Other myocardial diseases

Thursday 6 December 2012, 08:30–12:30
Location: Poster Area

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Assessment of subclinical left ventricular dysfunction in patients with chronic mitral regurgitation using torsional parameters described by tissue Doppler imaging

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Left ventricular (LV) twist is due to oppositely directed apical and basal rotation and has been proposed as a sensitive marker of the LV function. We sought to assess the impact of chronic pure mitral regurgitation (MR) on the torsional mechanics of the left human ventricle using tissue Doppler imaging. Nineteen severe MR patients with normal LV ejection fraction and 16 age-matched healthy controls underwent conventional echocardiography and apical and basal short-axis color Doppler myocardial imaging (CDMI) for the assessment of LV torsional parameters. LV rotation at the apical and basal short-axis levels was calculated from the averaged tangential velocities of the LV circumference corrected for the LV radius over time. LV twist was defined as the difference in LV rotation between the two levels, and the LV twist and twisting/septal and lateral regions, corrected for the LV radius over time. LV twist was significantly reduced in the MR patients when compared with the controls (10.38 ± 4.04° vs. 13.95 ± 4.27° p = 0.002). LV torsion was significantly depressed in the MR group (1.29 ± 0.54°/cm vs. 1.76 ± 0.56°/cm; p = 0.021), both suggesting incipient LV dysfunction in the MR group. Similarly, the untwisting rate was depressed in the MR group (79.74 ± 34.6°/s vs. -110.96 ± 34.6°/s; p = 0.002), but there was no other significant change in the LV twist rate (p = NS). When the time of the untwisting rate was normalized by systolic duration, MR was characterized by a significant delay in the time-to-peak untwist rate (159.60 ± 51.37% vs. 131.86 ± 15.82%; p = 0.002). When the peak untwisting rate was normalized by the LV length, there was a significant decline in the peak untwisting rate (–9.58 ± 4.49%/cm vs. –14.02 ± 4.92%/cm; p = 0.021) but not in the peak twist rate normalized by the LV length (p = NS). The peak untwisting rate, normalized by LV torsion, was preserved in the MR patients in comparison with the reference group (p = NS). Significant changes in the LV torsional parameters and delay in the onset of ventricular untwisting in the MR patients with a normal LV ejection fraction likely result from higher wall stress.

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Is intrinsic myocardial contractility preserved in heart failure patients? an echocardiographic study

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Purpose: Literature gives contradictory information on whether intrinsic myocardial contractility is preserved in heart failure (HF) patients. We recently proposed a novel echocardiographic approach to estimate LV contractility non-invasively by the slope of segmental passive stretch (preS) and systolic strain (SS) relationship. We aimed to apply it in HF patients to address this unresolved question.

Methods: 12 patients with non-ischemic systolic HF (49 ± 14 y, NYHA I–III) and 11 controls (CO 53 ± 3y) underwent an echocardiographic examination with narrow sector tissue Doppler imaging (TDI) of the interseptal wall (IS). 3 samples manually distributed from base to apex of IS were tracked throughout the cardiac cycle with custom software by setting the reference point at the onset of P wave on ECG. As such, regional preS was measured as peak positive strain after P wave and SS as subsequent systolic shortening. For each subject linear regression between stretch and strain was performed. Mean relations were then determined as an average slope and intercept over all subjects at each stage. LV end diastolic volume (LVEDV) was measured from apical triplane LV acquisition, LV end systolic wall stress was calculated as WS = (p*V)/2h, (p - systolic blood pressure, r - LV radius, h - LV wall thickness).

Results: HF patients had significantly lower SS (-15.5 ± 4.1% vs. -19.7 ± 3.8%), higher LVEDV (107 ± 14 ml vs. 66 ± 51 ml) and WS (338 ± 116 mmHg vs 226 ± 31 mmHg), but similar preS (5.2 ± 2.8% vs 5.9 ± 1.7%). Slope of PreS – SS relation was similar in HF and CO groups (p = NS) and intercept was higher in CO (fig).

Conclusion: Similar slopes of regional preS – SS relation in CO and HF patients suggest preserved intrinsic myocardial contractility in HF at rest. Lower intercept values in HF likely result from higher wall stress.
 offline after adequate image acquisition. However there is a lack of standardization of the acquired data among different manufacturers.

**Methods:** Thirty-seven volunteers, mean age 54.2 ± 16.7 years, 22 normal, in sinus rhythm, mean LVEF 53.6 ± 12.1% underwent a complete echocardiographic study in two different echo-machines (Phillips i33 and Vivid 9 GE) by the same operator. All images were digitally stored and analysed offline with Qlab-9 and Echopac version 110.1.3 software, respectively.

From the apical 3-, 4- and 2-chamber views, longitudinal strain was obtained as follows: The 3-ch view was used for defining the aortic valve surface frame as a reference for the subsequent analysis. The endocardial surface of the myocardial segment was then manually traced in all three views, producing an automated region of interest (ROI) of the myocardial endocardial and epicardial borders by the software. Manual readjustment of endocardial tracing and ROI were performed in both methods in order to achieve optimal alignment if necessary. Both global and segmental longitudinal peak systolic strain values were calculated in a 17-segment model.

**Results:** A total of 629 myocardial segments analyzed in each workstation and a strong relationship was found for the apical segments (apical septum -20.76 ± 7.9 vs -22 ± 8.3% r=0.706, p < 0.001, apical anterior -18.3 ± 8.4 vs -14.7 ± 6.8% r=0.70, p < 0.001, apical inferior -19.1 ± 8.9 vs -20.7 ± 8.4% r=0.75, p < 0.001, apical lateral -18.05 ± 7.1 vs -15.7 ± 6.5% r=0.763, p < 0.001 and apex -19 ± 7.7 vs -17.6 ± 6.2% r=0.849, p < 0.001 for GE and Philips respectively). However no significant correlation was found for the basal inferior, basal inferolateral and basal anterior segments between the 2 software.

**Conclusions:** While a strong relationship between the apical myocardial segments values, for longitudinal peak systolic strain, obtained in Philips and GE echo stations was found, such a relationship was not proved for the basal segments. Evaluation of the basal segments systolic strain must be made cautiously.

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**Evaluation of right ventricular function by 3D echocardiography and cardiac MRI in COPD patients with and without pulmonary hypertension**

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**Background:** Two-dimensional evaluation of right ventricular (RV) function is difficult due to the complex anatomy of the RV. Hence, the present study aimed to assess RV function by three-dimensional echocardiography (3DE) in patients with chronic obstructive pulmonary disease (COPD).

**Methods:** One hundred COPD patients, 63 ± 7 years, were prospectively recruited for right heart catheterization (RHC). Mean pulmonary artery pressure (mPAP), peak mPWP, right ventricular geometric and functional parameters were measured in all patients. RV volumes were measured using 4D RV function (4TomTec, Imaging systems, D). RV ejection fraction (RVEF) by 3D echo was significantly lower in COPD-PH, 46 ± 8 vs 59 ± 9% in COPD-PH (p < 0.0001 for both), respectively. No significant differences were observed for RV end-diastolic volume (RVEDV), end-systolic volume (RVESV) and RV mass. RV myocardial performance index was higher in group 1 (0.58 ± 0.12 vs 0.53 ± 0.11 s-1, p=0.0001) of the LV were significantly lower in COPD-PH. 3DE and MRI derived EF. RV end-diastolic volume in COPD-PH and COPD-non-PH was significantly lower by 3D echo, 74 ± 15 and 88 ± 14 ml/m2 (p < 0.01 for both), respectively. There were no significant differences between RV systolic function in patients with systemic inflammatory diseases like TAK and SLE.

**Results:** Results: Physiological and echo data are reported in Table. RV parameters were significantly different between genders. With aging, RV end-diastolic (EDV) and end-systolic (ESV) volumes decreased significantly (r = -0.33 and r = -0.20, respectively, p < 0.0001) whereas ejection fraction increased (r = 0.28, p < 0.0001). At multivariable regression analysis (including age, height, weight, systolic and diastolic blood pressure, and heart rate), age, weight and heart rate were selected as independent determinants of EDV and ESV in males (R² = 0.23 and R² = 0.27, respectively). Weight, height, and height, but not age, were selected as determinants of RV volumes in females (R² = 0.20, R² = 0.15, respectively).

**Conclusions:** There are significant differences in RV geometry and function between males and females that are not entirely explained by body size. Age is a determinant of RV volumes only in males.
<0.01). Also the tricuspid annulus systolic velocities obtained at the basal RV free wall were significantly decreased in group 1 (9.8 ± 1.4 cm/s vs. 14.1 ± 1.6 cm/s; p<0.01) suggesting RV systolic dysfunction. In addition tricuspid annulus early diastolic velocities were significantly reduced in group 1 (7.1 ± 1.5 cm/s vs. 10.5 ± 1.6 cm/s; p<0.01) with lower ratio of early to late diastolic velocities reflecting diastolic dysfunction. In addi- tion, we observed higher pulmonary arterial pressures in group 1.

Conclusion: Patients with heart failure with preserved LV ejection fraction and diastolic dysfunction may develop postcapillary pulmonary hypertension leading to RV dysfunction.

P383 Prognostic value of right ventricular function assessed by echocardiography in patients with acute myocardial infarction V. Andova, LGI, General hospital, Vratsa, SG, Robinska-Kostovska University Clinic of Cardiology, Skopje, Macedonia, The Former Yugoslav Republic of Background: There is uncertainty regarding the risk of major complications in patients with AMI complicated by RV dysfunction involvement. The aim of this study was to assess the prognosis in pts with echocardiographic signs of acute RVMI and echo-cardiographic RV dysfunction early after ST-elevation myocardial infarction (STEMI).

Methods: A total of 122 pts with STEMI were included. Echocardiographic signs of acute RVMI and RV dysfunction were assessed using standard echocardiographic criteria. RVMI was defined as a systolic anterior wall thickness > 2 mm in total and/or ST elevation in D3 being more than depression in lead V2. M-mode and 2D echocardiograms were obtained in all 122 patients at their admission in hospital and RV global and/or regional function parameters were obtained according to the ASE and EAE recommendations. Incidence of in-hospital adverse events as well as echocardiographic parameters of RV function as its predictors were determined.

Results: Out of 122 patients with AMI adverse events occurred in 19 pts (32.8%) with echocardiographic signs of acute RVMI in 9 (14.1%) pts without it (p=0.012). In pts with RVMI atroventricular block was the most frequent adverse event (20.7%), followed by atrial and ventricular arrhythmias and shock, but none death. Statistically significant differences between patients with and without RVMI were shown only regarding occurrence of atrioventricular block (p=0.002) and frequency of state of shock (p=0.022). In pts with RVMI stepwise logistic regression analysis showed that greater right atrial area (OR=1.3, 95%CI: 1.069-1.563, p=0.008), greater myocardial performance index (MPI) (OR= 271.5, 95%CI: 1.193-61826.276, p=0.043), and/or greater right atrial area (OR=1.3, 95%CI: 1.069-1.563, p=0.008) appeared as significant independent factors of adverse events occurrence.

Conclusion: Patients with AMI who also have RV myocardial involvement are at increased risk of arrhythmias and shock. Our results support the view that early recognition of RVMI, namely by means of ECG and assessment of echocardiographic RV dysfunction presence could predict in-hospital adverse events occurrence and/or will permit improvement of outcome with applying contemporary treatment.

P384 Effect of food intake on left ventricular wall stress and midwall mechanics Y. Gardinger, JH, Joanna Hebowicz; OB, Ola Bjorjell; MD, Magnus Dencker Lund University, Malmo University Hospital, Department of Clinical Sciences, Malmo, Sweden Purpose: Left ventricular wall stress and midwall mechanics have been used for prognostic investigations in a variety of populations, but the effect of food intake has not been investigated. We assessed if left ventricular wall stress and midwall mechanics are affected by food intake.

Methods: Twenty-three healthy subjects aged 25.6 ± 4.5 years were investigated. Meridional end-systolic wall stress (ESS) and circumferential end-systolic wall stress (cESS) were measured before, and 30 and 110 minutes after a standardised meal.

Results: Both ESS and cESS decreased significantly (p<0.05) from fasting values 30 min after the meal. The values for ESS and cESS were not back to baseline after 110 min. The mean fasting value of ESS was 65 ± 16 kdynes/cm². The intake of food significantly decreased the postprandial ESS at 30 min (44 ± 12 kdynes/cm²) and ESS at 110 min (58 ± 13 kdynes/cm²). The mean fasting value of cESS was 86 ± 24 kdynes/ cm². The intake of food significantly decreased the postprandial cESS at 30 min (87 ± 16 kdynes/cm²) and cESS at 110 min (87 ± 19 kdynes/cm²).

Conclusions: This study shows that left ventricular wall stress and midwall mechanics are affected by food intake. The results of this study show that food intake should be standardised prior to evaluation of cardiac function as postprandial effects may affect the results.

ASSESSMENT OF DIASTOLIC FUNCTION

P385 Posterior wall deceleration slope obtained by m-mode is a surrogate index of mitral annulus early diastolic velocity obtained by tissue doppler imaging M.T. Liao; C-T. Tsai; J-L. Lin Division of Cardiology, Department of Internal Medicine, National Taiwan University Hospital, Taipei, Taiwan Background: The ratio of early transmitral flow velocity to mitral annulus early diastolic velocity (E/Em) is a widely used noninvasive tool to evaluate left ventricular diastolic function. But tissue doppler imaging (TDI) is not available everywhere, especially in underdeveloped countries. Therefore, it is important to look for another index that could be easily obtained. The aim of this study was to evaluate the relationship between a novel echocardiographic index, the ratio of early transmitral flow velocity to posterior wall deceleration slope (E/PWd) and E/Em, and to see whether E/PWd could substitute for E/Em.

Methods: Transthoracic echocardiography was performed in 35 patients without structural heart diseases, 20 patients with systolic dysfunction and 20 patients with valvular heart diseases. E/Em was determined by conventional M-mode method near the mitral annulus at the parasternal long-axis view.

Results: We found very high correlations between E/PWd and E/Em (r = 0.700, p = 0.001) and E/Em (medial) (r = 0.686, p = 0.001). There were also significant correlations between PWd and E/Em (r = 0.496, p = 0.001) and Ea (medial) (r = 0.445, p = 0.001). We also found significant correlations between the E/PWd and E/Em (average) in patients with normal heart function (r = 0.445, p = 0.007), systolic dysfunction (r = 0.656, p = 0.002) and especially valvular heart diseases (r = 0.848, p < 0.001).

Conclusions: The E/PWd slope had a very good correlation with the E/Em in patients with normal systolic function, systolic heart failure or valvular heart diseases. It indicates that E/PWd could replace E/Em, particularly in the settings when TDI is not readily available.

P386 Impact of weight loss on left ventricular reverse remodeling adipocytokines and in morbidly obese patients after bariatric surgery K. Piestrzeniewicz1; K. Luczaki1; M. Maciejewski2; J. Komorowski3; J. Jankiewicz-Wluka4; J. Drozd5.

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Purpose: To evaluate the impact of weight loss on adipocytokines and reverse cardiac remodeling in morbid obesity after vertical banded gastroplasty.

Methods: 29 patients (22 women, 16 men; aged, mean 44±9.9; body mass index (BMI) > 40) were studied before and 1 year after vertical banded gastroplasty. Exclu- sion criteria: atrial fibrillation, significant cardiovascular, endocrine or renal disease. Clinical, echocardiographic data and blood levels of leptin and adiponectin were analyzed.

Results: The comparison between the baseline and follow-up showed that BMI (45.6 ± 7.4 vs 32.8 ± 6.5 kg/m²), waist circumference (130.7 ± 16.5 vs 103.7 ± 17.0 cm), systolic and diastolic blood pressure (145 ± 17 vs 122 ± 11 and 88 ± 12 vs 75 ± 6 mmHg, respectively), blood leptin (131.0 ± 39.3 vs 68.5 ± 34.9 ng/ml), left ven- tricular walls thickness: interventricular septal thickness at end-diastole (10.9 ± 1.2 vs 9.5 ± 1.0mm) and posterior wall thickness at end-diastole (10.1 ± 1.0 vs 9.1 ± 0.8mm), left ventricular (LV) mass index (LVMI) (62.0 ± 12.1 vs 49.1 ± 9.8 g/ m²²), A ventricular velocity (71.7 ± 11.6 vs 63.4 ± 10.1 cm/sec) and E/Em ratio (7.06 ± 1.10 vs 6.10 ± 0.98) were significantly lower whereas blood adiponectin (10.9 ± 5.6 vs 21.1 ± 7.1 µg/ml), E' (11.5 ± 4.4 vs 13.5 ± 1.47 cm/s) and E/A ratio velocity (7.15 ± 0.28 vs 13.2 ± 0.3), were significantly higher at follow up. There was a significant relation between EMI and Δ adipocytoc (r = 0.55, p<0.01), ΔLVMI (r = 0.65, p<0.0001), Δ E' (r = 0.57, p<0.0001) and ΔE/Em (r = 0.37, p<0.05). Δ adipocytoc correlated only with ΔLVMI (r = 0.48, p<0.01), but not with parameters of LV systolic and diastolic function. There was no relation between Δ leptin and any echocardiographic parameter.

Conclusions: In patients with morbid obesity long-term weight loss after vertical banded gastroplasty improves LV reverse remodeling. Increase in adiponectin level is related to the reduction of LVMI.
The aim of this study is to evaluate the effect of significant DD on short term in-hospital post-CABG outcome.

