular early (D) velocity (Em) by PWDTI and mean mitral annular plane (S) excursion (MAPSE) by MME were calculated by averaging at each annular site. BNP levels were measured by a rapid immunoassay and blinded to cardiologist making the assessment of LV function.

Results: MAPSE<12 mm determined by MME has 90% sensitivity, 88% specificity & 89% accuracy for detection of LV Dys either (S,D or both). BNP levels were significantly higher in patients with combined (S&D) Dys. than those with only (S) Dys. The later group had significantly higher BNP levels than those with only (D) Dys. (1054.5±202.3 pg/ml vs. 500±39.9 pg/ml & 500±39.9 pg/ml vs. 215.3± p=0.004), Ea (r=-0.51, p<0.001), mitral E deceleration time (r=-0.36, p=0.02), pulmonary artery systolic pressure (r=0.48, p=0.001 ), LV end-diastolic diameter (r=0.50, p=0.001). In multiple regression model (r2=0.66), (E/Ea=Sa) was the most important predictor of NTproBNP level.

Conclusion: These data confirm that E/Ea is a powerful predictor of NTproBNP level in patients with E/Ea between 8 and 15 and can be a simple echocardiographic index for estimation of LV function. Further studies are needed to investigate the relationship between E/Ea (Sa) and LV filling pressures.

MYOCARDIAL VELOCITY IMAGING (DMI) – OTHER

281
The correlation between the Tissue Doppler velocities of mitral annulus and NTproBNP levels in patients with E/Ea between 8 and 15
C. Mornos 1 ; J.P. Baguet 1 ; I. Ionac 1 ; D. Cozza 1 ; A. Dragulescu 1 ; S.T. Dragulescu 1

Background: Peak early diastolic transmural velocity (using pulsed Doppler)/peak early mitral annular diastolic velocity (using pulsed tissue Doppler imaging - TDl) TDI ratio (E/Ea) and N-terminal pro brain natriuretic peptide (NTproBNP) have been correlated with left ventricular (LV) filling pressures. E/Ea between 8 and 15 is an obscure zone for the estimation of LV filling pressures.

Purpose: To assess the relationship between a new echocardiographic parameter, (E/Ea=Sa), where Sa is the peak systolic velocity at TDI of mitral annulus, and NTproBNP level in patients with E/Ea between 8 and 15.

Methods: Sixty-nine consecutive patients (age 61±13 years) with LV dysfunction in sinus rhythm, referred for echocardiography, were simultaneously analyzed with NTproBNP. Patients with paced rhythm, mitral stenosis, mitral prosthesis, severe mitral annular calcification, acute myocardial infarction, coronary artery by-pass within 72 hours or renal clearance <40 ml/min were excluded. Echocardiography was blinded to NTproBNP levels. E/Ea and E/Ea (Sa) were assessed by conventional echocardiography and TDI of lateral and septal mitral annulus. The average of the velocities from the septal and lateral site of the mitral annulus was used.

Results: Simple regression analysis demonstrated a statistically significant linear correlation between E/Ea (Sa) and NTproBNP (r=0.84, p<0.0001), superior to E/Ea correlation (r=0.70, p<0.0001). For patients (pts) with E/Ea <8 and >15 (30 pts) the two ratios were well correlated to NTproBNP (r=0.87, p<0.001 for E/Ea (Sa) vs. E/Ea; r=0.79, p<0.001 for E/Ea). In subjects with E/Ea=8-15 (39 pts) significant correlations were found between NTproBNP level and E/Ea (Sa) (r=0.77, p<0.0001), E/Ea (r=0.42, p=0.007), LV ejection fraction (r=0.61, p<0.0001), Sa (r=-0.63, p<0.0001), left atrial area (r=0.53, p=0.004), Ea (r=-0.51, p<0.001), mitral E deceleration time (r=0.36, p=0.02), pulmonary artery systolic pressure (r=0.48, p=0.001), LV end-diastolic diameter (r=0.50, p=0.001). In multiple regression model (r=0.66), (E/Ea=Sa) was the most important predictor of NTproBNP level.

Conclusion: These data confirm that E/Ea is a powerful predictor of NTproBNP level in patients with E/Ea between 8 and 15 and can be a simple echocardiographic index for estimation of LV function. Further studies are needed to investigate the relationship between E/Ea (Sa) and LV filling pressures.

