ANATOMY AND PHYSIOLOGY OF THE HEART AND GREAT VESSELS

P844
Is there any association between systemic vascular reactivity and pulmonary artery pressure in patients with common forms of pulmonary hypertension?

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Pulmonary vascular dysfunction is claimed to be a contributor to the development of pulmonary hypertension (PH). Impaired systemic vascular reactivity is one of the essential factors in the pathogenesis of cardiovascular disease. The aim of the investigation was to study whether there is any association between systemic vascular function and pulmonary artery pressure (PAP) in patients who have associated causes for PH development, such as coronary heart disease (CHD) and chronic obstructive pulmonary disease (COPD).

Methods: The brachial arterial vasodilator responses were measured by the ultrasound technique in twenty patients with mild to moderate COPD (group I) and twenty age-matched and COPD stage-matched patients who had past history of myocardial infarction (NYHA II) (group II). Conventional echocardiographic variables were measured in the said patients too.

Results: Both flow-mediated dilatation (FMD) and nitrate-mediated dilatation (NMD) were significantly lower, and PAP was significantly higher in the group II patients compared to group I patients.

Conclusions: Increased ascending aortic stiffness and enlarged aortic dimensions suggesting vascular remodeling could be demonstrated in AD patients as compared to matched controls.

Abstract P844 Table.

<table>
<thead>
<tr>
<th></th>
<th>Patients with atopic dermatitis</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV end-diastolic diameter (mm)</td>
<td>48.1 ± 4.7</td>
<td>47.9 ± 3.4</td>
</tr>
<tr>
<td>LV end-systolic diameter (mm)</td>
<td>29.7 ± 5.4</td>
<td>30.0 ± 3.3</td>
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<tr>
<td>Interventricular septum (mm)</td>
<td>9.4 ± 1.8</td>
<td>9.3 ± 0.9</td>
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<tr>
<td>LV posterior wall (mm)</td>
<td>9.2 ± 1.1</td>
<td>9.1 ± 1.0</td>
</tr>
<tr>
<td>LV ejection fraction (%)</td>
<td>66.2 ± 8.0</td>
<td>66.5 ± 5.0</td>
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<tr>
<td>Aortic systolic diameter (mm)</td>
<td>28.3 ± 4.7</td>
<td>26.2 ± 3.0</td>
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<tr>
<td>Aortic diastolic diameter (mm)</td>
<td>25.8 ± 4.9*</td>
<td>22.9 ± 2.4</td>
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<tr>
<td>Pulse change in aortic diameter (mm)</td>
<td>2.5 ± 1.2</td>
<td>3.2 ± 1.3</td>
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<td>Systolic blood pressure (mm Hg)</td>
<td>127.5 ± 13.3</td>
<td>125.7 ± 13.0</td>
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<tr>
<td>Diastolic blood pressure (mm Hg)</td>
<td>78.5 ± 9.7</td>
<td>74.4 ± 7.4</td>
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<tr>
<td>Pulse pressure (mm Hg)</td>
<td>48.9 ± 12.3</td>
<td>51.3 ± 12.3</td>
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<tr>
<td>Aortic strain</td>
<td>0.103 ± 0.055*</td>
<td>0.142 ± 0.061</td>
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<tr>
<td>Aortic distensibility (cm²/dynes 10(-6))</td>
<td>3.41 ± 2.07</td>
<td>4.29 ± 1.65</td>
</tr>
<tr>
<td>Aortic stiffness index</td>
<td>8.28 ± 8.95*</td>
<td>4.11 ± 1.47</td>
</tr>
</tbody>
</table>

P845
Atopic dermatitis is associated with increased aortic stiffness;

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Introduction: Atopic dermatitis (AD) is a common chronic inflammatory skin disease. The current study was designed to assess ascending aortic size and function by echocardiography in AD patients.

Methods: The study comprised 19 patients with typical features of AD (30.5 ± 10.8 years, 8 men). Their results were compared to 19 age- and gender-matched healthy controls (29.3 ± 2.9 years, 8 men). All subjects underwent a complete 2-dimensional transthoracic echocardiographic study. Systolic and diastolic ascending aortic diameters were measured in M-mode at a level 3 cm above the aortic valve from a parasternal long-axis view. Aortic elastic properties were calculated using aortic data and femoral blood pressure values.