Patients and Methods: In this retrospective study, 372 patients who underwent isolated CABG in Prince Sultan Heart Center at Riyadh (Jan 2009 - Feb 2010) were reviewed. The study included 168 patients who had non-significant LV systolic dysfunction, ejection fraction (> 35%). Using all Echocardiographic parameters for assessing LV diastolic function including; LA volume, transmitral blood flow, pulmonary venous flow and tissue Doppler, these patients were divided in two groups, Group I including; 112 patients without significant DD (normal or only impaired relaxation) and Group II including; 76 patients with significant DD.

Results: Both groups were comparable regarding age, gender, NYHA functional class, preoperative cardiac risk factors and other comorbidities.

Intra-operative data were similar in both groups. Bypass time was 130.7 ± 43.2 min in group I and 122.0 ± 42.9 min in group II (p = 0.179). Cross clamp time was 98.24 ± 37.3 min in group I compared to 89.02 ± 34.7 min in group II (p = 0.213).

Patients in group II showed higher incidence of low cardiac output syndrome (LOS) post-operatively (37% vs 22% p = 0.003), more use of inotropic support postoperatively (47% vs 29% p = 0.007), and higher incidence of post-operative atrial fibrillation (14% vs 5% p = 0.04).

There was no statistically significant difference between both groups regarding cardiac death, ICU and total in-hospital stay.

Conclusion: Significant LV diastolic dysfunction does not affect the cardiac mortality or total in-hospital stay after CABG. However, it can predict higher incidence of post-operative complications as LOS and AF.

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Left ventricular geometry and diastolic function in patients with resistant hypertension and presence of metabolic syndrome RESIST POL study

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Purpose: The study was aimed to evaluate the impact of metabolic syndrome (MS) on left ventricular (LV) geometry and diastolic function in patients with resistant hypertension.

Methods: Out of 204 patients with resistant hypertension in RESISTPOL study, 155 patients (93M, 62F, mean age 47.0 ± 10.5yrs, range 19–65yrs) without secondary hypertension were analyzed. LV mass, relative wall thickness (RWT), LV geometry, A, E, E/A, e′ and E/e′ were measured. In all patients ambulatory blood pressure monitoring (ABPM) was performed and mean 24h BP values were evaluated. Metabolic syndrome was defined by the Adult Treatment Panel (ATP) III.

Results: Patients were divided into 2 groups: with MS (n=101), without MS (n=56). Compared with patients without MS, patients with MS had significantly higher RWT (0.49 ± 0.07 vs. 0.45 ± 0.06; p<0.0001) and LV mass (283.2 ± 74.2 g vs. 222.0 ± 65.7g; p= 0.001). Concentric geometry was most frequent type of LV geometry (67.3%) in group with MS. In patients with MS - E/A (1.1 ± 0.4vs. 1.3 ± 0.4;p=0.022) and e′ (8.6 ± 2.6cm/s vs.11.4 ± 3.3cm/s;p=0.005) were significantly lower, whereas (E 76.8 ± 19.9cm/s vs. 69.1 ± 16.6cm/s;p=0.013) and E′ (11.4 ± 8.3 vs. 13.6 ± 0.009) were significantly higher than in patients without MS. In a multivariate model including: age, gender, presence of metabolic syndrome, LV systolic and diastolic BP values and known duration of hypertension LV mass correlated significantly with MS (beta= 0.178, p=0.012), systolic 24h BP values (beta= 0.240, p=0.001) and gender. Multiple variable analyses showed that gender, diastolic blood pressure, presence of MS were independent predictors of e′ after adjustment for LVMi.

Conclusions: Resistant hypertension and presence of metabolic syndrome are associated with higher prevalence of LV concentric geometry and LV diastolic dysfunction independently of LV mass.

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Effect of reduced sympathetic hyperactivity on cardiac hypertrophy and diastolic function of left ventricle in kidney transplant patients

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Background: The hyperactivity of sympathetic nervous system caused by chronic kidney disease (CKD) severely changes cardiac function, impairment of LV parameters and cardiac hypertrophy. A kidney transplantation does not ameliorate sympathetic nerve-activity over-This could be achieved by bilateral nephrectomy.

Purpose: The aim of the study was to evaluate the effect of bilateral nephrectomy on renal hypertensive outcome on cardiac hypertrophy and diastolic function of left ventricle in long term follow-up.

Methods and results: A total of 19 patients age 48.9 who had undergone native nephrectomy were studied. The control group consist of 17 patient age 50.5 kidney recipients with preserved native kidneys. The mean time after transplantation was 4.7 years, in all patient was performed echocardiography examination. The systolic and diastolic diameters of the left ventricle did not differ between groups but the diastolic diameter of the interventricular septum and posterior wall were significantly lower in study group than in control group (p<0.01) 1.38±0.2 vs. 1.47±0.2 cm and 1.03±0.15 vs. 1.16±0.12 cm respectively. RWTv was significantly different (p<0.01) between two groups – in study group was 0.42 and in control group was 0.48 The systolic function was normal in all the patients. The E/A ratio and DT was
similar between groups. The E/e' ratio did not significantly differ between groups but multivariable logistic regression analysis revealed that the E/e' ratio above 8 was related to the lack of nephrectomy of native kidneys during renal transplantation (OR 18.6 CI: 1.1-413.2) p<0.005. Classification and regression tree analysis revealed that nephrectomy is related to lower than 8 the E/e' ratio.

Conclusions: Reduction of sympathetic hyperactivity by nephrectomy connected with less cardiac hypertrophy, less impairment of diastolic function of left ventricle and may protect patients from cardiovascular morbidity.

P392 Role of serum NTproBNP level in assessment of subclinical left ventricular diastolic dysfunction
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Background: Subclinical diastolic dysfunction is a prognostic factor of cardiovascular mortality and hospitalisation due to heart failure.

Aim: Assessment of left ventricular diastolic function in persons free of complaints with preserved ejection fraction (EF) and elevated serum (se) NTproBNP level (above 220 pg/ml).

Methods: 895 person above age 18 and living in the same hungarian town was took part in a cardiovascular primary prevention screening test. During examination se NTproBNP was measured with immunochemical method. Left ventricular (LV) function was assessed with 2D echocardiography, Doppler and tissue Doppler technique. LV mass index (LVMi) and left atrial volume normalized on body surface (LAVi) was calculated. Persons were divided into three group on the basis of E/A, DT, E', E/e'; persons with normal (N), mildly abnormal (R) and pseudonormal (P) diastolic function. The group of (P) was divided into two part: P1 with 8 ≤ E/e' ≤ 11 and P2 with 11 < E/e' ≤ 15.

Results: Elevation se NTproBNP was found in 15% of screened persons. Normal diastolic function was assessed in 40%, mildly abnormal was 21% and pseudonormal was 39% of cases with elevated se NTproBNP.

Se NTproBNP was in group N: 273 + 39% of cases with elevated se NTproBNP. Systolic function was assessed in 40%, mildly abnormal was 21% and pseudonormal was 100% in group P2 (Fisher's exact test p=0.002).

Conclusion: Decreased left ventricular longitudinal contraction and increased LVMi was observed in persons with elevated se NTproBNP (above 220 pg/ml) and preserved EF but free of complaints. Se NTproBNP above 400 pg/ml marks diastolic dysfunction with high probability level and both with normal mitral inflow pattern indicates moderate diastolic dysfunction. Elevated se NTproBNP level indicates subclinical LV remodelling characterised by systolic and diastolic dysfunction and elevation of LVMi.

P393 Usefulness of Pulmonary arterial systolic pressure in the evaluation of left ventricular filling pressures with atrial fibrillation
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Echocardiographic assessment including E/e' is a good predictor of elevated left ventricular filling pressure. In the setting of AF, the evaluation of LV filling pressure using classical echocardiographic assessment such as using E/e' has been challenging. Clinical data, echocardiography and BNP levels were obtained in 33 persistent atrial fibrillation patients undergoing diagnostic left-heart catheterization. Left ventricular end diastolic filling pressure (VEDP) and standard echocardiographic measurements including pulmonary arterial systolic pressure (PASP) were measured. Blood samples were taken for serum BNP measurements with 24 hours of echocardiographic examination. E/e' correlated well with LVEDP (r=0.598, P<0.001). Using receiver operating characteristic analysis, the optimal cut-off for E/e' was 17.8 (Sensitivity, 80%; specificity, 75%) in order to predict >20 mmHg LVEDP. The pulmonary artery systolic pressure also correlated with LVEDP (r=0.482, P<0.01). The PASP of >43.5 could predict elevated LVEDP (>20 mmHg) with a sensitivity of 80% and a specificity of 70%. The E/e' and PASP well correlated with LVEDP in persistent AF patients. PASP more than 43.5mmHg may suggest elevated LVEDP (>20 mmHg) in patients with persistent AF.

P394 Left atrial remodeling and effects on diastolic function after transcatheter aortic valve implantation
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Purpose: Diastolic dysfunction is responsible of early symptoms of heart failure in elderly patients. The severe aortic stenosis is variable in degree of transcatheter aortic valve implantation (TAVI). Previous studies have shown a reduction in interventricular septal thickness after TAVI but information about left atrial (LA) remodeling and left ventricular (LV) diastolic function after this procedure is very scarce. Our aim was to evaluate the echocardiographic parameters of diastolic LV function and LA remodeling in patients, with severe aortic stenosis and preserved systolic ejection fraction, undergoing TAVI.

Methods: From January/2011 to December/2011 we included 18 consecutive patients (mean age 80±5 years, 39%male) diagnosed of severe aortic stenosis with preserved systolic ejection fraction, undergoing TAVI, in which echocardiographic parameters of diastolic function (E/A ratio and E/e' ratio, considering e' as the average of systolic velocities at septal and lateral mitral annulus estimated by tissue Doppler imaging, septal thickness and LA size (LA area adjusted for body surface area) were obtained at baseline and after 1 month of follow up after TAVI. All the echocardiographic studies were performed with an Artida Ultrasound System (Toshiba Medica System, Japan).

Results: At 1 month of follow up, there were no significant changes in left ventricular ejection fraction (67 ± 15.5 vs 64 ± 11%, p=0.39). However, we observed a significant reduction in LA area adjusted for body surface area (13.21 ± 12.51 cm²/m²) as well as a reduction in E/e' ratio (30.76 vs 12.61, p= 0.008) and in septal thickness (13.54 mm vs 12.65 mm, p=0.04).

Conclusion: In this preliminary study we have found, at a very short time of follow up, a significant septal thickness reduction, a favorable left atrial remodeling and a significant improvement in LV diastolic function.

P395 Impaired left atrial mechanical function is linked to post-operative atrial fibrillation in patients undergoing CABG
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Background: Post-operative atrial fibrillation (POAF) in coronary artery bypass surgery (CABG) patients increases morbidity as well as mortality. Although common, occurrence of POAF is difficult to predict. For example, the value of traditional echocardiographic indices such as LA volume is poor. In this study, we hypothesize that impairment of LA mechanical function would be a much stronger predictor of POAF. Methods: Thirty-four patients undergoing coronary artery bypass surgery were prospectively enrolled and underwent preoperative echocardiography. LA mechanical function was quantified using only 2D, Doppler and tissue Doppler measurements; this index, which we call the left atrial ejection force (LAEF) is calculated as 1/3 x maximum cross-sectional area x blood density x (peak velocity of a wave)². We normalise this index for LA afterload by calculating the LAEF: (E/e') ratio. The ability of clinical, traditional echocardiographic indices and afterload-adjusted LAEF to predict POAF was determined in a multi-variable regression model.

Results: Twelve patients (35%) were present with POAF after CABG surgery. There was no significant different on baseline medical conditions for patients with POAF than those without. In patients with POAF, mean afterload-adjusted LAEF was significantly lower (0.69 ± 0.37 vs 1.10 ± 0.47 kdynes, p<0.001), but conventional maximal and minimal LA volume indexes were comparable (max LAV index: 27 ± 10 vs 29 ± 11 mm²/m², min LAV index: 21 ± 11 vs 19 ± 8 mm²/m², both p>0.05) than those without. On multivariate analysis, afterload-adjusted LAEF was found to be the predictor of POAF (Odds ratio [OR]: 0.82 (0.67-1.01), p=0.02) after adjusting age, gender and other echo parameters.

Conclusion: Impaired LA mechanical function (denoted by depressed afterload-adjusted LAEF) is a strong predictor of POAF in patients undergoing CABG. This conclusion should be validated in a larger study and tested across different clinical scenarios.

P396 The risk of cardiac diastolic dysfunction in patients with type 2 diabetes may be assessed by the relation of myocardial diastolic velocity and age
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Purpose: Quantification of diastolic dysfunction is essential given the alarming prevalence of heart failure diagnosis. Myocardial myocardial velocity E as measured by tissue
Doppler implies age as most important determinant. We tested the hypothesis that physiologic aging determines E’ to an extent, that enables differentiation to subclinical dysfunction by the respective regression equation in order to assess the risk for dysfunction in patients with type 2 diabetes (T2D).

**Methods:** Demographic, cardiovascular (CV), metabolic and tissue Doppler data were assessed in the 409 consecutive patients (Diabetes Center, Klinikum Bogenhausen Munich) of this prospective cross-sectional study if: age between 20 and 90 years, in sinusrhythm, without cardiac disease and either without (controls C, n=205) or with type 2 diabetes (D, n=204).

**Results:** In C, mean age was 53 (range 20 to 86 years), 58% female and mean E’ 10.7 (5-20 cm/s). E’ had an inverse linear correlation with age: E’ = 0.15 * years + 19 (p<0.0001) without gender specific differences. According to this 1% reduction by annual physiologic aging, an age specific cut off value for normal diastolic function was calculated as E’ age > 0.15 * years + 18 and dysfunction assigned to an individual if E’ < E’ age.

Compared to C, D patients (55 women) had more CV risk factors, mean age was 56 (range 31 to 86 years) and mean E’ (8.1 cm/s, range 4.5 to 14.9 cm/s) was lower (p<0.0001). Diastolic dysfunction was observed in 73% of D patients vs 34% in C. C individuals may be taken as representative for these age groups but not as normals considering their prevalence of BMI >25 kg/m² in 40% and LV wall thickness >12mm in 13%.

**Conclusions:** Diastolic myocardial function measured as E’ by tissue Doppler has a linear relation to age implying a 1% reduction by annual physiologic aging. This relation allows to ascribe diastolic dysfunction in a strictly quantifiable way which offers great potential for (preventive) therapeutic studies.

**ISCHEMIC HEART DISEASE**

**P397**

Apical deformation parameters at the early post-myocardial infarction period can predict left ventricular remodeling

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**Background:** Post myocardial left ventricular (LV) remodeling is related to increased morbidity and mortality. The aim of the present study was to examine whether LV deformational and torsional parameters can predict LV remodeling in patients with acute myocardial infarction (MI).

**Methods:** Forty one patients (age 57 ±14 yrs) presented with an acute anterior STEMI treated with primary PTCA were included. Four days post MI, LV ejection fraction (EF), LV torsion, longitudinal (4-, 3- & 2-chamber) and circumferential strain (CS) of the LV apex were evaluated by conventional and speckle tracking echocardiography. Echocardiographic study was repeated 3 months post-MI and patients with LV remodeling [increase in LV end-systolic volume (LVESV) >15%] were indentified.

**Results:** The 11 patients with LV remodeling had significantly more impaired apical CS (7.2 ±2.2% vs. -18.9 ±5.2%, p=0.001), EF (42 ±7% vs. 48.9 ±5%, p=0.005), LV apical rotation (5.9 ±4.8 vs. 11.1 ±4.0, p=0.027) and LV global longitudinal strain (-10.1 ±1.7% vs. -12.1 ±2.9%, p=0.03) in comparison to those without LV remodeling, at 4th day post MI. Apical CS at 4th day post MI showed the strongest correlation with the LVESV 3 mo post-MI (r=0.75, p=0.001, Figure 1) in relation to EF (r=0.6, p=0.001), global longitudinal strain (r=0.52, p=0.001) and LV apical rotation (r=0.54, p=0.000). Furthermore, apical CS demonstrated the highest diagnostic accuracy (area under the receiver operating characteristic (ROC) curve 0.98) and good sensitivity and specificity of 100% and 96%, respectively, to predict LV remodeling, using a cutoff value of less than -11.0%. Conclusion: In patients with anterior STEMI, LV apical CS in the early post-MI period constitutes a significant prognostic parameter for the 3-months LV remodeling.

**P398**

Copeptin levels identify a sub-group of patients with increased risk of adverse outcome in STE elevation acute myocardial infarction, regardless of left ventricular ejection fraction

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**Background:** Risk stratification of patients (pts) with STE elevation acute myocardial infarction (STEMI) has been subject of intense research in recent years. Copeptin, the C-terminal portion of pro-hormone vasopressin, is elevated in myocardial infarction. Preliminary studies suggest that this new neurohormonal biomarker may have potential use for prognostic stratification of STEMI pts.

**Aim:** To evaluate short- and long-term prognostic value of copeptin in STEMI.

**Methods:** Prospective study of consecutive pts admitted with STEMI undergoing primary angioplasty. Copeptin was determined in samples taken at the beginning of coronary catheterization and 72 hours after. Ejection fraction (EF) was determined by transthoracic echocardiography (Simpson’s method), 24 to 72 hours after angioplasty. To evaluate the copeptin short- and long-term prognostic value, we defined the composite endpoint of progression to cardiogenic shock or in-hospital death. Long-term prognostic value was assessed by the composite endpoint of death, reinfarction or re-hospitalization due to cardiovascular disease. Copeptin prognostic potential was evaluated by Kaplan-Meier survival curve and Cox regression analysis, with stratification for EF (≤50%).