HEART FAILURE – RESYNCHRONISATION

282
Echocardiographic determinants of BNP levels at rest and at exercise in patients with systolic heart failure
P. Lancellotti 1 ; M. Lempereur 1 ; B. Cosynos 1 ; D. Karsera 1 ; G. Tumminello 1 ; L.A. Pierard 1

Background: Plasma brain natriuretic peptide (BNP) is an emerging diagnostic and prognostic biomarker in heart failure (HF). In these patients, dynamic mitral regurgitation (MR) contributes to exercise intolerance and conveys a poor prognosis. Whether exercise-induced increases in MR severity might be a trigger of BNP release has never been investigated. This study sought to examine the effect of exercise on levels of BNP and to assess the determinants of exercise-induced changes in plasma BNP in patients with systolic HF.

Methods: Forty-six consecutive patients with systolic left ventricular (LV) dysfunction and functional MR underwent quantitative analysis of BNP, MR, systolic and diastolic (early diastolic transmitral (E) and annular (EA) velocities), LV function and LV dyssynchrony at rest and during exercise. None of them had inducible ischemia on perfusion imaging.

Results: With stepwise multiple regression analysis, the LV end-systolic volume (p=0.0001), the E/Ea ratio (p=0.007) and the severity of MR (p=0.019) emerged as independent determinants of BNP. During test, BNP increased in 39 patients. The maximal increment occurred at peak exercise in 30 patients. In multivariate analysis, a larger increase in systolic dyssynchrony index (p=0.013) and in effective regurgitant orifice (p=0.037) during exercise and higher end-diastolic volume at peak test (p=0.048) emerged as independent determinants of exercise-induced changes in BNP.

Conclusions: MR severity, volume overload and LV filling pressure are surrogate of BNP under resting conditions. During exercise, changes in BNP reflect the presence of dynamic changes in both MR severity and LV dyssynchrony in the absence of inducible ischemia.

LV FUNCTION – OTHER

283
Impact of N Terminal pro B Natriuretic Peptide (NT pro BNP) testing on echocardiography referrals for left ventricular systolic function assessment from the community.
M. Al Barjas 1 ; D. Nair 1 ; R. Morris 1 ; J. Davar 1

1Royal Free Hospital, Cardiology Dept., London, United Kingdom; 2UCL, London, United Kingdom

Objective: To assess the value of NT pro BNP levels as a diagnostic tool for impaired left ventricular systolic function in patients referred from the community to One Stop Heart Failure Clinics based on the number needed to screen (NNS). The study was designed to determine if NT pro BNP testing could increase the clinical probability prior to echocardiography.

Study design and method: Patients referred by their GP with new onset symptoms and signs of LV impairment were assessed in a pilot One Stop Heart Failure Clinic within 2 weeks of referral. All patients underwent a full cardiological assessment including echocardiography, ECG and measurement of NT pro BNP. Ejection fraction (EF) of 50% was used as a cut off value for impaired left ventricular function on echocardiography. Receiver Operator Characteristic (ROC) curve was used to determine the most sensitive and specific NT pro
286
The role of Tissue Doppler echocardiography in the evaluation of NT-proBNP level in patients with heart failure
C. Mancino 1 ; A. Iacuba 1 ; D. Cossa 2 ; D. Dragulescu 2 ; D. Rusinaru 2 ; S.T.I. Dragulescu 1
'Institute Of Cardiovascular Medicine, Cardiology Dept., Timisoara, Romania

Background: It has been shown that N-terminal pro brain natriuretic peptide (NT-proBNP) correlate to left ventricular (LV) filling pressures. Peak early diastolic transmural velocity (E, using pulsed Doppler) peak early mitral annular diastolic velocity (Ea, using tissue Doppler imaging) TDI ratio (E/Ea) reflects LV filling pressures in a variety of cardiac disease states, but this is not relevant in all patients.

Aim: To assess the relationship between a new echocardiographic parameters, E/(Ea×Sa), where Sa is the maximal systolic velocity during ejection in TDI of mitral annulus, and NT-proBNP level in patients with heart failure. Methods. Sixty-one consecutive patients (age 62±13 years) with heart failure, in standard care protocol, were enrolled. Echocardiography parameters were analyzed simultaneously with NT-proBNP. Patients with paced rhythm, mitral stenosis, mitral prosthesis, severe mitral annular calcification, acute myocardial infarction, coronary artery by-pass within 72 hours or renal clearance <40 ml/min were excluded. Echocardiography was blinded to NT-proBNP levels. E/Ea and E/(Ea×Sa) were assessed by conventional echocardiography and TDI of lateral and septal mitral annuli. The average of the velocities from the septal and lateral site of the mitral annulus was used. Results: Simple regression analysis demonstrated a statistically significant linear correlation between E/(Ea×Sa) and NT-proBNP (r=0.85, p<0.0001), superior to E/Ea correlation (r=0.70, p<0.0001). Significant correlations were also observed with NT-proBNP level and Sa (r=-0.58, p<0.0001), Ea (r=-0.46, p=0.002), pulmonary arterial systolic pressure (r=-0.62, p<0.0001), left atrial area (r=0.46, p=0.001), LV ejection fraction (r=-0.45, p<0.001), LV end-diastolic diameter (r=0.48, p=0.001) and mitral E deceleration time (r=-0.28, p=0.04) to predict a NT-proBNP level >1200 pg/ml was 1.5 (sensitivity=84%, specificity=94%) with 92% accuracy.