Results: Aortic diameters of AD patients were enlarged compared to controls. Echocardiographic and blood pressure data and calculated aortic elastic properties are summarized in Table (LV = left ventricular; *p < 0.05 vs. controls). Reduced aortic strain and increased aortic stiffness index could be demonstrated in AD patients as compared to controls.

Conclusions: Increased ascending aortic stiffness and enlarged aortic dimensions suggesting vascular remodeling could be demonstrated in AD patients as compared to matched controls.

P846
Effects of cilostazol on arterial stiffness in patients undergoing percutaneous coronary intervention

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Purpose: Arterial stiffness is well known as predictor of cardiovascular events. Arterial stiffness can be evaluated by pulse wave velocity (PWV), augmentation index (AI) and central blood pressure. Recently, brachial-ankle PWV (baPWV) and radial AI measurement are increasingly used noninvasively. Cilostazol is a phosphodiesterase inhibitor and has anti-platelet function with vasodilatation effect. In practice, cilostazol is used for more potent antiplatelet effect after percutaneous coronary intervention (PCI). We thought that cilostazol may affect to arterial stiffness because of its vasodilatory effect. Therefore, we investigate the effect of cilostazol on arterial stiffness using baPWV, radial AI, central systolic blood pressure (cSBP) and central pulse pressure (central PP) in patients undergoing PCI.

Method: We included 133 patients (92 men, mean age 64 years) who underwent PCI for stable angina or acute coronary syndrome. Patients with known and suspicious peripheral artery disease were excluded. Cilostazol was prescribed based on the physician’s opinion. The baPWV, radial AI, cSBP and central PP were measured before discharge and after 3 weeks. The changes of parameters for 3 weeks were compared between cilostazol group (n = 48) and control group (n = 85).

Results: In baseline characteristics, prevalence of hypertension were higher in cilostazol group than control group (60% vs. 41%, p = 0.048). After PCI, discharge-medication were not different between two groups. In cilostazol group, radial AI, cSBP and central PP improved after 3 weeks (radial AI, 79.5 to 71.5, p = 0.020; cSBP, 129.0 to 117.5, p = 0.040; central PP, 53.5 to 48.0, p = 0.047). The heart rate (HR) of cilostazol group was significantly increased (70.0 to 77.5, p = 0.009). The control group has no significant interval changes of arterial stiffness and HR. In comparison with control group, radial AI and central PP of cilostazol group were more reduced significantly. There was no difference of baPWV in both groups. In multivariate analysis, the changes of brachial blood pressure and HR were independently correlated with the changes of radial AI and cSBP. Cilostazol was not independent factor of arterial stiffness.

Conclusion: Cilostazol increased HR and reduced radial AI, cSBP and central PP. However, cilostazol did not affect independently to arterial stiffness. We thought that...
cistostazo has a tendency to improve arterial stiffness but this effect might be related with increased HR.

**P847**

Adrenocorticotropic hormone and polymorphism of adrenocorticotropic hormone receptor predict left ventricular morphology

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**Purpose:** The endocrine system plays a key role in stress situation, also in chronic cardiopulmonary adaptation to physical stress, which is used as stress model. Adrenocorticotropic hormone (ACTH) as a measure of acute stress, has effects modulated and directed to the regulation of blood pressure and heart rate. It is unknown whether ACTH and ACTHR receptor polymorphism (ACTHRP) influence left ventricular (LV) remodeling.

**Methods:** Standard echocardiography was used to assess LV mass (LVM) and LV end-diastolic volume (LVVd) at rest in two different stress adaptation models (16 elite male wrestlers (W), 20 water polo player (WP)), and 20 sedentary subjects (S) matched for age. Fat free mass (FFM) was determined using Tanita bioimpedance weight. Maximal cardiopulmonary test on treadmill was used as acute stress model. Plasma levels of ACTH were measured 10 min before the test-at rest (1), at beginning (2), at maximal effort (3), at third minute of recovery (4), by radioimmunometric technique.

**Results:** Maximal cardiopulmonary test on treadmill was used as acute stress model. Plasma levels of ACTH were measured 10 min before the test-at rest (1), at beginning (2), at maximal effort (3), at third minute of recovery (4), by radioimmunometric technique. From resting blood samples, promoter region of ACTHR gene (18p11.2) was analyzed using reverse polymerization reaction with the analysis of restriction fragment length polymorphism by SacI restriction enzyme. Normal genotype (wild type) was considered using reverse polymerization reaction with the analysis of restriction fragment length polymorphism by SacI restriction enzyme. Normal genotype (wild type) was considered using reverse polymerization reaction with the analysis of restriction fragment length polymorphism by SacI restriction enzyme.