**Results:** We studied 42 pts (64% male, 64 ±13 years), EF was 49 ±11% (<40% in 20% of pts). Maximum Killip-Kimball class (KO) was ≥ III in 17.5% of pts. Copeptin concentration on admission was 65 ± 92 nmol/L, being significantly higher in pts with KK class worsening at 72 hours (115 ± 54 vs 101 ± 89 nmol/L, p=0.02). Seven pts (17.5%) developed cardiogenic shock or died during hospitalization. In these pts, copeptin baseline values were significantly higher (113 ±82 vs 56 ±94 nmol/L, p=0.015), Regarding long term (follow-up of 512 ± 264 days), there was the composite endpoint in 11 pts (27.5%). Even after stratification for EF, copeptin value higher than 49.44 nmol/L (3rd tertile) was an independent risk factor for an unfavorable outcome ( Cox hazard ratio: 25.04, 95% CI 2.52 to 248.64, p=0.006).

**Conclusion:** Copeptin baseline value > 49.44 nmol/L (3rd tertile) identified a sub- group of pts with increased risk of adverse outcome, regardless of EF. Therefore, copeptin is a new biomarker with short- and long-term prognostic value in STEMI pts.
Methods: CMR studies were performed in 184 consecutive patients with a first anterior STEMI within the first month and repeated in 120 at 6 months. Cine and late gadolinium enhancement sequences were used to assess left ventricular (LV) volumes, infarct size and segmental analysis of the myocardium. Adverse LV remodelling was defined as >20% increase in LV end-diastolic volume at follow-up.

Results: PE patients (n=30) were older (67 ± 11 vs 59 ± 13, p=0.001), presented a similar rate of Killip Class II (83% vs 90%, p=0.323) and a larger number of segments with >75% transmural necrosis (4.3 ± 2.3 vs 2.6 ± 2.4, p=0.001) than those without PE (n=154). Moreover, they also showed larger LV end-diastolic volume (p=0.028), LV end-systolic volume (p=0.001), infarct size (<p=0.001) and lower ejection fraction (p=0.018). Also, among PE patients there were no differences in CMR features between those with (n=26) and without (n=24; 80%) cardiac tamponade. A multivariate logistic regression analysis indicated infarct size as the only CMR-parameter that was an independent predictor of PE. At 6 months, PE patients showed more frequent adverse LV remodeling (6/9; 67% vs 29/111, 25%, p=0.018).

Conclusions: Extensive and transmural necrosis are conditions known to facilitate cardiac rupture and LV remodeling. The consistent association of these 2 features with PE - with or without cardiac tamponade - in our survivors of a first anterior STEMI, reinforces its potential link with a self-limited cardiac rupture.

P401
Impact of diabetes after myocardial infarction with ST elevation according to diastolic dysfunction
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Introduction: Diabetes are associated with diastolic dysfunction. In recent years, it has been increasingly apparent that LV diastolic dysfunction contributes to increased mortality rates in patients with acute coronary syndrome independent of systolic function. Different diastolic cardiac phenotypes are associated with different clinical outcomes. Our aim was to investigate the prognostic value of diabetes patients (p) admitted with a STEMI according to their diastolic function, classified into four types of LV filling patterns: Normal (1), impaired relaxation (2), ‘pseudonormalization’ (3), and restrictive (4).

Methods: We prospectively included 87 diabetic p with STEMI undergoing primary angioplasty. We evaluated the incidence of cardiovascular events defined as death, recurrent ischemia, revascularization and stroke. Results: 21.8% were women, 25.3% were active smokers, 11.2% with previous history of CAD. 69% had hypertension, 46% were dyslipemic and 13.8% nephropathy. The mean age was 70.1 ± 12.5 years. Based on the diastolic function: 11.5% showed pattern (1), 44.8% pattern (2), 32.2% pattern (3) and 11.5% pattern (4). Baseline characteristics were similar in all groups. There were no significant differences in treatment. Cardiogenic shock rate was higher with restrictive filling (0%, 5.6%, 3.6%, 12.5%, respectively, p=0.0001). Restrictive pattern was associated with more total events (10%, 38.5%, 25%, 31.3%, p=0.024) and total mortality (0%, 5.1%, 0.1%, 25%, p=0.0001). In survival analysis, the differences were also significant (p=0.001) as the only independent determinants of both RV end-diastolic diameters and RA area.

Conclusions: we provide the first population-based evidence of age-related increase in right heart dimensions, as well as its association with increasing pulmonary artery systolic pressures. These findings should be considered a normal consequence of age-associated pulmonary vascular stiffening, and should be considered as a ‘physiologic phenomenon’ when evaluating healthy subjects.

P403
Risk stratification in patients with low-gradient severe aortic stenosis and preserved ventricular function: stroke volume is the parameter we were looking for?
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Introduction: Low-gradient severe aortic stenosis (AS) with preserved left ventricular ejection fraction (LVEF) is an entity with a controversial prognosis and surgical indications. Low systemic flow as well as transvalvular gradient have been recently postulated as the most valuable parameters for risk stratification.

Purpose: To evaluate the impact of stroke volume (SV) on the prognosis of patients with low gradient AS and normal LVEF.

Methods: We retrospectively reviewed patients in our institution with the diagnosis of low-gradient AS with normal LVEF, defined as indexed aortic valve area (AVA) <0.6 cm²/m², mean gradient (MG) <40 mmHg and LVEF >50%. They were divided into 2 groups: low flow or normal flow, according to indexed SV (≤35 mL/m² vs >35 mL/m²).

Data on baseline characteristics, echocardiographic parameters, treatment and clinical outcomes (mortality, hospitalization from cardiovascular causes, stroke and bleeding) were collected. Data were obtained from a computarized registry and telephonic interview.

Results: We analyzed 85 patients from January to December 2011, with a mean age 76.8 ± 8.5 (45,9% male). All patients were symptomatic. Mean LVEF was 65.5 ± 9.2, MG 27.2 ± 7.3 mmHg and AVA 0.44 ± 0.1 cm²/m². 54.1% of patients had SV<36 mL/m² and 45.9% SV>35 mL/m², but no significant differences were observed in terms of mortality (17.4% vs 17.9%, p=0.95), cardiovascular events (17% vs 10%, p=0.44), or a combination of both (25% vs 17%, p=0.32). Aortic valve replacement (surgical or percutaneous) was performed in 65.2% of patients with low flow and 59% with normal flow. Similarly, in those patients in who a conservative strategy was selected, there was no increased mortality or cardiovascular events in the group of patients with low flow (31,3% vs 25%, p=0.68 and 18% vs 18%, p=0.92 respectively).

Conclusion: SV is not a prognostic factor to stratify risk in patients with low-gradient AS and preserved LVEF. This valvular disease is associated with high morbidity and mortality. Other parameters that discriminate which patients should undergo valve replacement are needed.

P404
Left ventricular global and regional systolic longitudinal deformation 1-year after femoral and apical transcatheater aortic valve implantation
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Purpose: Aortic valve replacement (AVR) is the recommended therapy for patients with severe aortic stenosis (AS) who have symptoms or decreased left ventricular (LV) function. Transcatheter aortic valve implantation (TAVI) is a treatment alternative in surgical-logic phenomenon" when evaluating healthy subjects.

Methods: We performed 2D echocardiography before and 1-year after TAVI. Ejection fraction (EF) was measured by biplane Simpson’s method and global LV longitudinal systolic strain (GLS) was obtained as an average of 16 segments in the three standard apical views by speckle tracking. GE Vivid 7/9 equipment was used for echocardiography and speckle tracking analysis was performed by EchoPAC PC ’08 software version 7.0.1. Data are reported as means and standard deviations.

Results: The study population consisted of 81 consecutive patients; 54% women, age of 81 ± 7 years and EuroScore of 9.6 ± 2.7. TAVI was performed by femoral approach in

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Does peak aortic jet velocity determine risk and time to event in asymptomatic severe aortic stenosis?

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Various studies have attempted to demonstrate the prognostic value of several echocardiographic parameters in patients with asymptomatic severe aortic stenosis (AS), which could influence the therapeutic attitude.

Purpose: To determine the predictive value of peak aortic jet velocity (AV-Vel), as an indicator of the need for surgery or death in patients with asymptomatic severe AS and preserved (LVEF) left ventricular ejection fraction.

Methods: We prospectively evaluated 85 patients with severe AS (aortic valve area (AVA) < 1 cm²) and EF ≥ 50%, excluding those with other significant valve disease. At the time of the inclusion patients were classified into 3 groups. Group 1: AVVel 3.5 - 4m/s; Group 2: AVVel 4.1-4.5 m/s (43p) and Group 3: AVVel 4, 5 m/s (25 p). Patients were followed up for a mean of 17 months (1-60) to observe if they had required aortic valve replacement or had died (primary event) or if they had remained asymptomatic.

Results: The average age was 74 ± 9 years, 39% were women. The average peak aortic jet velocity in each group was: Group 1: 3.7 ± 0.22 m/s; Group 2: 4.2 ± 0.14 m/s and Group 3: 4.8 ± 0.28 m/s. During follow-up, 42 p were operated because of appearance of symptoms and 10 p died. The 41%, 76% and 92% p of groups 1, 2 and 3 respectively required surgery or died. The multivariate analysis showed that in Group 2 had 2.6 times more risk of surgery or death (IC 95 1, 1.6-25, p=0.03) than those in Group 1. P in Group 3 had 4 times more risk of surgery or death (IC 95 1, 59-10, 3, p=0.003) that those in Group 1. There were no statistically significant differences between groups 2 and 3. From an average peak aortic jet velocity of 4, 39m/s, occurred significantly more events. The median time until the primary event was 129.9 ± 45 to 120.3 ± 41 g/m² (p=0.16) and relative wall thickness from 0.51 ± 0.16 to 0.48 ± 0.16 (p=0.24). The 1-year gain in EF was the same after femoral 9.7 ±10.1 and after apical approach TAVI 8 ± 10.8 (p=0.52). Also the 1-year improvement in GLS did not differ significantly between femoral and apical approach patients -3.8 ± 3.3 and -2.8 ± 3.7, respectively (p=0.21).

Conclusions: TAVI in severe aortic valve stenosis improved EF and GLS, with no difference between patients treated by the apical or by the femoral approach. EF and GLS generally improved in patients with preoperatively reduced LV function. No alterations in LV mass and geometry were observed.

P406

Evaluation of carotid artery stiffness in patients with aortic stenosis

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Aims: There is an increasing evidence that valvulo-arterial interplay is important in the evaluation of aortic stenosis (AS). In this study, we aimed to investigate the relationships between carotid artery stiffness and estimated left ventricular (LV) filling pressure, plasma brain natriuretic peptide (BNP) level and symptoms in AS.

Methods and results: Fifty-three patients (age: 75 ± 10 years; 51% of male) with at least moderate AS (aortic valve area < 1.5 cm²) and preserved LV ejection fraction (> 50%) underwent a comprehensive echocardiographic exam, with the concomitant measurement of carotid artery stiffness, while deformation were unmeasurable. We prospectively measured and circumferential of the mitral annulus in all patients at the beginning and also immediately at the end of the procedures in the catheter laboratory.

P407

Echocardiographic predictors of poor outcomes after transcatheter aortic valve implantation

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Background: Patients’ selection for TAVI remains a major concern given the large number of patients who do not improve after this procedure.

Methods: 69 consecutive patients undergoing TAVI at the university hospital of Rennes were included in a registry and prospectively followed at 6 months. The study population was divided into two groups: ‘good outcomes’ (GO) vs ‘bad outcomes’ (BO), according to the occurrence of death from any cause, acute heart failure (AHF) or coronary syndrome (ACS), stroke and 6-month NYHA functional class (Class III vs IV).

The patients’ clinical, biological and echocardiographic characteristics were studied to find predictive factors of BO.

Results: Forty patients met the criteria of the BO group. The mean (± SD) age of the GO and BO groups was 78.8 (11.6) and 81.5 (5.5) years respectively (p=0.06). Patients in the BO group had a higher Society of Thoracic Surgeon Score (7.5 ± 3.2 vs 5.9 ± 3.1; p=0.016). Univariate analysis identified the following pre-operative echocardiographic criteria as being linked to BO: left atrial area (LAA) on 4 chamber apical view (p=0.0016), mitral and tricuspid regurgitation grade ≥ 2 (p=0.008 and 0.001 respectively) and a systolic pulmonary arterial pressure ≥ 60 mm Hg (p=0.02). In a multivariate model combining these features, LAA remained the sole predictor of BO (p<0.09, relative risk (95% confidence interval) = 1.1[0.004-1.169]).

Conclusion: Our results suggest that a careful assessment of diastolic function is useful when evaluating a patient for TAVI and should be taken into account in patients’ selection.

P408

Immediate impact of MitraClip procedures on left ventricular geometry evaluation of the mitral annulus using 3-dimensional echocardiography

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Purpose: The impact of interventional MitraClip procedures using the “edge-to-edge” technique has already been demonstrated for the reduction of mitral regurgitation using 2-dimensional echocardiographic techniques. The immediate success of the procedure is not alone restricted to the reduction of mitral regurgitation (MR) but more importantly to the effects upon left ventricular geometry. These beneficial effects can be evaluated more precisely using 3-dimensional (3D) echocardiography. We therefore aimed at evaluating the immediate impact of MitraClip procedures not only on MR but also on mitral annulus plasticity using 3D transesophageal echocardiography (3D TEE) and dedicated post-processing software.

Methods: We measured the impact of the MitraClip procedure on mitral annulus plasticity in 14 consecutive patients. For our analysis we used Live 3D image data obtained by a Philips IE33 ultrasound machine (Philips Healthcare, Andover, MA, USA) equipped with a X7-2T TEE probe and a dedicated post-processing analysis software (Philips QLab, Mitral-Value-Quantification). We significantly measured diameter and circumference of the mitral annulus in all patients at the beginning and also immediately at the end of the procedures in the catheter laboratory.

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Results: All patients had a severe MR which could be reduced to mild or moderate. Additionally, we detected that not only the MR but also the diameter and circumference of the annulus could be reduced directly after intervention. The anterolateral to posterior-omedial diameter (ADPm) could be reduced (ΔADPm 43.89 ± 4.03 mm to 41.41 ± 4.04 mm, p = 0.001) upon the posterior diameter (ΔADP 35.64 ± 5.12 mm to 32.49 ± 4.00 mm, p = 0.001) and the 3D circumference of the annulus (C3D) (C3D 139.92 ± 15.02 mm to 132.05 ± 12.41 mm, p < 0.02).

Conclusion: 3D TEE with dedicated post-processing software modalities is very useful for monitoring the MitraClip procedure for the documentation of the success not only in the context of reducing MR, but also and more importantly for the evaluation of changes in left ventricular geometry and mitral annulus plasticity. Further studies will have to prove the concept that clinical outcome after MitraClip procedures relies more on remodelling indices of the left ventricle measured with 3D TEE than upon the reduction of MR alone.

P409 Perioperative mortality risk scores in severe aortic stenosis: relationship with flow rates and gradients

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Method and results: Risk scores (Euro I, II and STS) in patients with severe aortic stenosis (AS) undergoing isolated aortic valve replacement according to transvalvular flow rates and pressure gradients.

Results: All patients had a severe MR which could be reduced to mild or moderate. Additionally, we detected that not only the MR but also the diameter and circumference of the annulus could be reduced directly after intervention. The anterolateral to posterior-omedial diameter (ADPm) could be reduced (ΔADPm 43.89 ± 4.03 mm to 41.41 ± 4.04 mm, p = 0.001) upon the posterior diameter (ΔADP 35.64 ± 5.12 mm to 32.49 ± 4.00 mm, p = 0.001) and the 3D circumference of the annulus (C3D) (C3D 139.92 ± 15.02 mm to 132.05 ± 12.41 mm, p < 0.02).

Conclusion: 3D TEE with dedicated post-processing software modalities is very useful for monitoring the MitraClip procedure for the documentation of the success not only in the context of reducing MR, but also and more importantly for the evaluation of changes in left ventricular geometry and mitral annulus plasticity. Further studies will have to prove the concept that clinical outcome after MitraClip procedures relies more on remodelling indices of the left ventricle measured with 3D TEE than upon the reduction of MR alone.

P410 Single beat estimation of end-diastolic pressure-volume relationship (EDPVR) in patients with severe mitral stenosis (MS)

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Introduction: The evaluation of end diastolic (ED) left ventricular (LV) function in patients with significant rheumatic mitral stenosis (MS) has not been update thoroughly investigated as the main focus has been on the dominating valve pathology. We undertook this study in order to invasively explore the LV end diastolic characteristics in this group of patients.

Methods: 120 individuals (age 32 ± 9, 86 females) with severe rheumatic MS referred for percutaneous transvenous mitral valve commissurotomy (PTMC). Patients with atrial fibrillation, history of ischemic heart disease, diabetes mellitus and hypertension were traced, to obtain a 3D model of the repaired MV (400 nodes, 750 faces). Several measurements were obtained: diameters, 3D leaflet and orifices areas, and the local 3D curvature as the inverse of the radius of the sphere best fitting the leaflet surface (negative values for LV concavity).