Conclusion: E/(Ea×Sa) strongly correlates with plasma NT-proBNP level and can be a simple, reproducible and accurate echocardiographic index in patients with heart failure in sinus rhythm.

285
Echocardiographic correlates of plasma BNP in patients with chronic heart failure
M. Pasto 1 ; S. Ghio 1 ; R. Latini 2 ; S. Barlera 2 ; R. Meloni 2 ; E. Tellaroli 3 ; S. Masson 2 ; E. Tellaroli 3 ; S. Maffi 2 ; P. Kala 1 ; P. Strazzer 1
1Brno, Czech Republic; 2Faculty Hospital, Internal medicine-hematology Dept., Brno, Czech Republic; 3Istituto Mario Negri, Milano, Italy

Background: B-type natriuretic peptide (BNP) is a well-established diagnostic marker in patients with chronic heart failure (CHF). In addition, BNP is independently related to prognosis: outcome has been reported to be progressively worse starting from BNP concentrations lower than the validated diagnostic threshold of 100 pg/ml even though much higher levels are commonly observed in patients with advanced CHF. Aim of the present study was to verify if the clinical and echocardiographic correlates of BNP plasma levels in patients with CHF.

Methods: We evaluated 242 patients with symptomatic CHF enrolled in the CHORDS study. The mean age was 64±10 years. 86% were males. Echocardiographic recordings were submitted to a core laboratory to ensure consistency of quantitative analysis. BNP was centrally assayed (IRMA, Silesia). The optimal cut-off to predict a NT-proBNP level >1200 pg/ml was 1.5 (sensitivity=84%, specificity=94%) with 92% accuracy.

Results: NT-proBNP and ECG were applied together. NT pro BNP and maximum sensitivity and specificity (96% & 77%) for EF of 50% or more was found to be 125 pg/ml or less for all adult age groups males and females. The prevalence of LV in our cohort of patients referred from the community was 21%. This means that NNS applied to 100 patient model without NT pro BNP testing is 4.7 and with NT pro BNP testing 1/0.52=1.92. NNS was reduced further to 1.7 when NT pro BNP and ECG were applied together.

Conclusion: As NT pro BNP has very good sensitivity and NPV for impaired LV systolic function, its use in the community reduces the number of patients needed to have echocardiography for assessment of LV systolic function significantly and more importantly assists primary care physicians with better organization of clinical follow-up prior to referral. This has great impact on waiting time and overall cost.
Results: In pts with intrapulmonary shunt, CI (2.6±1.0 l/min/m² vs 2.2±
0.7 l/min/m², p<0.05) and NT-proBNP levels (141.6±118.3 ng/ml vs
63.7±54.5 ng/ml, p=0.001) were significantly higher in pts without shunt.
Also Child score was significantly higher in shunt positive pts (8.57±2.63 vs
6.29±1.3, p<0.05). However, neither morphologic nor systolic function par-
ameters differed between the two studied groups.

Conclusions: In patients with hepatic cirrhosis presence of intrapulmonary
shunt was associated with elevated plasma NT-proBNP level. This may be due to
hyperdynamic cardiac function as reflected by increased cardiac output.  

288 Automated Function Imaging (AFI): A new onboard and clinically
applicable method of LV global function assessment by speckle
tracking  
S. Brette 1; S. Lafitte 1; P. Reant 1; M. Lafitte 1; P. Dos Santos 1; H. Hurger
Goldsmith 2; R. Roudaut 1
1Univerte Bordeaux II, Hospital Cardiologique Haut-Leveque Echocardio,
Bordeaux-Pessac, France; 2General Electric Medical System, Paris, France

Background: Echocardiographic quantification of left ventricular (LV) func-
tion is still limited by a significant lack of accuracy and reproducibility. Speckle
tracking technique is based on a pure 2D grayscale ultrasound acquisition
allowing calculation of segmental strains. In order to become clinically rel-
vant, the speckle tracking technique has been implemented onboard for a
quick and automated evaluation of LV function called AFI.  
Objective: To evaluate feasibility, calculation time, accuracy and reproduc-
ability of AFI in determining LV function in comparison to reference echo
and angiographic methods.