**Conclusion:** Adrenocorticotropic hormone and polymorphism of adrenocorticotropic hormone receptor predict left ventricular morphology and polymorphism by SacI restriction enzyme. Normal genotype (wild type) was considered using reverse polymerization reaction with the analysis of restriction fragment length polymorphism by SacI restriction enzyme. Normal genotype (wild type) was considered using reverse polymerization reaction with the analysis of restriction fragment length polymorphism by SacI restriction enzyme.

**ASSESSMENT OF DIAMETERS, VOLUMES AND MASS**

**P848**

Adrenomedullin serum levels correlate with right chamber parameters in patients with pulmonary arterial hypertension

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**Background:** Adrenomedullin has emerged as a relevant biomarker in prognostic stratification of patients with heart failure (HF), but its predictive value in patients with pulmonary arterial hypertension (PAH) is still to be defined. Since right chambers’ dimensions, observed well before any sexual maturity signs, can be attributed to body size differences alone.

**Methods:** We conducted a cohort study of patients with pulmonary arterial hypertension confirmed by right heart catheterization. All patients were submitted to clinical, laboratory and echocardiographic analysis at baseline, including quantification of right atrium (RA) and right ventricle (RV) dimensions. The association of adrenomedullin serum levels with the composite endpoint of death or hospitalization due to cardiac cause was evaluated by Kaplan-Meier and Cox-regression (univariate and multivariate) survival analysis and their correlation with the echocardiographic parameters was evaluated by the Pearson’s coefficient.

**Results:** We studied 39 patients (56 ± 15 years), 59% female. Adrenomedullin levels at baseline (0.78 ± 0.50 pmol/L) correlated with RA major dimension (r = 0.62; p = 0.001), volume (r = 0.72; p = 0.001) and area (r = 0.69; p = 0.001), as well as with the RV telediastolic area (r = 0.52; p = 0.005). Furthermore, adrenomedullin was found to be a strong prognostic predictor. In the multivariate analysis, only high adrenomedullin levels and increased RA area were identified as independent prognostic predictors.

**Conclusion:** Adrenomedullin serum levels correlated with right heart chambers dimensions and their combined assessment is valuable for prognostic stratification of PAH patients.
Background: Right ventricular (RV) volume quantification is becoming more important with increasing numbers of patients with CHD. Realtime 3D-Echo (RT3DE) is upcoming for volumetric measurements catching up with MRI, which is regarded as the imaging modality of choice. Goal of this study was the validation the new software prototype Angelo which is capable to calculate RT3DE as well as MRI datasets.

Methods: We prospectively enrolled 40 individuals (2.3-43.9 y., median 15.6y) undergoing MRI as well as RT3DE in the same setting. The group included 20 healthy persons as well as 20 patients with congenital cardiac defects (14 right ventricular, 6 left ventricular). RT3DE was done with an IE 33 (Philips, X5-1 transducer) or Vivid E9 (GE, V4 transducer) machine, MRI using a 3T TX Achieva scanner (Philips Medical Systems). MRI datasets were quantified by standard automatic software based on differentiation of signal intensities using the summation of disks method (PBS). RT3DE full-volumes were quantified using 2D echocardiographic imaging planes selected from single RT3DE datasets. Anatomic landmark selection on the 2D images was performed using Angelo (ventrigo) to obtain end-diastolic and end-systolic volumes (EDV, ESV). Quantification of accordance between MRI and RT3DE was done by Bland and Altman analysis, correlations by Pearson-Bravais.

Results: All datasets were included from the MRI studies, RT3DE provided sufficient image quality in 35. Volumes ranged from 29.5 to 226.8 ml, mean 119 ml. Comparison of MRI dataset using PBS vs. Angelo software resulted in good accuracy of EDV (0.8 ± 8.8%, r = 0.98) and ESV (−1.9 ± 17%, r = 0.92). There were no major differences between RT3DE and CMR using Angelo software for EDV (0.6 ± 8.8%, r = 0.98) as well as ESV (−2.5 ± 15%, r = 0.90)). Intraobserver variability was excellent for EDV (MRI: −4.0 ± 7.4%, r = 0.97, RT3DE: 0.1 ± 2.4%, r = 0.99) and ESV (MRI: −5.6 ± 11.9%, r = 0.98, RT3DE: −1.0 ± 3.4%, r = 0.97). Interobserver variability also just showed mild differences in EDV (MRI: 3.5 ± 6.3%, r = 0.99, RT3DE: 1.8 ± 4.9%, r = 0.99) and ESV (MRI: 4.2 ± 15%, r = 0.95, RT3DE: −5.4 ± 13%, r = 0.96). Mean calculation time using Angelo software was 5 minutes for MRI as well as RT3DE.