Conclusion: The right shifted EDPVR is well recognized in patients with severe rheumatic MS. In patients with excessive grade of shifted EDPVR the CI is fairly preserved with increased contractile LV performance which in turn may be the result of increased sympathetic activity as the present results imply.

P411 Advanced 3D morphological analysis of the mitral valve after MitraClip

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MitraClip is an innovative percutaneous procedure to correct mitral valve (MV) insufficiency, by suturing the leaflets where the regurgitant jet originates and creating two distinct orifices. We explored the feasibility of building a 3D model from 3D TEE data to describe morphology of the repaired MV.

10 pts with functional (5) or degenerative (5) regurgitation underwent percutaneous MV repair. The procedure was guided using 2D and 3D TEE. Full-volume dataset were processed using custom software in mid-diastole: annulus and leaflets were manually traced, to obtain a 3D model of the repaired MV (400 nodes, 750 faces). Several measurements were obtained: diameters, 3D leaflet and orifices areas, and the local 3D curvature and the inverse of the radius of the spherical best fitting the leaflet surface (negative values for LV concavity).

Conclusions: The right shifted EDPVR is well recognized in patients with severe rheumatic MS. In patients with excessive grade of shifted EDPVR the CI is fairly preserved with increased contractile LV performance which in turn may be the result of increased sympathetic activity as the present results imply.
analysis MR was independently associated with LV dilatation (OR=4.53, 95% CI 2.51-8.23, p<0.001), NYHA class of congestive heart failure (2.44; 1.62-3.84, p<0.001), index of the left atrium size (1.57; 1.43-1.80, p<0.001), and extent of LV wall motion abnormalities (1.03, 1.01-1.12, p=0.012). No association between MR and the localization of significant coronary lesions was found.

Conclusions: LV dilatation, NYHA class of congestive heart failure, index of left atrial size and extent of LV wall motion abnormalities were associated with chronic MR in postmyocardial infarction patients. Moderate or severe chronic MR was not associated independently with localization of significant coronary lesions in these patients.

P413
Standardized segmentation of aortic annulus (ao an) across multi-modalities imaging techniques. Location of annulus calcification (an ca) predict peri-prothetical leaks (pl) post TAVI
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Since TAVI involves multimodality imaging (TTE, TOE, CT or MR) to screen patients it is highly important to standardize the rapport and the analysis of the AO valve.

Aim: To standardize AO valve description, and to explore whether the precise location of the Annulus Ca could predict peri-prothetical leaks post TAVI in 43 patients.

Method: Cardiac CT performed before and after TAVI (non-contrast) and then compared to the echo (short axis) post TAVI. Ao An was divided in 12 clockwise quadrants. 6 o'clock was defined as the insertion of interatrial septum to Ao An, which is easily identified in TTE, CT or TOE.

Results: nb of Leaks >grade 2 : 17% (8/40) located at 3h (70%), 6h (14%), 9h (14%), 12h (40%)
Calcic score Ao valve: 1/4 23%, 2/4 35%, 3/4 35%, 4/4 7%
Calcic location and periprothetical leaks: p coef correlation 0.90
cor between the thickness of the calcic annular apposition and the grade of the leaks (p coef correlation 0.95).

Discussion: Calc of Ao cusp is common but not predictive of a location of the leak. There may have heavy cusp calcification without significant annulus ca and, alternatively, less cusp calc with a protrusive An ca.

40% (3/7) of pat with leaks grade 2 > have calcic annular thickness >2mm.

Conclusion: Calc of AO cusp is common but not predictive of a location of the leak. One may have heavy cusp calcification without significant annulus ca and, alternatively, less cusp calc with a protrusive An ca.

P414
Left ventricular dysfunction assessed by three-dimensional strain in takotsubo cardiomyopathy
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Purpose: Takotsubo cardiomyopathy (TC) shows transient left ventricular (LV) apical dysfunction and electrocardiographic (ECG) abnormalities. Just after LV wall motion recovery, there still remains ECG STT change. This study sought to characterize LV function in TC using three-dimensional (3D) tracking.

Methods and results: Twelve consecutive patients underwent routine and 3D echocardiography as well as an electrocardiogram and two-dimensional echocardiographic examination. Mitral regurgitation was measured using an Ensite NavX system (St. Jude Medical) and the Tei index as an echocardiographic Doppler indicator of combined ventricular systolic and diastolic function.

Results: Global systolic longitudinal strain was not different between the ph+/ge+ group -19.15% (SE 0.49%) and the ph-/ge- group -19.68% (0.45%) but lower in the ph+/ge- group -14.30% (0.49%) (P<0.001). However, in segmental analysis, mean mid segment inferoseptal strain was -4.63% (0.87%) in the ph+/ge+ group but -13.22% (0.64%) in the ph+/ge- group and -17.01% (0.42%) in the ph-/ge- group (P<0.001). Similar differences were seen at the basal segment and with average segmental strain. However, the area under the curve (AUC) was greatest for mid segment inferoseptal strain 0.78 (95% CI 0.67-0.88) in comparison to 0.68 (95% CI 0.50-0.80) for the basal segment and 0.75 (0.64-0.86) for the average. The sensitivity of a cut off value of strain of -14.6% at the mid segment was 61% whilst the specificity was high at 94%. In a sensitivity analysis the ability of mid segment inferoseptal strain to discriminate between groups was even higher in individuals under 35 years of age (AUC 0.81 95% CI 0.67-0.94). Measurements of strain rate were not as discriminating as measures of strain in differentiating between ph+/ge+ and ph-/ge- individuals. The AUC for strain rate at the mid segment was 0.64 (95% CI 0.51-0.77). Global circumferential strain was also assessed and was -25.50% (0.73%) in the ph+/ge+ group, -24.37% (0.70%) in the ph+/ge- group and -20.17% (1.83%) in the ph-/ge- group (P<0.008), the AUC indicated poor discrimination 0.31 (95% CI 0.13-0.48).

Conclusions: Abnormalities in myocardial function as measured by speckle strain can be detected in those without hypertrophy but an identifiable genetic mutation for hypertrophic cardiomyopathy. This has important implications for the screening and follow up of phenotypically normal family members of those with hypertrophic cardiomyopathy.

P415
Subclinical myocardial dysfunction in myotonic dystrophy type 1 patients
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Introduction: Myotonic dystrophy type 1 (MD1) is a neuromuscular disorder which can present cardiac involvement, most commonly in the form of progressive conduction disturbances and less frequent, myocardial dysfunction and ischemic heart disease. The myocardial performance index (TEI index) is an echocardiographic Doppler indicator of combined ventricular systolic and diastolic function. The aim of this study was to explore the utility of TEI index in detecting early left ventricle (LV) systolic dysfunction in MD1 adults with no overt cardiac involvement.

Methods: A total of 20 MD1 patients with preserved LV ejection fraction (9 male, age 39.4 ± 13.0 years) and 13 healthy controls (6 male, age 35.2 ± 13.2 years) underwent an electrocardiogram and two-dimensional echocardiographic examination. Mitral annulus strain and diastolic myocardial velocities were obtained by tissue Doppler (TDI) echocardiography. Tissue Doppler imaging derived TEI index was determined by the ratio of the sum of isovolumetric contraction time (IVCT) and isovolumetric relaxation time (IVRT) over the ejection time (ET).

Results: Left ventricle Tei index was higher in the group of MD1 patients when compared to the control group (0.87 ± 0.19 vs 0.45 ± 0.29, p<0.001). Both IVCT and IVRT were significantly longer (108.6 ± 15.2 ms vs 67.2 ± 29.4 ms, p<0.001; 108.4 ± 20.9 ms vs 59.3 ± 8.9 ms, p<0.001, respectively) in MD1 patients, when comparison time (IVRT) over the ejection time (ET).
P418 Evaluation of early left-ventricular remodeling 6 months after heart transplantation

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Purpose: At the time of transplantation, donor heart is susceptible to a myriad of factors including both ischaemia and acute immune response that could result in early left ventricular remodeling (LV-R). This study aimed at identifying the early thickening of left ventricular (LV) wall from late hypertrophy that is due to denervation, immune response and myocyte proliferation. Therefore, we compared early postoperative echocardiographic findings with the same measurements performed six months after transplantation.

Methods: 22 patients after heart transplantation were assessed by echocardiography during postoperative hospital stay and at the follow-up visit at six months using standard M-mode, 2D and Doppler measurements. Baseline measurements of end-diastolic interventricular septum (IVSd), LV posterior wall thickness (LVPWd) and LV cavity diameters (IVSd, LVPWd, IVSd+LVPWd, LVd) were assessed using a standard echocardiographic technique. LV mass was estimated in calculation using cubed formula, volumes and systolic function were assessed using Simpson method. Diastolic function was assessed through analysis of transmitial and pulmonary venous Doppler flow and tissue Doppler analysis of movement of mitral annulus and classified according to grades of dysfunction. Student Ttest was used for statistical analysis.

Results: IVSd decreased significantly from 11.8±2.2 to 9.3±1.5 mm (P<0.01) while LVPWd decreased from 11.7±2.5 to 9.3±1.8 mm (P<0.01). LVDD significantly increased in the follow up from average 44.9 mm to 47.7 mm (P<0.02) while LV mass decreased significantly from 197.1±56.4 g to 191±43 g (P<0.01) with no statistically significant change in LV volumes (P=0.49 for change in end-diastolic volumes, P=0.37 for change in end-systolic volumes). There was a significant improvement in diastolic function (P<0.05), and no change in systolic function (P=0.74).

Conclusions: Statistically significant remodeling of implanted hearts 6 months after heart transplantation was found in all 22 patients. Thickness of interventricular septum and posterior wall in almost all patients immediately after heart transplantation was on the upper limit of normal or showing mild hypertrophy according to measurements, but after six months all the values decreased and normalized. Also, the patients that were showing diastolic dysfunction showed normal inflow patterns after six months. We presume this is the consequence of postoperative interstitial oedema that could result both from prolonged ischaemia during transplantation as well as early immune response of the host, but which appears to be a normal finding early after heart transplantation.

P419 Predictors of left ventricular functional recovery in patients with acute de novo dilated cardiomyopathy-like pattern on echocardiography

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Purpose: To identify the useful predictors of left ventricular (LV) functional recovery in patients with acute de novo heart failure who showed dilated cardiomyopathy (DCM) like pattern on echocardiography.

Methods: A total of 175 consecutive patients who presented with acute de novo heart failure and showed DCM-like pattern on echocardiography were divided into 2 groups; the recovered (group I, n=54, 54.3±18.5 years, 31 males) vs the non-recovered (group II, n=121, 60.5±15.1 years, 79 males). Clinical, laboratory, and echocardiographic findings were compared.

Results: During follow up, LV function was normalized in 54 patients (30.8%), and LV ejection fraction (EF) increased from 29.0±8.6 to 42.4±13.4%. LVEF were significantly improved in both groups (from 30.2±9.6 to 56.2±5.4% in group I vs from 28.3±10.0 to 48.3±8.9% in group II). The LV end-diastolic dimension (61.2±5.4 vs 64.3±6.1 mm, p<0.005) and volume (148.6±41.01 vs 166.9; 59.9 ml, p=0.036) were significantly smaller in group I than in group II, but the other echocardiographic parameters were not associated with LV functional recovery. Among clinical variables, the prevalence of atrial fibrillation (AF) (35.2 vs 19.0%, p=0.026), the level of blood pressure (BP) (129.1±19.5 vs 121.7±22.7 mmHg, p=0.043), and the use of angiotensin II receptor blocker (ARB) (70.4 vs 46.3%, p<0.008) were significantly higher in group I than in group II. BUN (17.5±6.2 vs 23.3±15.6 mg/dL, p=0.002) and creatinine (0.51±0.33 vs 1.1±0.1 mg/dL, p=0.001) were significantly elevated, and the prevalence of diabetes mellitus (DM) (13.0 vs 31.4%, p<0.008) was significantly higher in group II than in group I.

Conclusion: The recovery of LV function was not infrequent in acute de novo heart patients with DCM-like echocardiography pattern. The initial size and volume of the LV were significant echocardiographic predictors of future LV functional recovery, and DM, AF, BP, renal function, and ARB use were significant clinical predictors.

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Conclusion: Patients with TC who have RV involvement have significant impairment of several parameters of global RV function. This is predominantly caused by dysfunction of RV mid and apical segments. Of note, patients with RV involvement have a significantly lower LVEF which might be caused by a more severe initial insult.

Methods: KaRen is a multicenter prospective registry of HFPEF. Inclusion criteria are acute presentation with Framingham symptoms and signs of heart failure together with NT-proBNP ≥350 ng/l and LVEF ≥45%. Each patient had a complete echocardiographic in a stable stage always with the same protocol. An extensive echo-analysis has been performed including the assessment of right ventricular function. All data were analyzed in a coroblab blinded to clinical data. We categorized the patients according to the TAPSE with a cut-off value of 16mm.

Results: 290 patients were prospectively analyzed. 120 patients had a TAPSE < 16mm and 170 had a TAPSE ≥16mm, they were respectively 78 ± 8 and 76.5 ± 9 yo (p=0.07). The sexe ratio was 60% versus 53% of female. The QRS-duration was 104 ± 27.6 versus 101 ± 24.3 ms (P=0.5). Systolic blood pressure was 136 ± 23 versus 139 ± 24 mm Hg (p=0.6). These 6 groups of patients looked pretty identical according to medical history and clinical characteristics. But, the left ventricle (LV) of patients with TAPSE < 16 mm were smaller (LV end-diastolic volume 84 ± 26 versus 94 ± 29ml, p=0.005) without any difference in LVEF (62 ± 7 versus 63 ± 7%, p=0.34) but a significant difference in LV:longitudinal systolic function (strain global longitudinal −13.9 ± 2.9 versus −15.5 ± 3.8%, p = 0.002) and a significantly more severe LV:diastolic dysfunction with, for instance, a significantly more enlarged left atrium (left atrial volume 52.8 ± 21.2 versus 44.0 ± 14.8 ml/m², p=0.002). The degree of mitral regurgitation was not significantly different between the two groups.

Conclusions: HFPEF patients with right heart dysfunction have a more depressed LV longitudinal function despite identical LVEF and more severe LV diastolic dysfunction. These patients with right heart dysfunction are patients with a more severe left heart dysfunction.

SYSTEMIC DISEASES AND OTHER CONDITIONS

P424 Significance of T-wave inversions in athletes

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Purpose: T-wave inversion beyond V1 is rarely observed on the ECG of healthy athletes (<4%), whereas it is a common finding in patients with cardiomyopathy as hypertrophic cardiomyopathy (HCM) or arrhythmogenic right ventricular cardiomyopathy (ARVC). Thus recent ESC recommendations for interpretation of resting ECG in the athlete underline that this ECG pattern is not due to physical training and request cardiovascular exams. Classical exam performed is resting echocardiography. In this prospective study the respective value of different non invasive exams performed in case of negative T waves in athletes was evaluated.

Method: We prospectively included 49 athletes with T-wave inversion beyond V1. They underwent intensive cardiac investigations (clinical examination, exercise test, 24h ECG Holter monitor, rest and exercise echocardiography, cardiac magnetic resonance imaging (MRI)) to identify a potential cause.

Results: In all cases ECG was realized for pre-participation screening. Only few subjects reported cardiovascular symptoms (n=10). Thus in most cases no evidence of cardiovascular disease (n=39) was noted. In 25 subjects no significant abnormality was detected. Cardiomyopathy was diagnosed in 24 (49%) subjects, 20 HCM, 1 ARVC and 3 resolutes myocarditis. In the cardiac disease group (n=24), only 4 presented cardiovascular symptoms vs 6 in the non pathologic one (n=25). In 2 patients with myocarditis but normal echocardiography, the diagnosis was performed by cardiac MRI because of evidence of late gadolinium enhancement (LGE). LGE was also useful for risk stratification in HCM patients (B). Exercise echocardiography was very useful in 2 patients for the diagnosis of HCM by unmasking dynamic LVOT obstruction. In one myocarditis, exercise echocardiography showed absence of contractile reserve.

Conclusion: Our results confirm that T-wave inversions in athletes cannot be regarded as a physiological adaptation even in absence of symptoms. An intensive functional and morphological cardiac evaluation is necessary including cardiac MRI and exercise echocardiography in subjects with considered normal resting echocardiography and positive ECG.

P425 Subtle impairment of right ventricular function in systemic sclerosis with lung fibrosis detected by tissue Doppler

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Systemic sclerosis (SS) is an autoimmune connective disease that courses with fibrosis and microvascular occlusion, involving skin and visceral organs, including lungs and the heart. It is not clear whether involvement of the right ventricle (RV) results from direct organ lesion or indirectly from pulmonary hypertension. To assess the
relationship between RV performance and lung involvement in SS we studied 51 patients with echocardiography with tissue Doppler and chest computed tomography (CT).

Methods: SS diagnosis was made by clinical and laboratory examinations; RV function was evaluated by means of RV fractional area change (FAC), tissue Doppler s’ (systolic velocity), myocardial performance index (MPI) and tricuspid annular plane systolic excursion (TAPSE). Pulmonary artery systolic pressure (PAP) was estimated by tricuspid regurgitation. Additionally, left ventricular (LV) systolic (ejection fraction) and diastolic (transmitral Doppler and mitral annulus tissue Doppler) function was also assessed. Chest CT was used to assess the presence of lung fibrosis.