Methods: 40 patients scheduled for an X-ray angiography were previously
screened the same day using a Vivid 7 system. Image quality, global
parameters of LV function (fractionation, aortic flow, +dP/dt) and seg-
mental contraction were conventionally measured. Global longitudinal strain
parameter (GS) was obtained by 2 observers from the apical 2, 3 and 4
chamber views after placing 3 landmarks in each view. GS was then com-
pared to EF from both echo and angiography, but also to other hemody-
amic echo parameters.

Results: GS was obtained successfully in 90% of patients. Mean calculation
time including correction of the endocardial detection was less than 60 sec-
onds. GS was significantly lower in patients with EF below 50% (18±3% vs
9±5%, p<0.01). A strong correlation was observed between EF and GS (Table 1)
with good reproducibility.

Conclusion: Global strain onboard obtained by AFI is clinically applicable
and of high relevance in echocardiography as demonstrated by its short
acquisition time, its feasibility and its high level of accuracy.

Table 1  

<table>
<thead>
<tr>
<th>Regression</th>
<th>Correlation</th>
<th>P</th>
<th>Feasibility</th>
<th>Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Strain</td>
<td>y = 0.26 ± 0.03</td>
<td>0.88</td>
<td>0.001</td>
<td>100%</td>
</tr>
<tr>
<td>Angio EF</td>
<td>y = 0.28 ± 0.02</td>
<td>0.85</td>
<td>&gt;0.05</td>
<td>100%</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>y = 0.27 ± 0.02</td>
<td>0.97</td>
<td>&gt;0.05</td>
<td>95%</td>
</tr>
<tr>
<td>Aortic flow</td>
<td>y = 0.27 ± 0.02</td>
<td>0.95</td>
<td>&gt;0.05</td>
<td>95%</td>
</tr>
<tr>
<td>+dP/dt</td>
<td>y = 0.0001 ± 0.06</td>
<td>0.63</td>
<td>&gt;0.05</td>
<td>50%</td>
</tr>
</tbody>
</table>

289 Assessment of left ventricular torsion by Speckle Tracking
Echocardiography  
P. Devech 1; G. Sarasso 1; C. Piccicino 1; G. Marti 1; V. Bolzani 1; P. Marino 1
1Az. Ospedaliera Maggiore Di Caserta, Divisione Cliniciata Di Cardiologia, Novara, Italy

Purpose: Left ventricular torsion has an important role in both left ventricular
systole and diastole. During systole the left ventricle presents an opposite
rotation between apex and base: as viewed from the apex it is counterclock-
wise at the apex and clockwise at the basal level. This opposite rotation
causes the torsion of the left ventricle that has been evaluated in previous
studies by cinefluoroscopy or tagged magnetic resonance. Aim of our study
was to assess left ventricular torsion in a group of normal patients using the
speckle tracking echocardiography. The speckle formations in a gray scale
echocardiography can be used as myocardial tissue markers that can be
tracked during the cardiac cycle. The markers allow to assess myocardial
strain or rotation.

Methods: We studied 17 patients (9 males; mean age 36±18 years)
with normal ejection fraction (60±5%) and without significant valvular disease.
We acquired 2D standard short axis images of the left ventricle at the
base (just distal the mitral annulus) and at the apex (as distal as possible).
Time to peak of left and right ventricles were elaborated on a
computerized software that calculated in a semiautomatic manner basal and
apical rotation (expressed in degrees, negative if clockwise and positive if
counterclockwise), and the time to peak from electrocardiographic R wave
(expressed in msec). We estimated the torsion as the difference between
counterclockwise and clockwise rotation. All the values mean plus standard deviation.

Results: At the basal level we obtained a small early systolic counterclockwise
rotation (2.8±2.4°; time to peak 80±36 msec) followed by a wider late sys-
tolic clockwise rotation (14.2±5.6°; 338±58 msec). At the apical level we ob-
tained a small early systolic clockwise rotation (1.1±0.9°; 32±21 msec) fol-
lowed by a late systolic counterclockwise rotation (10.9±4.4°; 301±73 msec).
We calculated a small early systolic counterclockwise torsion (-2.3±1.8°; time
to peak 50±27 msec) and a bigger late systolic counterclockwise torsion
(18±5.7°; 316±53 msec). Our data are comparable with those calculated by
tagged magnetic resonance in previous studies. Moreover, the speckle
tracking echocardiography allows to assess the minimal clockwise apical
early systolic rotation that as easily be revealed by tagged magnetic reso-
nance, given its lower frame rate.