Conclusions: The Angelo approach for right ventricular volumetry on MRI and RT3DE datasets is accurate, versatile, time saving and shows excellent reproducibility. Because of the landmark based strategy also medium quality datasets can precisely be investigated which makes the tool promising for clinical use.

P852
Early changes in atrial function following catheter ablation of paroxysmal atrial fibrillation
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Methods: 70 sequential cases were reviewed. LV contractility and wall motion were visualized in early diastolic phase (EDV, MRI 3.5 T) and mid systolic phase (11.7%, No= 38. Diastolic Dyst: Yes = 39, No= 5).Optimization Results: Baseline EF: 24.3 ± 10.5%. Best VAV = 60.9 ± 12.5 ms (LV first), Best A-V Delay = 195.9 ± 31.4ms, Best PV Delay = 161.2 ± 35.9 ms. Optimized EF: 29.5 ± 11.7%. All pts had some improvement in EF. The average pt’s EF increased by 25.0 ± 13.7%. LV first was best in 98%; RV first was best in 2%. Conclusion: 1) A Logical Method of Optimization is shown focusing in the main goal of CRT: Re-synchronize LV global wall motion, by adjusting the V-V interval. Only then is the AV optimization. 2) Some visible echocardiographic improvement in overall LVEF was seen in all pts. (net gain 5.2%, relative increase 25%). 3) This method results in more aggressive V-V intervals than ever reported.

P854
Speckle tracking beyond normal strains: development, validation and first experience with a post processing software for tracking based assessment of 3D myocardial deformation
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Background: So far, approaches to quantify myocardial function were mostly based on one-dimensional Tissue Doppler or two-dimensional speckle tracking. It has been argued that the complex three-dimensional deformation (3D) of the heart can be better described using a 3D approach. In particular shear strains or principle strains could be more sensitive in non-transmural dysfunction which are less detectable with 2D and 3D imaging. We therefore sought to develop postprocessing software which is able to extract additional parameters of myocardial deformation beyond normal strains from 3D echocardiographic data sets.

Methods: A MATLAB-based analysis software was developed for the processing of 3D tracking data from an EchoPAC workstation. The software is capable of calculating eight new parameters besides the normal strains: longitudinal- circumferential (LC) shear, circumferential- longitudinal (CL) shear, the direction and magnitude of two principal strains as well as rotation and torsion of the left ventricle. The implemented algorithms were validated using a software phantom addressing the specific deformation parameters locally and globally. Consequently, test data sets from volunteers and patients were compared.

Results: All deformation parameters were successfully validated against the phantom, suggesting the correct calculation of the respective parameters. The comparison of normal and pathologic data sets revealed obvious differences in most of the new parameters.

Conclusion: We developed and validated a new software tool which allows to assess parameters of 3D myocardial deformation beyond normal strains based on echocardiographic data sets. Patient studies are ongoing to explore the clinical value of the new parameters.

P858
Analysis of flow distribution inside the right ventricle by vector flow mapping
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Introduction: Little is known about intracardiac flow behaviour in right chambers. A novel imaging technique, Vector Flow Mapping (VFM) enables flow analysis. We aim to describe flow behaviour inside the right ventricle (RV) using VFM. Methods: 10 healthy subjects underwent VFM echocardiographic evaluation. Flow was analyzed in the right ventricle in an A4-Me view at basal, mid and apical levels and in short axis paraseptal view in the RV inflow and outflow tract. An analysis-segment was drawn perpendicular to flow direction. Flow velocity across this segment and an