Results: Out of 51 patients, 37 were female, aged 52 ± 12 years; all patients had normal ventricular function, as assessed by UVEF > 55% and FAC > 40%. Out of 51 patients, 43 had chest CT. According to CT results, patients were divided into 2 subgroups: Group I (n=24), including patients with pulmonary fibrosis (n=26) and Group II (n=27) with no fibrosis (n=17). There was no significant difference regarding age or disease duration for the groups. Except for decreased tissue Doppler s’ velocities in patients with fibrosis, all indexes of RV performance were similar for both groups.

Conclusion: in patients with SS and pulmonary fibrosis, tissue Doppler systolic velocities seem to identify early myocardial involvement, despite a preserved RV systolic performance.

P426

Intrinsic myocardial circumferential contraction as well as longitudinal function is impaired in patients with hypertensive heart disease: layer-specific analysis of speckle-tracking strain

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Background: Although hypertensive heart disease (HHD) is associated with reduced longitudinal myocardial shortening despite preserved left ventricular (LV) ejection fraction (EF), it remains unknown whether circumferential strain (CS) is reduced or not. Recently, layer-specific myocardial strain can be measured at innermost, midwall, and outermost LV layers by using 2-dimensional speckle tracking echocardiography. We thus aimed to determine whether layer-specific CS is reduced in patients with HHD.

Methods: Echocardiography was performed in 32 HHD patients with preserved EF and 30 healthy volunteers using an Artida system (Toshiba Medical Systems). Layer-specific global longitudinal strain (LS) and CS were measured from apical 4-chamber view and parasternal LV short-axis view at the mid-ventricular level, respectively. Layer-specific end-systolic circumferential wall stress (CWS) was calculated according to Minsky’s formula. Endocardial meridional wall stress (MWS) was also calculated.

Results: Interventricular septal thickness (13 ± 2 vs 9 ± 1 mm, p < 0.001), LV posterior wall thickness (11.1 ± 3 vs 8 ± 1 mm, p < 0.001), and LV mass index (129 ± 20 vs 60 ± 14 g/m², p < 0.001) were significantly greater in HHD than in control. LV EF did not differ between groups (67.8 ± 6 vs 66.6 ± 3%, p = 0.36). LS was reduced in HHD than in control in all 3 layers (inner: -13.3 ± 3 vs -16.5 ± 2.5%, p < 0.001; mid: -12.6 ± 2.8 vs -15.1 ± 2.5%, p < 0.001; outer: -11.1 ± 2.9 vs -12.8 ± 2.9%, p < 0.05), whereas MWS was also reduced in HHD (539 ± 153 vs 628 ± 168 dynes/mm², p < 0.05), and CS and CWS did not differ between groups in innermost layer (CS: -24.4 ± 4.8 vs -24.6 ± 4.5%, p = 0.14; CWS: 973 ± 163 vs 995 ± 138 dynes/mm², p = 0.57). In contrast, CS was reduced in HHD in midwall and outer layers (mid: -11.5 ± 3.8 vs -13.2 ± 2.5%, p < 0.05; outer: -6.8 ± 2.4 vs -8.4 ± 1.9%, p < 0.01) despite reduced CWS (mid: 360 ± 110 vs 486 ± 141 dynes/mm², p < 0.001; outer: 238 ± 84 vs 348 ± 119 dynes/mm², p < 0.001).

Conclusions: Longitudinal myocardial contractility was impaired in all 3 LV layers of HHD patients. Although circumferential stress-strain relationship was preserved normal in innermost layer, it was failed in midwall and outermost layers in HHD patients. These findings indicated that intrinsic myocardial contraction is impaired in the circumferential direction as well as in the longitudinal direction in this disease.

P427

Obstructive sleep apnea determines endothelial dysfunction and increased arterial stiffness, similarly with diabetes mellitus

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Background: Obstructive sleep apnea (OSA) is a frequent sleep disorder, suggested to be associated with cardiovascular diseases. Proposed mechanisms are increased sympathetic and pro-inflammatory activity, high heart rate variability, diurnal hypertension, and are probably related to the action of hypoxia on vascular function, however detailed evidences are still lacking. Aim: Assess endothelial and arterial functions in patients with moderate to severe OSA, by comparison with control normal subjects (age and sex matched), and patients with diabetes mellitus (age, sex, and cardiovascular risk factors matched).

Methods: 60 patients were studied (55 ± 12 years, 9 women); 20 patients with moderate to severe OSA, by comparison with control normal subjects (age and sex matched), and patients with diabetes mellitus (age, sex, and cardiovascular risk factors matched). Methods: 60 patients were studied (55 ± 12 years, 9 women): 20 patients with moderate to severe OSA (mean apnea-hypopnea index 43 ± 23) without diabetes; 20 patients with treated type 2 diabetes (DM); and 20 control, normal subjects. Patients with OSA and DM were hypertensive, with similar values at ambulatory blood pressure monitoring (149/95 in both groups). Arterial function was assessed through intima-media thickness (IMT), 'te-tracking' and 'wave intensity'. We determined: IMT, Young modulus (E0), beta stiffness (SP), arterial stiffness (FP), and second systolic peak (SP). Endothelial function was quantified through flow mediated dilation (FMD).

Results: Patients with OSA and DM had similar levels of endothelial dysfunction and arterial stiffness, significantly abnormal than the control group (see table).

Conclusion: Patients with moderate to severe OSA have endothelial dysfunction and increased arterial stiffness, with a similar vascular profile with patients with DM, suggesting that OSA should be considered a disease associated with a high cardiovascular risk.

P428

Hypercytokinemia and cardiac decompensation in hypertensive patients

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Objective: It was proposed that proinflammatory cytokines can modulate cardiac structure and function through mechanisms resulted in heart hypertrophy, fibrosis, cardiomyocytes apoptosis, left ventricular diastolic and systolic dysfunction. Tumor necrosis factor-alpha (TNF-alpha) – proinflammatory cytokine can cause negative inotropic effects on the heart, activity of which can be inhibited by soluble forms of TNF receptors type 1 (sTNF-R1).

The aim of our clinical study was to investigate circulating plasma TNF-alpha, sTNF-R1 levels in patients with arterial hypertension depend on left ventricular hypertrophy presence. The aim of our clinical study was to investigate circulating plasma TNF-alpha, sTNF-R1 levels in patients with arterial hypertension depend on left ventricular hypertrophy presence.

Design and methods: TNF-alpha and sTNF-R1 plasma levels were measured by ELISA in 72 hypertensive patients. Left ventricular myocardium mass (LVM) and function by 2D echocardiography have been examined. Patients were divided into 2 groups depend on left ventricular hypertrophy (LVH) presence: 1st group – 22 patients (30.56%) with normal LVMM (LVMM index 103.59 g/m², EF 63.14 ± 1.33%), 2nd group – 50 patients (69.44%) with LVH (LVMM index 137.38 ± 2.75 kg/m², EF 58.81 ± 1.14%).

Results: Plasma TNF-alpha (139.52 ± 21.11 pg/ml) and sTNF-R1 (2.15 ± 0.11 ng/ml) levels were higher in hypertensives with LVM as compared with those without LVH (121.24 ± 26.04 pg/ml; p < 0.05 and 2.13 ± 0.15 ng/ml; p < 0.05). We calculated TNF-alpha/sTNF-R1 ratio which reflect degree of immunoinflammatory activity. This ratio was statistically elevated (64.89) in hypertensives with LVH vs hypertensives without LVH (56.92; p < 0.05) that indicate increased proinflammatory responses in this group. Positive correlation between TNF-alpha and LVM index were found in 2nd group (r = 0.64; p < 0.05) and negative with EF (r = 0.53; p < 0.05).

Conclusions: The result of our clinical study suggest that elevated levels of proinflammatory cytokine – TNF-a may be one of several different maladaptive mechanisms responsible for the progression of cardiac decompensation that occur in arterial hypertension. This study revealed increased levels of sTNFR1 that might reduce or
in some cases completely inhibits TNF-α activity. Measurement of sTNFR1, in addition to TNF-α, could provide us with some additional and more complete information about activation of this cytokine in arterial hypertension.

P429
Subclinical organ damage detected by carotid ultrasonography
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Background and Objective: Conventional scores as SCORE underestimate the cardiovasc u lar risk (CVR) in a significant proportion of population. Carotid artery ultrasonography, through measurement of carotid intima-media thickness (CIMT), is useful in identifying subclinical atherosclerosis and placing an individual into a higher CVR class. The objective of the study was to establish the real CVR of the study population measuring CIMT and by carotid plaques detection.

Methods: Carotid artery ultrasonography was eff ected to 142 subjects, aged over 40 years, with low or intermediate SOFA risk. The detection of abnormal CIMT and carotid plaques classifies the subjects to high CVR.

Results: The calculated CVR of the study population by SCORE charts was low risk at 40 patients (28.2 %) and intermediate at 102 (71.8 %). Mean CIMT was 0.76 ± 0.14mm. The results of the ultrasonography reclassifi ed the risk class in 39 patients (27.4 %). Reclassifi cation occurred at 34 patients (33.3 %) of the intermediate CVR group and at 5 patients (12.5 %) of the low CVR group (p < 0.05). Reclassifi cation was connected to history of arterial hypertension (p < 0.001), systolic blood pressure (p = 0.001), age (p < 0.005), cholesterol levels (p < 0.05) and smoking (p < 0.05).

Conclusions: Carotid ultrasonography is an important investigation in preventive medicine. CVR improves risk classifi cation, identifying high risk individuals, not detected by SCORE function and contributes to establish earlier and more aggressive CVV preventive strategies.

P430
Diastolic left ventricular function by echocardiography in patients with shock: serial evaluation and implications for mortality
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Purpose: This study investigated the prognostic information of left ventricular (LV) diastolic function, assessed by serial echocardiography, for 28-day mortality in patients with shock.

Methods: Prospective, observational, cohort study of 44 patients. TTE examinations and hemodynamic parameters were assessed daily for a total of 7 days. LV diastolic function was measured by transmural pulsed Doppler (E, A, E/A), tissue Doppler indices (e’, a’, E/e’), deceleration time (DT) and left atrial volume (La volume). Heart rate (HR), mean arterial pressure (MAP), systemic vascular resistance index (SVR), continuous cardiac index (CCI) and norepinephrine dose was assessed. Sequential Organ Failure Assessment (SOFA) scores were calculated. Kruskal Wallis test and Mann-Whitney’s U Test were used.

Results: In non-survivors median E/e’ , E/A and SOFA was significantly higher and median A and a lower than in survivors (Table 1). On day 1 E/e’ (13 vs 10, p = 0.05), LA volume (31 vs 24 m3, p = 0.047) and SOFA (13 vs 10, P = 0.005) were significant more in non-survivors vs survivors. Over the 7-day observation period E and A increased significantly (p < 0.05) in all patients but none of the other diastolic LV function parameters did. MAP and CCI increased and norepinephrine dose decreased significantly (p < 0.05) in all patients but none of the other pressure-related parameters did. MAP and CCI increased and norepinephrine dose decreased significantly (p < 0.05) in all patients but none of the other pressure-related parameters did.

Conclusions: LV diastolic function parameters differed significantly between survivors and non-survivors despite only modest temporal changes in particular assessment of LV filling pressures early and throughout the study period seem clinically important in these patients.

Variable
Survivors (n=31)
Non-survivors (n=13)
P
E (cm/s) 95 (79.5-115.5) 114 (103.5-127.5) 0.004
A 69 (65.9-115.5) 61 (54-79.5) 0.040
E/A 1.2 (0.9-1.4) 1.9 (1.5-2.2) 0.002
DT (ms) 165 (143-190) 180 (155-180) ns
E (cm/s) 9.1 (8.0-10.5) 9.4 (6.3-11.8) ns
a (cm/s) 9.7 (8.0-12.0) 7.1 (6.2-8.0) 0.011
Ee 10 (7.9-12.7) 12.4 (9.8-18.0) 0.021
La volume (mL/m2) 26.0 (22.9-30.3) 28.0 (24.0-39.0) ns
SOFA 7 (5.9-9.2) 8 (7.1-14.2) 0.038

Median value (day 1-7) for survivors vs non-survivors of 28-day mortality.

P431
Comparison of incident patients with pulmonary hypertension and risk factors for left heart disease according to their haemodynamic profile: a retrospective study
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Purpose: Many patients with pulmonary hypertension (PH) present for the first time with risk factors (RF) for left heart disease (LHD) such as systemic hypertension (SH), diabetes mellitus, atrial fibrillation (AF), coronary artery disease, obesity and mitral or aortic valve disease. The purpose of this study was to identify the patients’ features that may discriminate between PH associated with LHD (PHLHD) and pulmonary arterial hypertension (PAH).

Methods: This is a retrospective study of all consecutive incident patients with PH investigated at a single centre. We selected those who had at least one of the above RF. All patients underwent cardiac catheterization. We divided our patients into two groups: Group 1 included patients with PAH and Group 2 with PHLHD. In both groups we compared various data.

Results: Group 1 included 93 and Group 2 109 patients. The difference in demographic, electrocardiographic and haemodynamic data are shown in Table 1.

Conclusions: The presence of 3 or more RF for LHD and especially SH and AF, as well RVH and on ECG can help to differentiate patients with PHLHD from those with PAH, before cardiac catheterization.

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P432
Cardiac adaptation to deconditioning after 5-days of head-down bed-rest: a Doppler-echocardiographic study
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Purpose: Cardiac deconditioning is a risk factor for cardiovascular disease. The physiology of cardiac adaptation to deconditioning has not been well elucidated. The purpose of the present study was to assess the effects of 5-days of strict head-down (4 degrees) bed-rest (BR) deconditioning on cardiac dimensions and function measured by echocardiography and Doppler.

Methods: Twelve healthy men (mean age 33 ± 7) were enrolled; the experiment was conducted at MEDES (Toulouse, France) as part of the European Space Agency BR studies. Transthoracic 2D and 3D echocardiography (E33, Philips) was performed (X3-1 and 55 probes) before (PRE), the last day of BR (HDT5), and three days after the BR conclusion (POST).

Results: All HDT5, significant reductions in left ventricular (LV) mass (18%) end-diastolic volume (12%) and stroke volume (13%) were seen, together with a significant reduction (33%) in left atrial volumes. Accordingly, the aortic flow mean velocity resulted decreased (7%), as well as the mitral flow E velocity (18%) and the pulmonary flow peak S velocity (11%). At POST, all parameters returned to their respective control values.

Conclusions: Despite the short-term BR, cardiac adaptation to deconditioning affected LV mass and dimensions, as well as the left atrium and pulmonic, mitral and aortic flow velocities. This should be taken into account in patients with cardiovascular diseases, when immobilized in bed, to properly adjust the pharmacological therapy in order to avoid further complications.

Variable
PRE
HDT5
POST
LV mass (g) 136 (22) 110 (21)* 147 (24)
End-diastolic 3D volume (mL) 126 (22) 110 (24)* 122 (24)
End-systolic 3D volume (mL) 38 (12) 33 (11) 36 (11)
3D Stroke volume (mL) 88 (14) 76 (16)* 87 (19)
3D EF (%) 70 (5) 71 (5) 71 (7)
LA volume (mL) 39 (13) 26 (11)* 31 (7)
Mittal flow E velocity (cm/s) 83 (21) 67 (18)* 89 (16)
Mittal flow A velocity (cm/s) 51 (9) 48 (9) 49 (10)
Aortic flow mean velocity (cm/s) 89 (11) 83 (6)* 88 (9)
Pulmonic flow S velocity (cm/s) 57 (11) 50 (9)* 54 (8)

*: p<0.05 vs PRE (one-way Anova for paired data and Tukey test)
Our experience revealed that while LAA occlusion is a safe and successful strategy, full anticoagulation should be undertaken for the first three months following implantation. The device, is insufficient in preventing device-related thrombus formation. We suggest that full anticoagulation should be undertaken for the first three months following implantation.

P433
Thrombus on left atrial appendage occluder device: periprocedural caution

Introduction: Atrial fibrillation (AF) is associated with up to 20% of ischemic strokes, with the left atrial appendage (LAA) being the main source of thromboemboli. LAA closure has therefore been shown to be an effective strategy for thromboprophylaxis. However, the need for periprocedural anticoagulation following LAA occlusion is often complicated by the, often, significant anticoagulation risk in the population undergoing LAA occlusion. We therefore wished to determine the efficacy of low dose Dabigatran (110mg BD) strategy in preventing thrombus formation following LAA occlusion.

Methods: Thirty-three patients (27 men, 8 women; mean age 74.5 ± 8.0 years) were treated with non-valvular AF, at high risk for cardioembolic stroke (mean CHA2DS2-VASc score 3.6 ± 1.8) and complications of oral anticoagulation, underwent percutaneous LAA closure using the WATCHMAN device. All procedures were performed with fluoroscopy and transoesophageal echocardiography (TOE) guidance. Follow-up included clinical and echocardiographic review within 45 days.

Results: The LAA was successfully occluded in 31 patients (97.1%). In 4 cases, device insertion was abandoned due to unsuitable appendage anatomy. The mean device size was 24.6 ± 3.8 mm. All procedures were uncomplicated and had no residual flow post WATCHMAN insertion. Due to significant risk of bleeding with anticoagulation, 15 patients were commenced on low dose dabigatran (110mg BD) rather than a full anticoagulation strategy. The six-week follow up TOE demonstrated mobile thrombus on the atrial side of the device in four patients treated with low dose dabigatran. These patients were therefore commenced on full anticoagulation. Subsequent TOE demonstrated full resolution of the thrombus in all patients. No thrombus was demonstrated in the patients who received warfarin or full dose dabigatran anticoagulation.