Conclusions: Echocardiography with speckle tracking imaging allows to
evaluate opposite rotation of basal and apical levels and the consequent
torsion of the left ventricle.

290 Speckle tracking is a reliable new method for quantitative evaluation
of left ventricular function  
K. Korkmaz 1; P. Jacobsen 1; R. Winter 1; C. Westholm 1; J. Nowak 1; L.A. Brodin 1
1Karolinska University Hospital, Clinical Physiology and Cardiology Dept.,
Stockholm, Sweden

Background: The recommended method for evaluation of left ventricular
ejection fraction (LVEF) using modified Simpson’s rule is user-dependent
and time consuming. Speckle tracking echocardiography (STE) is a method
based on an algorithm for the detection of myocardial motion allowing quan-
titative analysis of global longitudinal strain (GLS) and determination of end-
systolic (ESV) as well as of end-diastolic volume (EDV) and LVEF. In this
study, we compared the reproducibility of STE based LVEF, EDV, ESV
and GLS measurements performed by an inexperienced interpreter to the
results obtained by an experienced echocardiographer using measurements
with modified Simpson’s rule as a reference.

Material and methods: In 28 patients (17 men and 11 women), digital loops
from apical 4-, 2- and 3-chamber views were recorded for subsequent offline
analysis on GE Echocap workstation. Both the experienced and the inexpe-
rienced echocardiography interpreter were blinded to all clinically relevant
information and performed their readings independently of each other two
times at two different occasions.

Results: There was a numerically small (by 8.2%) but statistically significant
(p<0.001) underestimation of LVEF by the inexperienced interpreter. On the
other hand, there was a good linear correlation between the Simpson’s rule-
based ESV and EDV determinations of the experienced echocardiographer
and STE based results of the inexperienced interpreter (r=0.759 and 0.566,
respectively) without any significant differences between the obtained re-
sults. Similarly, there was a good correlation between the first and second
LVEF, EDV and ESV determination of the experienced echocardiographer
(r=0.948, 0.978, and 0.946, respectively) without any significant difference
between the first and the second readings being observed. The same was
valid for the inexperienced reader even if the respective correlation re-
cipients for the STE based results were slightly lower (r=0.795, 0.931, and
0.875 for LVEF, ESV, and EDV, respectively; r=0.868 for GLS).

Conclusions: Speckle tracking appears to be a reliable, user-friendly and
powerful tool for the quantitative analysis of the left ventricular function.
Furthermore, it can be used as a valuable tool for the training of the novice
echocardiographers in the daily clinical practice.

291 Real-time, quantitative assessment of left ventricular ejection fraction
and regional wall motion by speckle imaging  
M. Leitman 1; P. Lysyansky 1; Z. Vered 2
1Assal Harofeh Medical Center, Heart Institute, Cardiology Dept., Zerifin,
Israel; 2The Technion Institute of Science, Haifa, Israel; 3Assaf Harofeh
Medical Center, Heart Institute, Zerifin, Israel

Background: Echocardiographic assessment of left ventricular function (LV
fraction includes calculation of ejection fraction (EF) and regional wall mo-
tion analysis. Recently Speckle Imaging (SI) has been introduced for quan-
tification of LV function.

Objective: Assessment of LV EF by Speckle Imaging and comparison with
Simpson’s method; Assessment of regional LV strain obtained by Speckle
Imaging in relation to conventional echo score. Methods. 30 consecutive
patients, 28 with regional LV dysfunction underwent standard echocardi-
ographic evaluation. LV end-diastolic (EDV), LV end-systolic volumes (ESV)
and LVEF were calculated independently by Speckle Imaging and Simpson’s
rule. Regional peak systolic strain presented by Speckle Imaging as bull’s
eye map was compared with conventional visual estimate of echo score.

Results: Average EDV obtained by Speckle Imaging and by Simpson’s method
were 85.1±92.7 ml (p=0.38), average ESV was 49.4±48.8 ml (p=0.94),
calculated EDV was 43.9±50.5% (p=0.08). Correlation rate with Simpson’s rule
was high: for EDV 0.92, for ESV 0.96, for EF 0.89. Peak systolic strain in 2 patients
without wall motion abnormality was 17.3±4.7, in normal segments of patients
with regional dysfunction peak systolic strain (13.4±4.8)

Eur J Echocardiography Abstracts Supplement, December 2006
was significantly higher than in hypokinetic segments (10.5±4.5) (p<0.00001). Strain in hypokinetic segments was significantly higher than in akinetic segments 6.2±3.6 (p=0.00001).