Conclusion: Our experience revealed that while LAA occlusion is a safe and successful procedure, the practice of low dose dabigatran therapy, before endothelialisation of the LAA, is insufficient in preventing device-related thrombus formation. We suggest that full anticoagulation should be undertaken for the first three months following implantation.

P434
Evaluation of left atrial appendage function and thrombi in patients with atrial fibrillation: from transthoracic to real time 3D transoesophageal echocardiography

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The detection of source of embolism in atrial fibrillation (AF) is important to guide anti-coagulant therapy, especially in patients at moderate/high embolic and hemorrhagic risk. The differential diagnosis between thrombi or pectinate muscles in the left atrial appendage (LAA) sometimes can be difficult, when performing 2D transoesophageal echocardiography (TEE). Moreover, with 2DTEE some side lobes of the LAA can be poorly detected (blind area), missing some small thrombi or localized LAA dysfunction.

Purpose: To study with transthoracic echocardiography (TTE) atrio auricular dysfunctions in patients with AF and to compare it with TEE emptying velocities (LAAeV) and the gold standard of real time 3D transoesophageal echocardiography (RT3DTEE).

Methods: The study protocol approved from the ethic committee and co-financed by a grant from Cassa di Risparmio di Puglia foundation, included 93 pts (60 males, age 67.1 ± 14.2 y, range 35-84) with persistent (59) or permanent (34) AF and a moderate to high embolic (CHA2DS2-VASc 4 ± 1) and hemorrhagic risk (HASBLED 2.3 ± 0.9). For the detection of thrombi and the study of LAA function we performed a TTE and a RT3DTEE (K7-ET probe, Philips) within 24 hours between each other. A previously described M-mode TTE sign was used to determine the thickening of LAA medial, index of LAA contraction.

Results: LAA visualization with TTE Mmode was obtained in 89/93 patients (96%), while LAAeV at TTE was well defined only in 59/93 patients (63%). With TEE a LAAeV was obtained with a good quality in all pts in 2D and RT3DTEE, with a optimal correlation of LAAeV (r=0.91); 49/93 (53%) patients showed dysfunctions LAA (LAAeV<50 cm/sec) in 28/30 patients (sensitivity 93%) with dysfunctions LAA and a visible tracking (30/49). The TTE Delta was visible and 0.25 in 47/49 patients (sensitivity 96%) with dysfunctioning LAA at TEE. The linear correlation between TTE delta and TEE LAAeV was very good in the 90 patients (r=0.91). A thrombus was observed at 2DTEE with certainty in 8/93 pts (8.6%). In 4 cases with uncertainty about the diagnosis at 2DTEE, the addition of RT3DTEE imaging managed to discriminate with certainty the presence of only pectinate muscles in 4 pts and a small apical thrombus in the other patient.

Conclusions: TTE Mmode delta is a sensitive sign of LAA function, when compared to 2DTEE. The analysis of LAAeV at RT3DTEE is feasible and accurate. RT3DTEE showed an additional diagnostic capability in the differential diagnosis of selected cases of suspected LAA thrombi.
Role of transesophageal echocardiography in the diagnosis and treatment of patients with stroke.

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Background and aim: Strokes are the third cause of mortality in our environment and are a major cause of disability. Most are ischemic and 20% of cases are cardioembolic. The aim of our study is to analyze the diagnostic findings on transesophageal echocardiography (TEE) in patients referred from Neurology’s department with cardioembolic stroke diagnosis and to study their influence on the therapeutic approach.

Methods: We retrospectively analyzed TEE performed at our institution during two consecutive years (2010-2011) to patients with cardioembolic stroke. We value diagnostic profitability and if the findings modified the treatment of patients.

Results: A total of 800 patients were referred for transesophageal echocardiography and in 93 patients the TEE was also made, which constitute the study sample. The following clinical features were presented: 42% female (38 patients) with mean age 50.5 ± 15 years, and presence of hypertension (33%), diabetes mellitus (16%), dyslipidemia (28%), smoking history (48%) and atrial fibrillation (9.7%). In 33% of cases the TEE showed findings not previously diagnosed by transthoracic echocardiography, including foramen ovale (PFO) in 13 patients (14%), cardiac masses in 5 patients (5.4%), aortic plaques in 7 patients (7.5%) and endocarditis in 6 patients (6.5%). The TEE did not modify the therapeutic approach of aortic plaques or the FOP (continue anti-platelet therapy), but it had therapeutic implications in the cardiac masses (myxoma and thrombi) and endocarditis (antibiotic treatment and surgery).

Conclusions: Although TEE did not modify the therapeutic approach in a high percentage of patients, it was essential for the diagnosis of cardiac masses and endocarditis, especially if there is a previous high clinical suspicion. The yield of TEE is low but it is essential for the diagnosis of certain entities, as it is shown in our study.

STRESS ECHOCARDIOGRAPHY

Effect of age on normal ranges of pulmonary artery pressure at peak treadmill exercise

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Background: Treadmill stress echocardiography (TSE) is frequently used for the assessment of dyspnea on exertion. This study sought to explore the effect of age on the normal ranges of pulmonary artery pressure at peak treadmill exercise.

Methods: Patients referred for TSE to rule out ischemia or for the evaluation of dyspnea on exertion underwent measurement of the right ventricular: right atrial (RV:RA) gradient pre and post exercise. RA pressure was estimated at 5mmHg unless there was evidence of IV dilatation or failure to collapse. Patients with moderate or greater stenotic or regurgitant valvular disease, baseline wall motion abnormalities or studies positive for inducible ischemia were excluded from the analysis.

Results: 128 patients met criteria and underwent TSE with pre and post measurement of RV:RA gradient. Pre-study RV:RA gradient was not obtained in 18 patients (14%) and post study RV:RA gradient was not obtained in 23 patients (18%). Estimated PA pressure pre and post exercise according to decade of life is presented in the table below.

Conclusions: Resting and peak pulmonary artery pressure can be measured in the majority of patients referred for TSE. Estimated peak PA pressure > 40 mmHg in non-trained patients under 70, and > 49 mmHg in patients 70 and over should be considered abnormal.

Correlation of traditional 2D speckle tracking echocardiography and AFI derived parameters of left ventricle global and regional function during dobutamine stress test

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Background: Speckle tracking echocardiography (STE) provides quantitative assessment of global and regional myocardial function beyond ejection fraction calculations and subjective visual evaluation of contractility. Classic analysis by STE, demanding manual tracing of left ventricle myocardium in consecutive apical views, is time-consuming whereas automated function imaging (AFI) offers faster and more convenient (connected only with selection of three points) assessment of longitudinal strain. Nevertheless correlation between both methods are not thoroughly examined in clinical settings especially during induced tachycardia on peak stage of dobutamine stress echocardiography (DSE).

Methods: We performed DSE in 238 patients (pts) with recording of apical views (2ch, 3ch, 4ch- 2, 3 and 4 chamber respectively) during baseline (0) and peak (1) DSE stage and analysed them on working station by STE and AFI methods. According to angiography 127 pts had significant (above 70%) lesions in coronary arteries. We assessed correlations between STE and AFI derived peak systolic longitudinal strain (SLS) for global (averaged from 18 segments) and regional (in each segment) rest and stress parameters.

Results: Global SLS measured during baseline and peak stage of DSE by AFI showed very good correlation with classical STE parameters with correlation coefficients r=0.90 (Figure) and r=0.86 respectively, p<0.0001. For regional parameters measured in middle segments of left ventricle correlation coefficient ranged from 0.83 to 0.86 for baseline and from 0.70 to 0.79 for peak parameters.
Conclusions: Global and regional longitudinal strain parameters achieved by fast and less operator-dependent AFF method correlates well with classic more time-consuming STE during baseline and peak stage of DSE.

P440 Low-dose dobutamine stress echo for reverse remodeling prediction after cardiac resynchronization
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Cardiac resynchronization therapy (CRT) is a valuable option for patients with heart failure and wide QRS to reduce electromechanical dysynchrony (DYS). High non-responder rate (30%) urges the need to improve patients selection. We hypothesized that low-dose dobutamine stress echo (DSE) can help unmask dysynchronous motion and the aim of the present study was to compare dysynchrony index at rest and during low-dose dobutamine stress to predict left ventricular reverse remodeling after CRT. Prospectively, 57 consecutive patients (37 male), aged 61.8 ± 9 qualified for CRT according to current guidelines were enrolled. 2D echocardiography and tissue Doppler imaging (TDI) were performed before and after 6 month from CRT to assess reverse deformity (rLV). Additionally low dose dobutamine-stress echocardiography (DSE) was performed before CRT. DYS was assessed at rest and peak DSE separately, as a difference between T2 of septum and lateral wall (DYSr), T2. T2 was corrected for heart rate. rLV defined as decrease ≥15% of LVESD at follow-up was found in 39 (67%) of patients. DYSr and DYSd were independent predictors of rLV (OR=1.04, CI: 1.01-1.07, p<0.002; OR=1.05, CI: 1.03-1.08, p<0.002 respectively). ROC analysis found that DYSr ≥45ms and DYSd ≥55ms had sensitivity of 70% and 87%, specificity of 61% and 78%, accuracy of 70% and 84% respectively for prediction of rLV. AUC for DYSr was higher than for DYSd (0.89 vs 0.71 p<0.007).

Conclusion: Exercise intraventricular dysynchrony assessed by dobutamine stress echo is a strong independent predictor of cardiac resynchronization therapy response.

REAL TIME THREE DIMENSIONAL ECHOCARDIOGRAPHY

P441 Left ventricular mass by novel automatic 3D echocardiography analysis in patients with hypertrophic cardiomyopathy
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Introduction: Left ventricular mass (LVM) measurement by manual tracing, using 3D echocardiography was shown to be highly accurate compared to LVM measured by magnetic resonance imaging (MRI). LVM by pre-release eSIE Mechanics (Siemens Ultrasound, Mountain View, CA) is a new software used in transesophageal 3D echocardiography with automatic analysis. Considering that LVM is a sensitive predictor of outcome in patients with hypertrophic cardiomyopathy (HCM), we aimed to assess the feasibility of LVM by eSIE Mechanics analysis in patients with HCM.

Methods: 42 patients with diagnosis of HCM confirmed by MRI were included in this study. 2D and 3D transthoracic echocardiography (ACUSON SC2000TM, Siemens Medical Solutions USA Inc.) was performed on all patients. Automated full-volume acquisition was used for 4-chamber, 2-chamber and 3-chamber cropped view was provided with user optimization capabilities. Endocardium and epicardium automatic tracing was performed at end-diastole in one full volume of one-heartbeat acquisition per patient. The contours were subsequently recognized in all frames and the peak LVM estimated. All analyses were performed offline. Measurement of LVM by MRI was performed in a 3-Tesla MRI scan, using the Simpson’s method.

Results: Among the 42 patients, 3 (7.1%) were excluded for poor 3D echocardiography window. A significant correlation was obtained between 3D (r=0.75, p<0.01) and 2D (r=0.49, p=0.005) echocardiography and MRI. Compared with 2D echocardiography, automated LVM 3D analysis achieved a significantly higher agreement with the results of the MRI (3D: 201.5 ± 77.3 g: 2D: 212.5 ± 116.2 g; versus MRI: 192.0 ± 88.2 g). Mean interobserver variability was 1.8 ± 1.4g for automatic 3D LVM measurement.

Conclusion: LVM performed by eSIE Mechanics analysis is feasible and accurate in patients with HCM. This can be an alternative to MRI for serial monitoring and risk assessment in this group of patients.

P442 Assessment of volumes and myocardial deformation properties of the normal right ventricle in young people by three-dimensional echocardiography and speckle tracking
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Background: Right ventricular (RV) function plays an important role in determining cardiac symptoms in several diseases. It has been demonstrated that the new imaging modality of three-dimensional echocardiography (3DE) is interchangeable to cardiac magnetic resonance in reproducibility and accuracy. Speckle Tracking is a sensitive tool to quantitatively assess regional deformation properties.

Purpose: to obtain normal reference ranges for RV volumes, RV EF, by 3DE (TomTec) and RV deformation properties by Speckle Tracking and intra and inter-observer reliability.

Methods: 60 subjects, 32 males and 28 females, aged 25 ± 7 yrs, without any cardiovascular disease, were included. By 3DE we measured RV maximum and minimum volumes by tracing RV endocardial borders during enddiastole (largest RV volume) and end-systolic (smallest RV volume) phases, in apical 4-chamber, short-axis, and coronal views. Volumes were indexed for body surface. By Speckle tracking we measured 2D longitudinal systolic RV Strain (S) and Strain rate (SR) in apical-4-chambers view, at level of RV free wall (basal, medium and apical segments). A reproducibility study was performed to compare the intra and inter-observer variability. Results: We have reported reference ranges in young people for volumes and EF (3DF RV end-diastolic: 33 ± 11ml/m²; end-systolic volume:16± 6ml/m²; 3DF RVEF: 67 ± 8%). RV systolic 2D S values in young people were for apical segment – 24.59 ± 4.8%, for medium – 29.69 ± 4.78%, for basal -30.1 ± 5.88% and RV systolic 2D SR were for apical – 1.44 ± 0.25 S-1, for medium: – 1.78 ± 0.37 S-1, for basal: – 2 ± 0.4 S-1. Inter and intraobserver variability coefficients were 8% and 7% for 3D volumes and 6% and 4% for 3-SR measurements, respectively.

Conclusions: The present study provides normal reference values for RV volumes and RVEF by 3DE and normal longitudinal RV deformation values in young people. 3DE is an alternative imaging modality for quantification of RV volumes and EF, showing improved accuracy and lower interobserver and intraobserver variability compared to 2D echocardiography; it overcomes the limitations due to the complex anatomy of the RV.

P443 Comparison between left atrial appendage size measured with 2D and 3D echocardiography
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Purpose: Percutaneous left atrial appendage (LAA) closure has emerged as an alternative to oral anticoagulation for prevention of thromboembolic stroke in patients with non-valvular atrial fibrillation (NVAF). One of the significant steps of this procedure is to correctly measure the LAA size to choose the suitable device. The purpose of this study was to assess whether there are differences between the measures with transeosophageal echocardiography (TEE)bidimensional (2D) and TEE tridimensional (3D).

Methods: From November 2010 to January 2011 245 patients underwent TEE. TEE with both 2D and 3D images of the LAA were selected. Measurements of the maximal diameter of the output orifice (OO) and the depth (D) were done on 2D images. The area of the output orifice in 2D TEE was calculated with the diameter assuming a circular orifice. Using multiplanar reconstruction on 3D images, OO and D measures were obtained, as well as the area of the OO by planimetry. The resulting data were analyzed using t-student test.

Results: No statistically significant differences were found in the main variable on study (maximal diameter of the OO), nor in the D. The areas obtained do not significantly differ, which can be explained by the OO not being strictly circular.

Conclusion: There are no significant differences among 2D TEE and 3D TEE measures of the LAA. By 3D TEE we can reliably determine the LAA size to choose the device adequately.

P444 Myocardial deformation by 3D speckle-tracking echocardiography in hypertrophic cardiomyopathy and cardiac amyloidosis
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Background: Left ventricular (LV) hypertrophy due to hypertrophic cardiomyopathy (HCM) or cardiac amyloidosis (CA) results in an impairment of myocardial deformation. 3D speckle tracking echocardiography allows analysis of LV segmental and global deformation. The aim of the study was to analyze deformation parameters by 3D strain (S, %) in HCM and CA patients as compared to normal patients.

Methods and results: A complete echocardiography was performed in 31 healthy adults, (20M, mean age 55.6 ± 8.7 yrs) and 32 patients with non-hypertensive LV hypertrophy with preserved LVEF (20M, mean age 61.4 ± 14.1 yrs, 18 HCM and 14 CA). LV systolic deformation was assessed by 2D global LV longitudinal S (2DGLS) derived from 2D speckle analysis and by analysis of 3D strains. Values of 3D global LV area S (3DGAS), longitudinal S (3DGLS), circumferential S (3DGCS) and radial S

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Impact of mitral annuloplasty on aortic-mitral valvular coupling in mitral valve prolapse

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Purpose: Mitral (MA) and aortic annuli (AoA) are linked via fibrous tissue. Their functions are dynamically coupled, a phenomenon known as aortic-mitral coupling (AMC). Implantation of annular rings at mitral position may therefore affect both mitral and aortic annular dynamics. We aimed to study the impact of mitral annuloplasty on AMC in patients with mitral valve prolapse (MVP).

Methods: We studied 40 patients (31 men, age=59 years) with MVP and severe mitral regurgitation who underwent repair with rigid annuloplasty ring. Real-time three-dimensional transeosophageal echocardiography (RT3D-TEE) was performed pre-surgery and 6 months post surgery. 20 with ischemic mitral regurgitation (IMR) and 20 normal subjects were studied as controls. Custom software tracked MA and AoA in 3D space throughout cardiac cycle, allowing measurement of changes in mitral and aortic valve morphology.

Results: In normal subjects, MA and AoA areas changed reciprocally throughout cardiac cycle and aortic-mitral angle decreased during systole. In IMR, MA and AoA were dilated and reciprocal AMC was lost as MA became adynamic (p=NS systole vs diastole). Patients with MVP had dilated MA and AoA (p<0.05 vs controls) but reciprocal AMC and systolic contraction of aortic-mitral angle were preserved. After annuloplasty, both MA and AoA areas were reduced (p<0.05 vs pre-repair and normal controls) and became adynamic throughout cardiac cycle (p=NS systole vs diastole), and systolic contraction of aortic-mitral angle was significantly restricted (p<0.05 vs pre-repair and normal controls).