**Conclusion:** Speckle Imaging can be successfully used for the assessment of LV volumes and EF. Bull’s eye strain map, created by Speckle Imaging can successfully accomplish accurate real-time segmental wall motion analysis.

**Material and methods:** 9 consecutive patients with NSTEMI were included in this pilot study. The ultrasound examination was done within the first 24 hours after onset of symptoms and prior to coronary angiography. Colour coded tissue velocity images were registered with GE Vivid 7 and transferred as raw data for digital editing in Matlab 7.0.1. A „Velocity tracking“ tomogram was created using a step-by-step colour coding of longitudinal velocity of the left ventricle presented as a Bull’s eye plot that gives a good three dimensional understanding of regional longitudinal velocity. The images were then compared to the results of the coronary angiography.

**Results:** All the patients showed impaired, either regional or global longitudinal velocity in the tomogram. In seven of the patients this had an excellent anatomical correlation to the „culprit lesion“ from coronary angiography. Two of the patients showed impairment of longitudinal function, where determination of the culprit lesion were somewhat unclear.

**Conclusion:** Velocity tracking is a promising technique for easy 3 dimensional visual assessment of left ventricular longitudinal velocity with great potential for detection of regional dysfunction and myocardial ischemia. However, the method needs further validation in larger clinical patient populations.

### 293

**Apex-to-base temporal dispersion of circumferential strain in the human left ventricle; a 2D-strain echocardiography study**

C. Mellberg1; U. Gustafsson1; P. Lindqvist1; S. Morner1

1Heart Center, University Hospital, Umeå, Sweden

**Background:** Recent advances in echocardiography, such as strain and strain rate imaging, are believed to be more sensitive when evaluating regional cardiac function, compared with traditional 2D and M-mode echocardiography. The present study was undertaken to evaluate the normal strain patterns and apex-to-base dispersion in regional timings of the left ventricle in healthy individuals.

**Methods:** Thirty-nine healthy individuals were examined by echocardiography. Short axis images of basal, midventricular and apical segments of the left ventricle were recorded, and analysed offline by speckle tracking (Echopen, GE). Circumferential strain, including peak strain and time to peak strain was measured.

**Results:** Circumferential strain shows three distinctively different patterns at the basal, midventricular and apical levels of the LV (figure). Peak strain is higher and occurs earlier in the apex than the base (413±28 ms vs 463±43 ms and 29±7% vs 32±5%, p<0.001 for both). Peak strain occurred after aortic valve closure (AVC) at all three levels. Strain in the basal and midventricular part of the LV showed greater dispersion, whereas the apex showed more homogenous strain profiles.

**Conclusion:** The study suggests that mechanical activation of the LV starts at the apex and propagates towards the base. The apical part of the LV consists mainly of longitudinal myocardial fibers, whereas the midventricular and basal parts are composed by both longitudinal and circumferential fibers. This might partly explain the homogenous strain profiles seen in the apex, compared to the more complex strain patterns seen in the other portions of the LV. Knowledge about the normal temporal sequence and strain profiles of the LV are of importance when evaluating patients with cardiac diseases.

### 294

**Longitudinal, but not circumferential, myocardial strain assessed by 2D ultrasound speckle tracking imaging is a preload dependent index of myocardial function**

L. Badano1; E. Tosoratti1; M. Baldassi1; D. Pavoni1; P. Gianfragnia1; G. Nuclotia1; P.M. Fioretti1; A.O. S Maria della Misericordia, Chief Echo Lab., Cardiopulmonary Sciences Dept., Udine, Italy