Conclusion: Mitral annuloplasty alters MA and AoA dynamics in MVP patients. These changes may be important for refinement of mitral reparative techniques and ring design.

TISSUE DOPPLER AND SPECKLE TRACKING

P445

Recurrency of ventricular arrhythmias after myocardial infarction: correlation with left ventricular function assessed by STI

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Background: A myocardial strain reduction by speckle tracking imaging (STI) can potentially be a direct indicator of non-viable myocardium and sudden cardiac death (SCD) risk and could help in identifying high-risk patients currently missed by left ventricular ejection fraction (LVEF) criteria. We aimed to compare strain data of patients with structural heart disease with and without ventricular tachycardia (VT) regardless of LVEF.

Methods: We studied 84 patients (pts) with previous myocardial infarction (age, 60 ± 14 years) scheduled for cardioverter-defibrillator (ICD) implantation. Forty-two pts had documented VT and 42 pts presented with no VT. Exclusion criteria were previous coronary artery surgery, moderate-severe or severe valve regurgitation, atrial fibrillation, and left bundle branch block. Left ventricular (LV) function and volumes were expressed as mean ± SD. *P<0.01 vs controls.

### Parameters (%) Control HCM CA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>HCM</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAS</td>
<td>-35.9±2.4</td>
<td>-27.1±5.2</td>
<td>-25.6±8.0</td>
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<td>2DGLS</td>
<td>-20.2±2.5</td>
<td>-13.0±3.9</td>
<td>-12.9±3.8</td>
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<tr>
<td>3DGLS</td>
<td>-31.3±2.3</td>
<td>-30.2±6.1</td>
<td>-11.2±4.6</td>
</tr>
<tr>
<td>3DGCS</td>
<td>-19.6±2.3</td>
<td>-17.9±3.9</td>
<td>-17.5±5.8</td>
</tr>
<tr>
<td>3DRGRS</td>
<td>59.5±7.1</td>
<td>42.1±11.2</td>
<td>40.4±18.7</td>
</tr>
</tbody>
</table>

Data are expressed as mean ± SD. *P<0.01 vs controls.

Conclusions: No statistical difference in LVEF and LV volumes was shown in pts with recurrent ventricular arrhythmias and those without VT. There were no differences in QRS and QTc duration or in standard global and regional LV function echocardiographic parameters between pts with or without VT occurring during follow-up. Multivariate analysis revealed that global (p=0.021) and posterior wall circumferential strain (p=0.006) were strong and independent predictors of the occurrence of arrhythmic events. The area under the curve (AUC) for QRS was 0.33 yielding a sensitivity and specificity of, respectively, 51% and 63% to predict arrhythmias and AUC for EF was 0.49 yielding a sensitivity and specificity of, respectively, 54% and 68%. AUC for posterior wall circumferential strain was 0.78 and the optimal cutoff value -6.4% for a sensitivity of 69% and a specificity of 88% in predicting arrhythmic events.

Conclusions: In patients with previous myocardial infarction scheduled for ICD therapy circumferential strain was the strongest predictor of spontaneous ventricular arrhythmias among other clinical and echocardiographic variables such as score index and LV function and volumes.

P447

The reduction in radial strain delay index predicts the response to CRT

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Purpose: Correcting mechanical dyssynchrony is proposed as one of the major mechanisms of benefit from CRT. Very early and late segmental contraction may not fully contribute to end-systolic function. Echocardiographic dyssynchrony measures as predictive parameters of CRT response have been disappointing. We evaluated a novel radial strain delay index (RSDI) to quantify reserve of wasted contraction, caused by dyssynchrony and segments of low amplitude strain or scar prior to CRT implantation, and gain of contractility following CRT, and relate our findings to response.

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Eur Heart J Cardiovasc Imaging Abstracts Supplement, December 2012

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Methods: 30 heart failure patients referred for CRT (NYHA III, QRS 146 ± 19ms, EF 22% ± 6.5, ischaemic aetiology60%) were tracked using speckle tracking radial strain as the sum of the difference between peak and end-systolic strain (%) across 12 (basal and mid) LV segments (figure). Response to CRT was defined as >15% reduction in end systolic volume (ESV).

Results: 50% of patients were classified as CRT responders. RSDI did not correlate with QRS duration (r=0.14). CRT responders had a greater baseline RSDI than non-responders (median 74% vs. 21.7% p<0.001). Reduction in RSDI correlated with reverse remodeling (15% reduction in ESV), r=0.43, p=0.03. In CRT responders the decrease in RSDI was more marked than in non-responders (33% reduction vs. 8% reduction p<0.001). In CRT non-responders no significant change in RSDI was observed between baseline and follow up studies (median 24.7% vs 27.7% p=0.1).

Conclusions: RSDI may provide a valuable tool for understanding the mechanism of CRT response. Recruitment of wasted energy appears to be related to LV remodelling after CRT. Evaluation in a larger population of patients is required.

Mathematical modeling of the myocardial LV

P448
A novel mathematical based software for modeling the left ventricular myocardium of hear
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Purpose: Currently, an echocardiogram presents the left ventricle (LV) of the heart based on images obtained from ultrasound methods. Utilizing mathematical equations, specific echocardiographic data may provide more detailed, valuable and practical information for physicians. In our project using appropriate mathematically based software, we have attempted to create a novel software capable of demonstrating LV model in normal hearts.

Methods: Echocardiography was performed on 70 healthy volunteers. Data evaluated included: velocity (radial, longitudinal, rotational and vector point), displacement (longitudinal and rotational), strain rate (longitudinal and circumferential) and strain (radial, longitudinal and circumferential) of all 16 LV myocardial segments. Using these data, force vectors of myocardial samples were estimated by MATLAB and LSDYNA softwares. Dynamic orientation contraction (through the cardiac cycle) of every individual myocardial fiber could be created by adding together the sequential steps of the multiple fragmented sectors of that fiber. This way we attempted to mechanically illustrate the global LV model.

Results: LV Myocardial modeling of the heart: Our study shows that in normal cases myocardial fibers initiate from the posterior-basal region of the heart, continues through the LV free wall, reaches the septum, loops around the apex, ascends, and ends at the superior-anterior edge of LV.

Conclusion: We were able to define the whole LV myocardial model mathematically based on echocardiography, by MATLAB software and LSDYNA software in normal subjects. This will enable physicians to diagnose and follow-up many cardiac diseases when this software is interfaced with echocardiographic machines.

P449
Improvement of left ventricular longitudinal strain following surgical revascularization of ischemic cardiomyopathy and left ventricular ejection fraction < 30%: a 3D and speckle tracking study
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Purpose: In the present study, we calculated longitudinal strain of the left ventricle before and after coronary artery bypass grafting. We hypothesized that speckle tracking would improve following surgical revascularization, in patients with ischemic cardiomyopathy and left ventricular ejection fraction (LVEF <30%).

Methods: 76 patients with triple vessel coronary artery disease were examined with 2- and 3-dimensional echocardiography along with speckle tracking of the left ventricle, before and 6 weeks after coronary artery by pass grafting (CABG). Demographics including bypass and cross clamp time, body mass index and risk factors were correlated with echocardiographic indices.

Results: Post CABG, there was improvement of diastolic filling (before: 1 ± 0.4 vs. After 1.2 ± 0.19, p<0.001). There was reduction of myocardial volumes and improvement of left ventricular ejection fraction (p<0.01), predominantly in the group of LVEF ≥ 30% (p=0.05). This study also demonstrates significant improvement of global longitudinal strain: before: -12 ± (-9) vs. after -14.7 ± (3), p<0.01. When the two groups were compared, there was significant improvement of longitudinal strain when compared to radial strain for the patients with LVEF ≤ 30% (difference of strain: longitudinal: 2.3 ± 0.9 vs. radial: 0.8 ± 0.2, p<0.01).

Conclusion: Surgical revascularization improves longitudinal strain of the left ventricle and ventricular remodelling. The new imaging modality of speckle tracking and more specifically longitudinal strain may focus the identification of patients who would benefit from surgical revascularization.
contraction. PreS was directly measured as peak positive strain after the P wave, SS as total shortening during systole. For each subject linear regression line was established through 18 segmental preS and SS values. Mean preS - SS relation was determined as an average slope and intercept over all subjects (i.e. two-step procedure). Intradomain semivariability of individual regression lines was tested in 10 randomly chosen subjects. Results: PreS and SS correlated closely in every subject (mean r=0,82). Mean intercept of regression lines was -10,67±3,19 (range -5,05-17,8), mean slope -1,45±0,28 (range -1,01-1,9) (fig). Individual intercepts could be reproduced with 19%, slopes with 12% relative error. Conclusion: High reproducibility of regression equations amongst individuals confirms that systolic strain depends on strain during systolic atrial contraction. A major part of systolic strain variability within the LV can thus be explained by segmental differences in diastolic stretch as a direct consequence of the FS mechanism.

P451 Left atrial systolic strain rate estimates pulmonary capillary pressure: a simultaneous echocardiography and cardiac catheterization study M. Heine1; S. Soderberg1; E. Tossavainen1; M. Heine2; P. Lindqvist2
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Background: Raised left atrial (LA) pressure is a common pathway for many pathologies and is known for its complications. It also has a direct effect on LA cavity size and overall systolic function. We hypothesized that raised LA pressure as shown by pulmonaty capillary wedge pressure (PCWP) correlates with severity of LA intrinsic systolic function.
Methods: We studied 46 patients, mean age 61 ± 13 years, 17 males, of various etiologies with exenrtional breathlessness who underwent right heart catheterization and simultaneous transthoracic Doppler echocardiography using spectral, tissue Doppler and speckle tracking echocardiography techniques for assessing LA structure and function.
Results: PCWP correlated with direct measurements of LA structure and function: LA volume (r=0,43, p<0,01), global LA systolic strain rate (r=0,79, p<0,001) and to a lesser extent with LA systolic filling fraction (r=0,52, p<0,001). PCWP also correlated with indirect measures of LA pressure: LV E/A (r=0,68, p<0,001), E wave deceleration time (r=0,54, p<0,001), lateral E’ (r=0,49, p<0,001) and LV isovolumic relaxation time (r=0,36, p<0,01). LA strain rate was 78% sensitive and 84% specific in identifying patients with PCWP > 15 mm Hg, having accurately predicted PCWP in 63% of the cases.
Conclusion: PCWP correlates with LA intrinsic systolic function and to a much lesser degree with indirect Doppler measures of raised LV filling pressures. These findings should have significant clinical implications in identifying breathless patients with raised LA pressure.

P452 The impact of residual left ventricular morphology on right ventricular mechanics in hypoplastic left heart syndrome H. Bellsham-Revell; AJ. Bell; OI. Miller; JM. Simpson
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Purpose: There is a wide spectrum of residual left ventricular (LV) morphology in hypoplastic left heart syndrome (HLHS) ranging from a barely discernible or slit like LV to a hypertrophied, globular LV. This residual LV alters the right ventricular (RV) geometry and is likely to impact on RV mechanics.
Methods: Strain analysis using a novel technique (chords placed along the RV free wall (FW) and septum in a standard 4 chamber view) and speckle derived tricuspid annular displacement (point placed either side of the tricuspid annulus) were measured in patients with HLHS (32 slit like LV, 42 globular LV). The FW and septal values were compared within each patient as well as between the two patient groups.
Results: Septal strain was significantly reduced compared to the RV FW in both groups – this was more marked in the globular LV group seen in figure 1 (slit like LV -19.6 and -14.4 versus globular LV -19.0 and -7.2). Tricuspid annular displacement was also greater on the RV FW than the septum in both groups.
Conclusions: Residual LV morphology affects septal strain and motion. This may in turn affect ventricular efficiency and tricuspid valve function and merits further investigation.

P453 Evaluation of the left ventricular regional function using two-dimensional speckle tracking echocardiography in patients with end-stage renal disease with preserved left ventricular ejection fraction E. Ateken1; M. Kucuk1; A. Yanikoglu1; S. Karakas1; A. Er2; D. Ozel2; C. Ermis1; I. Demiri1
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Purpose: It is known that patients with end stage renal disease (ESRD) more frequently develop a wide range of left ventricular (LV) structural and functional abnormalities. The aim of our study is to evaluate the left ventricular regional function using two-dimensional speckle tracking echocardiography (2D-STE) in ESRD patients with pre- served left ventricular ejection fraction (PLEVFE) undergoing haemodialysis treatment.
Methods: For the purposes of our study, 61 healthy individuals and 87 ESRD patients were enrolled. Using the 2D-STE method, the strain (S) and strain rate (SRS: systolic, SRE; early diastolic, SRA; late diastolic) values belonging to the radial (R), circumferential (C), longitudinal (L) functions of the LV have been measured and the SRE/L values were calculated.
Results: While the LVFE (64.39 ± 5.7 vs 65.49 ± 3.95, p=0.033; RS=45.17 ± 17.28 vs 53.97 ± 14.29, p=0.001; LS=-19.71 ± 3.1 vs -20.31 ± 2.1, p<0.001; RSRE/A =1.155 ± 0.85 vs 2.04 ± 0.96, p=0.001, LSRE/A =1.42 ± 0.51 vs 1.88 ± 0.7, p=0.001) values in the ESRD group were found to be lower than the healthy control group, no difference was observed in terms of the CS (19.42 ± 7.14 vs 18.57 ± 4.12, p=0.155) and CSRE/A (2.5 ± 1.34 vs 2.56 ± 1.35, p=0.689) values. The CS was observed as an independent predictor related to the LVFE (r=0.32, p=0.003; LS=0.126-0.207, p=0.005).
Conclusion: In patients with ESRD, although the longitudinal and radial systolic functions are reduced, the LVFE may remain within normal limits due to the preservation of the circumferential functions. 2D-STE has the potential to detect the severity of uremic cardiomyopathy in the early stages of the disease and might provide useful information for the risk stratification in ESRD patients with PLEVFE.

P454 Disturbed Left atrial function in idiopathic pulmonary hypertension MARK. Heine1; S. Soderberg1; M. Heine2; P. Lindqvist2; G. Bajraktari2
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Purpose: Despite the right and left atria (LA) share the circumferential fibres the two individually support two individual ventricles. Evidence exists supporting atrial interaction in patients with both right and left ventricular (LV) outflow tract obstruction. We therefore hypothesized that the LA function is affected in patients with pulmonary arterial hypertension (PAH).
Methods: We studied LA size and reservoir function in 35 patients (age 63 ± 15 years, 16 male) with idiopathic PAH using speckle tracking echocardiography who also underwent right heart catheterization simultaneously to assess pulmonary artery systolic pressure (PASP), and compared them with 27 age and gender normal controls.
Results: In IPAH patients, LA longitudinal diameter was not different from controls but transverse diameter was reduced (3.0 ± 0.6 vs. 3.7 ± 0.5cm, p<0.001). LA lateral wall strain rate (SR) during LV systole (atrial reservoir function) was reduced at annular (p<0.001) and mid cavity (p<0.01) levels as were septal segments (p<0.03, for both) compared to controls. Opposite to controls, the two LA walls responded differently to heart pressures. Left SR inversely correlated with pulmonary artery systolic pressure (PASP) (annular: r=0.45, p<0.005 and mid-cavity: r=-0.43, p<0.01), but not with right atrial pressure (RAP). In contrast, septal SR inversely correlated with RAP (annular: r=-0.39, p=0.02 and mid-cavity: r=-0.38, p=0.03).
Conclusion: In patients with PAH, left atrial reservoir function is significantly impaired showing reduced strain rate. Also, segmental function differ in their response to raised right heart pressures with the septal wall related to right atrial pressure and lateral wall related to the PASP. These findings suggest an evidence for atrial interaction in PAH, which is likely to have significant impact on LV performance.

P455 Abnormal cardiac mechanics in children with heterozygous familial hypercholesterolemia G. Di Salvo1; L. Baldini2; F. Del Gaizo2; A. Reali2; V. Pergola1; P. Caso2; G. Piccioli2; B. Padel1; R. Calabrò2; MG. Russì2
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Background: So far there are few data on cardiac morphology and function in familial hypercholesterolemia (FH) children. Speckle tracking echocardiography (STE) has been added to our capabilities and has been proposed as an index of myocardial deformation property. FH children represent a unique clinical model to assess the effect of the pure hypercholesterolemia on cardiac morphology and function, excluding the effect of co-morbidities.
Aim: Thus, we sought to define in FH children the preclinical effects of isolated hypercholesterolemia on the cardiovascular system, by examining left ventricular (LV) function using the more sensitive STE.
Methods: In all we prospectively studied 90 children (45 FH children and 45 controls, mean age 11 ± 3 years).

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Results: FH children showed thicker LV walls and significantly increased LV mass indexed for height 2.7 (p=0.0008) and for body surface area (p<0.0001). LV ejection fraction was similar between groups. The diastolic evaluation demonstrated a prolonged deceleration time (p<0.0001), a reduced early diastolic mitral annular velocity (p=0.0001), and higher transmitral early diastolic diastolic mitral annular velocity ratio (p=0.0003) in FH children. Longitudinal and circumferential myocardial deformations of the LV were significantly reduced in FH children (p<0.0001). Radial deformation was increased in FH children (p=0.039).