It has been reported that conventional measurements of LV systolic function as well as the myocardial performance index obtained with Tissue Doppler analysis are strongly preload dependent. Two-Dimensional Ultrasound Speckle Tracking Imaging (2DSTI) is a novel, angle-independent technique which allows measurements of global longitudinal and global circumferential strain (S) and strain rate (SR) for left ventricular (LV) myocardial function quantification. Nevertheless not so much is known about the relationship between these novel indices of myocardial function and LV preload. Accordingly, we assessed the effect of acute preload reduction by haemodialysis on new 2DSTI indices of LV function. We acquired standard longitudinal apical, and parasternal (basal, mid-papillary level and apical) short-axis views of the LV (Vivid 7 Dimension, GE Healthcare, Horten, N) in 15 patients (9 males, mean age 59±19 years, range 32-81 years) on maintenance hospital haemodialysis (HD) (mean duration 4 h 28 min, range 4-5 h, 3 times a week) approx. 60 min prior to, and 30 min after a routine haemodialysis session to evaluate global longitudinal and global circumferential S of the LV. For STI analysis we acquired second harmonic 2D images with a frame rate between 60 and 80 fps (average 61±2 fps), HD resulted in a mean reduction in patient weight of 2.2±0.5 kg (p<0.0001). Consistent with preload reduction was the decrease in the peak early transmural flow velocity (from 0.83±0.19 to 0.61±0.18; p=0.002). Post-HD, systolic blood pressure was higher (from 138±27 to 155±28 mm Hg; p=0.012), while 3D echo LV end-diastolic (from 89±23 mm to 77±22 mm; p<0.0001) and end-systolic (from 29±11 mm to 27±12 mm; p<0.0001) volumes were smaller than pre-HD. LV ejection fraction (from 68±6% to 67±8%; p=0.41) did not change after HD. Pre- and post-HD myocardial strain values are shown in the table.

### Table 1

<table>
<thead>
<tr>
<th>STRAIN</th>
<th>Pre-HD (%)</th>
<th>Post-HD (%)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal (4CH view)</td>
<td>-17±3</td>
<td>-15±4</td>
<td>0.001</td>
</tr>
<tr>
<td>Longitudinal (2CH view)</td>
<td>-16±3</td>
<td>-15±3</td>
<td>0.004</td>
</tr>
<tr>
<td>Circumferential (at basal level)</td>
<td>-14±3</td>
<td>-13±4</td>
<td>0.225</td>
</tr>
<tr>
<td>Circumferential (at mid ventricle)</td>
<td>-15±3</td>
<td>-15±5</td>
<td>0.22</td>
</tr>
</tbody>
</table>

**Background:** Left ventricular (LV) torsion plays an important role on systolic and diastolic LV function. 2D Speckle tracking echocardiography (STE) at parasternal short axis view, has been recently accepted as a new method to assess LV rotation. Using the EchoPac 2D strain software, GE, we have analysed the relationship between LV torsion (obtained as the net difference between apical rotation - counterclockwise - and basal rotation - clockwise-) and other LV function parameters. This method is independent on the angle, therefore is specially useful.

**Methods:** Basal and apical rotation were measured by STE. The rotation magnitude was calculated as the angular rotation average of the 9 segments. Basal and apical circumferential strain (CS) were also assessed.

Eur J Echocardiography Abstracts Supplement, December 2006
Results: 54 studies were performed, 39 with normal LV function (ejection fraction, EF=50, group I) and 15 with LV dysfunction (EF=50, group II; 4 mild, 4 moderate and 9 severe). The lineal effect found a significantly relationship between LV ejection fraction and LV torsion (R=0.433; p=0.001).

Conclusion: LV torsion represents a new approach to quantify the LV function as a non-invasive way. LV torsion is able to differentiate between normal and dysfunctional LV, if we compare their values with others already established LV function parameters.

Table 1

<table>
<thead>
<tr>
<th>FE</th>
<th>LV-tor</th>
<th>LV-rot</th>
<th>LV-rot</th>
<th>CS</th>
<th>CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>apical</td>
<td>basal</td>
<td>apical</td>
<td>basal</td>
<td>p</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>60.6±7.9</td>
<td>14.4±2.8</td>
<td>7.4±5.7</td>
<td>5.4</td>
<td>2.8</td>
</tr>
<tr>
<td>II</td>
<td>37.7±8.1</td>
<td>14.4±3.2</td>
<td>3.4±8.7</td>
<td>7.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

298 Left Ventricular Rotation In Dilated Cardiomyopathy Patients As Evaluated By 2D-Strain Echocardiography

A. Patrianakos 1; F.I. Parthenakis 1; E. Fouarakis 2; J. Karalis 1; G. Lyrarakis 1; P. Kafarakis 1; E. Nykti 1; P.E. Vardas 2

1Heraklion, Greece; 2Heraklion University Hospital, Cardiology Dept., Crete, Greece

Background and aim: Cardiac motion can be described by three components: rotation, translation and displacement. 2D-Strain is a novel method which to measure strain from 2D echocardiographic images and rotation, rotation rate and translation rate simultaneously. We examine in this study the Cardiac rotation, rotation rate and the diastolic untwisting rate in patients suffering by dilated cardiomyopathy.

Methods: We examined 34 angiographically proven non-ischemic dilated cardiomyopathy (NIDC) patients, aged 52.6±13.9 years, LVEF 35.3±5.8% and in 14 healthy volunteers.

Results: Reduced LV rotation and rotation rate were found in the NIDC patients compared to healthy volunteers. Linear regression analysis revealed that the LV rotation and rotation rate were correlated with the LV diastolic function.

Conclusions: The Cardiac rotation, rotation rate and the diastolic untwisting rate are new potential parameters to be used in the assessment of dilated cardiomyopathy.

299 Echocardiographic analysis with 2D strain of the Tako-tsubo syndrome: another way to the ischemic etiology

M. Acena 1; C. Fernandez Palomeque 2; L. Vidal 3; J. Torres 1; H. Conde 1; H. Martinez 2; A. Rodriguez 2; J.F. Forcheza 3

1Hospital Universitari Son Dureta - IUNICS, Cardiology Dept., Palma De Mallorca, Spain

Tako-Tsubo syndrome or transient apical dysfunction is a still unknown etiology entity, which is characterized by ST elevation, reversible apical dysfunction and normal coronary angiography.

Objective: To analyze by two dimensional strain echocardiography technology the evolution of myoccardial contraction pattern in patients with Tako-Tsubo syndrome.

Material and method: We reported 9 cases of Tako-Tsubo syndrome (9 women, aged 60±7.1 years). In each case we performed a transthoracic echocardiography with 2D strain at the onset of symptoms, after 2 weeks and 3 months later.

Results: We observed 5 patterns of strain: 1 (normal): systolic contraction with normal amplitude (>15), 2 (hypocinesia): systolic contraction with a reduction of the amplitude (<15), 3 (postsystolic contraction): no systolic contraction with postsystolic shortening, 4 (acynesis): lack of contraction (<5%); 5 (dyscynesia): positive strain (elongation) during systole. Patterns were completely normal after 3 months.

LV FUNCTION – OTHER

Eur J Echocardiography Abstracts Supplement, December 2006
Conclusions: The most frequent strain pattern at the clinical onset of Tako-Tsubo syndrome was that of severe ischemia or stunning, which suggest the ischemic theory. However, the second pattern most frequent at the apex was that of transmural necrosis, but in this case reversible; because of that we think this model may be controversial as a marker of no viability. This contradictory findings keep the enigma of Tako-Tsubo on.

Table 1. 2D strain patterns in Takotsubo patients

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Apical 1</th>
<th>Mid 1</th>
<th>Apical 2</th>
<th>Mid 2</th>
<th>Apical 3</th>
<th>Mid 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>22.2</td>
<td>55</td>
<td>75</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>16.6</td>
<td>16.6</td>
<td>5</td>
<td>15</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>38.9</td>
<td>44.4</td>
<td>67.5</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>24.1</td>
<td>5.5</td>
<td>2.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>12.9</td>
<td>7.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Frequency (expressed as percent) of strain patterns observed in apical and mid ventricular segments at onset (1), two weeks (2) and three months (3)

300
The assessment of left ventricular wall radial and circumferential deformation in biatrial and bicaval heart transplanted patients
A 2D strain ultrasonic imaging study

C.F. Sirbu 1; S. Shebani 1; J. Dhooge 1; P. Claus 1; M.F. Mattei 1; J.P. Villemot 1; F. Rademakers 1
1University Hospital Nancy-Brabois, Cardiac Surgery and Transplantation Dept., Vandoeuvre Les Nancy, France; 2KU Leuven, Cardiac Imaging Research Dept., Leuven, Belgium

Background: This study was set out to investigate the clinical potential of 2D strain ultrasonography in quantifying myocardial left ventricular (LV) systolic deformation in heart transplanted (HTX) patients with biatrial (BA) and bicaval (BC) anastomosis.

Material and methods: 30 HTX patients: 15 BA HTX (group A), 15 BC HTX (group B) with similar heart age (40.33±11 vs 40.6±15 years) and 15 controls age matched (group C) underwent a standard transthoracic echocardiography (TTE) followed by a 2D strain (2DS) imaging study (in mid parasternal short axis view) (GE Vivid 7). From the TTE the LV ejection fraction (EF) was evaluated. The 2DS data were analysed using a speckle tracking application (Echopac). The peak strain (s) for the radial deformation of each segment and the peak strain (s) for the circumferential deformation of each segment and global circumferential were measured.

Results: Table 1. Conclusion: For a similar LV systolic performance the contribution of radial and circumferential deformation is different in BA and BC HTX vs controls.