Conclusions: This study demonstrated that already during childhood hypercholesterolemia is responsible of significant LV morphological and functional differences when compared to healthy children. Of interest, a decreased longitudinal and circumferential deformations are compensated by increased radial strain in FH children with normal LV ejection fraction. Our study raises the question of the clinical importance of these findings, and may suggest the need for a cholesterol lowering therapy. However, the potential benefits and risks of such a treatment at this age need to be addressed in longer term studies.

P456 Myocardial mechanics are different between septal and apical hypertrophic cardiomyopathy
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Background: Regional myocardial mechanics in patients with septal and apical hypertrophic cardiomyopathy (HCM) is not well known. The aim of this study is to define the difference in regional mechanics in two different patterns of HCM.

Methods: Sixteen patients with HCM (8 with apical HCM, 8 with septal HCM) were included. Myocardial mechanics were assessed using 2-dimensional speckle tracking echocardiographic measurement of myocardial strain and strain rate at the 16 segments of left ventricle.

Results: Compared with patients with septal HCM, those with apical HCM had higher LV radial strain and rotation at the basal segments (63.5±39.5 vs 39.5±16.8, p=0.015; 8.94±7.57 vs 7.97±5.76, p=0.038, respectively). Interestingly, radial strains were increased at the hypertrophied or adjacent segments (septal, anteroseptal and anterior wall), however, rotations were increased at the non-affected segments (inferior, posterior and lateral segments). Circumferential and longitudinal strains were not different between both groups at any segment.

Conclusions: The mechanical properties of HCM were different according to the pattern of hypertrophy. The clinical implication of the difference is needed to evaluate in future with large population.

P457 The effect of pacing mode on left ventricular strain, twist and coronary flow parameters
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Purpose: Right ventricular (RV) apical pacing (P) may induce detrimental effects on left ventricular (LV) function and coronary flow. In this study the effect of pacing mode on cardiac mechanics and potential changes on coronary blood flow were evaluated.

Methods: The study included 23 patients who have received DDD pacemaker for sick sinus syndrome or atrio ventricular block syndrome. All patients had their pacemaker lead placed in the RV apex. Patients underwent a complete thorascopic echocardiographic examination while in sinus rhythm and subsequently underwent non-invasive Doppler assessment of coronary flow in the LAD and spackle tracking echo of basal and apical short axes planes during AAI, DDD and VVI P mode for 5 min with 5 min intervals in sinus rhythm. Rotation of the base and apex, twist, untwist velocity and circumferential strain were measured.

Results: Rotation of the base was significantly decreased in DDD and VVI P compared to AAI P (7.07±2.70 vs -5.48±3.47°, p=0.016 in AAI, DDD, VVI P respectively) as well as LV twist (18.29±4.27° vs. 14.67±5.26°, 15.55±4.34°, p=0.02). Apical rotation, peak untwist velocity and circumferential strain did not change significantly. Flow in the LAD, expressed as velocity–time integral, decreased significantly in DDD and further more in VVI P (10.36±2.38 cm vs. 9.47±2.57 cm vs 9.23±3.40 cm, p=0.038). LAD flow correlated significantly with basal rotation (r=0.43, p=0.01) only when patients were paced from the RV apex (DDD & VVI P).

Conclusions: The prognostic value of normal stress cardiac MRI in patients with known or suspected coronary artery disease: a meta-analysis
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Background: Multiple prognostic studies have shown that stress cardiac magnetic resonance (CMR) may be applied for the risk stratification of patients with known or suspected coronary artery disease. This study pools data from published series examining the prognostic value of normal stress CMR defined as the absence of inducible perfusion defects (PD) and/or the absence of inducible wall motion abnormalities (WMA).

Methods: We searched the PubMed, Cochrane and DARE databases between January 1985 and April 2012, and reviewed bibliographies of the obtained articles. We included prospective and retrospective cohort studies of subjects who underwent stress CMR for known or suspected CAD, reporting data on primary outcomes of myocardial infarction (MI) and cardiac death with at least 3 months of follow-up. Secondary outcomes of unstable angina (UA) and/or revascularization procedures (RP) were abstracted when provided. The risk-adjusted relationship between absence of PD and/or absence of WMA and event-free survival was assessed by meta-regression.

Results: Of 446 identified studies, 12 met inclusion criteria. The negative predictive value for MI and cardiac death of the absence of myocardial ischemia was 98.3% (95% confidence interval [CI] 97% to 98%) over a median follow-up of 24 months, resulting in estimate event rate after negative test equal to 1.7% (95% confidence interval [CI] 1.25% to 2.3%). The corresponding annualized event rate was 0.9% per year. In subgroup analyses, annualized event rates were 0.7% for perfusion studies and were similar for studies that considered absence of inducible WMA (equal to 1.2%). For secondary events, stress CMR had annualized event rates of 1.5%.

Conclusions: Stress CMR has a high negative predictive value for primary and secondary cardiac events. The absence of PD and the absence of WMA show similar ability to identify low-risk patients with known or suspected CAD.

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index Qh showed good agreement with SPECT: sensitivity 0.82, specificity 0.83, accuracy 0.82.

Conclusions: Quantitative 3D analysis of regadenoson stress MDCT images allows the evaluation of myocardial perfusion in good agreement with SPECT. The use of index Qh results in better differentiation between normally and abnormally perfused segments than the raw x-ray attenuation, allowing automated detection of stress-induced perfusion abnormalities.

P460
Left atrial volume index during ventricular diastasis assessed by cardiac computed tomography is an incremental predictor of adverse events: a matched control study
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Purpose: Computed tomographic (CT) coronary angiography (CTA) is increasingly being accepted as a key diagnostic modality for the non-invasive detection of coronary artery disease (CAD). To minimize patient radiation exposure prospective-ECG gated image acquisition algorithms are being increasingly used whereby image acquisition is restricted to ventricular diastasis when cardiac motion is at a minimum. However, this leads to the loss of the LAVI (LV and left atria) functional parameter. Previous studies have shown that assessment of LA volume index (LAVI) has incremental prognostic value in CAD patients. However, prognostic value of LAVI during ventricular diastasis has never been investigated before. The objective of the present study was to determine the prognostic ability of LAVI assessed during ventricular diastasis in predicting adverse events.

Methods: The Cardiac CT Registry data base at the University of Ottawa Heart Institute was queried and 101 patients (constituted test population) with adverse events (all-cause mortality and troponin positive acute myocardial infarction) on follow up were identified. A matched control list (matched according to the Marise score: the score based on clinical findings) of 101 patients (constituted control population) with no adverse events on follow up was also generated from the same registry. Images were reconstructed at the 75% phase (mid diastasis) and LA volume index (LAVI: LA volume indexed to body surface area) was calculated in both groups. Prognostic value of LAVI was assessed for both univariable and multivariable associations with all-cause mortality and acute myocardial infarction as combined end point using Cox proportional hazard models.

Results: Baseline characteristics of the test and control populations were similar. The mean follow up duration was 20 ± 12 months. LAVI was significantly larger (118.68 ± 40.24 vs 100.27 ± 27.93; p=0.0002) in patients who experienced adverse events on follow up. LAVI was both univariable (p=0.001) as well as multivariable predictor (p=0.001) of adverse events on Cox regression analysis.

Conclusions: Patients experiencing adverse events (all-cause mortality and troponin positive acute myocardial infarction) on follow-up have significantly larger LAVI during ventricular diastasis. LAVI assessed during ventricular diastasis by CT is an incremental predictor of adverse events. This additional prognostic information from existing prospective ECG-gated CTA data sets may be provided to clinicians.

P461
Identification of right ventricular dysfunction in patients with acute pulmonary embolism with multivariate regression of computed tomography measurements
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Purpose: Right ventricular dysfunction in the course of acute pulmonary embolism (PE) is associated with increased risk of mortality and the patients require more aggressive treatment. Thus, the purpose of the study was to calculate a multivariate model for identification of right ventricular dysfunction (RVD) in patients diagnosed with computed tomography pulmonary angiography.

Methods: 110 consecutive CTPA studies of patients with confirmed acute pulmonary embolism and echocardiographic measurement of pulmonary artery systolic pressure (PASP) were retrospectively analyzed. Patients were divided into groups with and without RVD basing upon PASP. Severity of PE was graded with the pulmonary obstruction score. Short axis CT measurements of heart chambers and diameters of mediastinal vessels were performed; position of interventricular septum and contrast reflux into IVC were analyzed. Stepwise logistic regression was used to calculate the multivariate model of RVD probability. Performance of the calculated model was compared with the single parameters by comparison of ROC curves.

Results: The parameters used in the model include pulmonary obstruction score, short axis diameter of right ventricle and diameter of inferior vena cava. The model is characterized by 79% sensitivity and 81% specificity. Odds ratio of RVD for particular parameters were also calculated.

Conclusions: The performance of the multivariate model was significantly better than single CT-based measurements, which proves the feasibility of this model for identification of RVD by means of CT pulmonary angiography.

MISCELLANEOUS
P462
High resolution epicardial ultrasonography in coronary artery surgery: an integrated intraoperative approach with transit-time flow measurement
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Objective: Transit-Time Flow Measurement (TTFM) has gained credit during last two decades as easy and reliable method to verify coronary grafts intraoperatively. ESC/EACTS guidelines for coronary artery bypass grafting (CABG) confirmed this importance suggesting to revise low-flow/high-resistance grafts. A well known pitfall of this method is a low specificity that may limit its diagnostic accuracy leading to unnecessary revisions. Epicardial Ultrasound (ECUS) with color flow mapping (CFM) recently became available in clinical practice in the same equipment with TTFM. Purpose of this study is to demonstrate the ability of this integrated approach to increase diagnostic accuracy of TTFM alone. The aim of the study is to assess the influence of imaging in addition to TTFM to increase specificity of intraoperative graft verification procedure.

Methods: Object of the study is a group of consecutive patients submitted to isolated CABG with intraoperative grafts verification procedure using an integrated, morpho-functional approach. TTFM verification, in use at our Institution since 1995, was performed along with epicardial high resolution imaging. The study concerns 681 distal anastomoses in 288 patients submitted to isolated CABG from December 2009 to May 2012. TTFM Mean graft flow (MGF) cutoff value was set at 15 ml/min as previously reported by our group. The endpoint was the recategorization of those MGF values lower than cutoff using imaging in the aim to increase diagnostic accuracy so avoiding undue surgical revisions.

Results: TTFM analysis revealed 104 out of 681 (15.3%) grafts in 51 patients suspected to be malfunctioning showing a MGF <15ml/min. High resolution imaging confirmed malfusion in 4 grafts out of 104 suspected (3.8%). The 4 grafts (in 4 patients) were successfully revised during the same procedure with complete recovery of TTFM parameters and morphology at ultrasound verification. Therefore 100 grafts suspected to be failing giving TTFM evaluation were reclassified by echo-imaging as patent in absence of technical failure. Clinical outcome of 47 patients whose grafts were reclassified was uneventful without significant difference of Troponin I release (p<0.005).

Conclusions: Our study demonstrates that TTFM integrated by high resolution imaging provides better diagnostic accuracy than TTFM alone avoiding undue graft revisions due to false positive findings helping to improve clinical outcome.

P463
Echocardiography before non-cardiac surgery - is the service being appropriately used?
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Introduction: Efficiency in health-care is of paramount importance. We set out to find if pre-operative echocardiogram referrals placed inappropriate demands on our echocardiography service

Setting: Echocardiography laboratory in a District General Hospital performing approximately 5000 scans/year

Methods: We retrospectively identified 100 consecutive trans-thoracic echocardiograms over a 4 month period performed before non-cardiac surgery to see if the scans were justified against criteria set out by the ESC guidelines (2009). We also reviewed the echocardiograms to identify significant new findings that would impact on pre-operative cardiovascular management.

Results: The mean age was 70 years (SD=13), and 53 patients were male. Only 13 patients out of 100 (13%) satisfied the criteria for appropriate referral. The most common indication for referral was detection of a murmur at pre-assessment clinic in 38 patients (38%). Five of these were found to have significant valvular disease. Other common indications were ‘routine pre-operative LV assessment’ (18%) and ‘ECG changes’ (9%). Two patients were undergoing high risk surgery and referrals were inappropriate. Eleven patients (11%) had unstable cardiac symptoms. Sixty-one patients (61%) did not have any relevant symptoms. Significant new findings were found in 10 scans (12%). Only 2 patients (2%) had a significant finding at echo in the absence of cardiac symptoms or appropriate referral.

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Conclusion: Our study shows that adhering to guidelines would significantly reduce the number of referrals for pre-operative echocardiograms. However, 9% of inappropriate referrals detected pathology that impacted patient management and clinical judgement remains important at surgical pre-assessment.

P464
Persistent pulmonary congestion at discharge evaluated by lung ultrasound
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Purpose: B-Lines evaluated by lung ultrasound (LUS) are a simple and reliable sonographic sign of pulmonary interstitial syndrome, detectable in cardiogenic pulmonary oedema. Our aim was to assess the value of B-lines at discharge in predicting events in patients admitted for acute heart failure (AHF).

Methods: A prospective cohort of 44 emergency room (ER) patients presenting with acute dyspnoea and admitted for AHF were enrolled (age 69+14 years, males: 34/56%). B-Lines were evaluated by a portable device with a cardiac probe at admission (T0), within 24 hours (T1) and at discharge (Td). Subjects received telephone follow-up within 90 days after discharge.

Results: Mean B-lines at T0 was 78+47 with a statistically significant reduction at T1 (44+33, p<.001) and Td (28+26, p<.05, see figure). At discharge, 50% of patients showed significant pulmonary congestion at LUS (total number of B-lines >15). Thirty-two patients (73%) were successfully contacted for follow-up. During the follow-up period (median 58, interquartile range 44-62 days) 15 events occurred: 2 deaths and 13 rehospitalizations. In the subset of patients who experienced events during follow-up, 93% were discharged with presence of B-lines.

Conclusions: Many patients hospitalized for AHF are discharged with sonographic evidence of persistent pulmonary congestion. In this cohort, absence of B-lines at discharge identifies a group of patients at very low risk of events.

P465
Impaired endothelial function is dependent on the prevalence of cardiovascular risk factors
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Background: Flow-mediated dilation (FMD) is a well-evidenced non-invasive method of endothelial dysfunction (ED) assessment. Since pathophysiology of ED is complex, multiple factors affect FMD.

Aim: was to evaluate the association between major risk factors and FMD values.

Methods: 617 consecutive subjects hospitalized in the Department of Cardiology between 2005 and 2011 (mean age: 50.1±14.9 years, males: 349 / 56.5%) were included in the study and evaluated in our echo lab. Baseline demographic characteristics, prevalence of the cardiovascular risk factors: hyperlipidemia, active smoking, arterial hypertension, coronary artery disease, diabetes mellitus or heart valve disease were assessed and brachial artery FMD were obtained.

Results: The study group was divided into the subgroups based on the number of the selected risk factors: 0-77 patients (pts), 1-151 pts, 2-148 pts, 3-40 pts, 5-9 pts. FMD values correlated with age and male sex. Mean FMD values were the highest in healthy subjects (20.0±4%) and were significantly impaired dependent on the number of the above mentioned factors (Fig. 1). The relations were independent of the age, sex, body mass index as well as brachial artery diameter.

Conclusions: Severity of endothelial dysfunction is related to the number of coexisted risk factors. FMD is a valuable tool for total cardiovascular risk evaluation.

P466
Left ventricular assessment by novel echocardiographic markers and correlation with biomarkers in patients with heart failure
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Purpose: Novel echocardiographic indices, such as global longitudinal peak systolic strain (GLPS), torsion and ratio E/E′ have been proposed to evaluate the overall left ventricular function in heart failure. However, their relationship with inflammatory markers such as interleukin 6 (IL6) and tumor necrosis factor-alpha (TNFa), tension markers such as brain natriuretic peptide (BNP), markers of necrosis including troponin I (tnI), as well as protein hormones as adiponectin remains unknown. We sought to elucidate their potential interrelationship between echocardiographic indices and circulating biomarkers.

Methods: The study population consisted of 80 with heart failure II-III stage according to the New York Heart Association (NYHA) classification with EF<40% (estimated by Simpson’s formula). The GLPS was evaluated by Automatic Function Index (AFI) software and torsion as the difference between the apical and basal rotation, measured by 2D speckle tracking echocardiography at the end of the systole. IL-6, TNFα and adiponectin levels were measured by enzyme-linked immunosorbent assay (ELISA). Brain natriuretic peptide and TnI levels were assessed by rapid immunoassays.

Results: Importantly, we observed a strong inverse correlation between EF and GLPS (r=-0.720, p<.001), as well as with torsion (r=-0.517, p<.001). However, no significant association was found between BNP/GLPS (r=0.299, p=0.086), IL6/GLPS (r=0.090, p=0.608) and TNFa/GLPS (r=-0.022, p=0.860). Similarly, no significant associations were observed between BNP/torsion (r=-0.225, p=0.233), IL6/torsion (r=-0.066, p=0.733) and TNFa/torsion (r=0.182, p=0.180). Moreover, we observed a significant inverse correlation between adiponectin/torsion (r=-0.311, p=0.017) and adiponectin/EF (r=-0.265, p=0.023), while it was strongly associated with GLPS too (r=-0.369, p=0.001).

Conclusions: Our findings indicate a significant correlation between EF and systolic strain. The systolic strain was also correlated with adiponectin and not with other inflammation biomarkers. These findings indicate that systolic strain may be correlated with an adipokine which has important anti-inflammatory and anti-atherogenic effect.