Abstract P854 Figure. Five new parameters from the 3D mesh
approximation to stroke volume was automatically summing all flow across this segment in a cycle.
Results: In diastole, most of blood volume occupies the RV inflow tract, through the direct path towards the outflow tract and through the indirect path towards the apex. Only a minimum proportion of blood volume reaches the RV apex. The largest proportion of volume stays in the inflow tract, shared by both direct and indirect paths. The amount of flow reaching the RVOT is hard to quantify given the interference generated by the physiological pulmonary regurgitation.
In systole, there is very little flow in the apical 4Ch view and, when present, it can be observed moving towards the apex. A redirection of flow occurs, so that blood volume previously residing in the inflow tract is redirected towards the outflow tract through the direct path. In this study we have not analysed the small apical component that possibly moves directly towards the RVOT without passing through the inflow tract.
Conclusions: VFM allows analysis of flow behaviour inside the right ventricle. Two flow paths are observed: a direct one, from the inflow to the outflow tract; and an indirect path, less significant in volume, passing through the apex.

Abstract P855 Figure.

P856 Assessing right ventricular functional response during incremental exercise in heart failure: insights on mitral regurgitation and ventilatory efficiency
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Purpose: Right ventricular (RV) dysfunction and pulmonary hypertension (PH) are predictors of adverse prognosis in patients with heart failure reduced ejection fraction (HFrEF). Mitral regurgitation (MR) plays a central role in determining pulmonary flow over-load and PH. We explored the functional response of the RV during maximal exercise according to MR severity and ventilatory response by combining stress Echo with cardio-pulmonary exercise test (CPET).
Methods: 45 HFrEF patients (age 67 ± 11; male 64%; ischemic 79%; NYHA class II/III/IV 46%/42%/12% and EF 36 ± 8%) were evaluated at rest and during exercise (tilt table exercise) assessing the changes in the RV TAPSE (length) vs pulmonary arterial systolic pressure PASP (developed pressure, force) relationship along with exercise-induced MR changes and ventilatory efficiency (VE/VO2) response.
Results: Patients with an impaired RV function (n 14, Group A, TAPSE < 16 mm; average 12.8 ± 2.5 mm and PASP 44 ± 20 mmHg) compared to Group B (n 31, TAPSE > 16 mm, average 21.6 ± 3 mm and PASP 35.2 ± 11 mm) presented with a higher prevalence of reduced to severe MR (43% vs 13%; p < 0.05), a remarkable steeper VE/VO2 slope (41.2 ± 9 vs 30.5 ± 6; p < 0.001) and an unfavorable TAPSE vs PASP relationship (Figure). At peak exercise, the relationship TAPSE vs PASP of the group A shifted upward to a functional RV response lower than the one observed at rest in group B (Figure), suggesting a limited degree of RV contractile reserve.
Conclusions: In HFrEF the functional response of the RV during maximal exercise differs according to the degree of MR that, when moderate to severe, typically combines with ventilatory inefficiency. The functional evaluation of RV function during maximal exercise provides adjunctive insights in the clinical work-up of HFrEF.

Abstract P856 Figure.

P857 Complementary echocardiographic assessment of the systemic right ventricle function - how to do it in a simple way?
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Purpose: Patients with systemic right ventricle (RV) are prone to develop heart failure over time. Magnetic resonance imaging (MRI) is a gold standard in the assessment of the RV, however its application is limited by high costs, restricted availability and contraindications. Therefore, the echocardiographic evaluation of the RV function is still crucial. The aim of our study was to assess global and regional RV function in adults with congenitally corrected transposition of the great arteries (ccTGA) by means of echocardiographic parameters.
Methods: The transthoracic echocardiographic study was performed in 39 consecutive adults with ccTGA who were admitted to our Congenital Heart Disease outpatient clinic. Only patients with two ventricles of adequate size were included. We measured RV end-diastolic and end-systolic areas and RV fractional area change (FAC) was calculated. Among non geometric parameters of the global RV function, tricuspid annular plane systolic excursion (TAPSE), myocardial performance index (MPI) and pulsed Doppler peak systolic velocity at the basal segment of the RV free wall (S') were analyzed. Speckle-tracking method was used to assess regional deformation (global longitudinal strain, GLS). Results: 39 adults (17F/22M; mean age 35.5 years) with ccTGA were studied. The average RV diameter was 55 (±9) mm and FAC was 0.4 (±0.08). The mean values of non geometric parameters of the RV function were decreased when compared to lower reference limits for subpulmonary RV according to EAE/ASE guidelines: MPI – 0.49 (+/-0.19); S' – 9.2 (±3.5) cm/s and TAPSE – 15.5 (±4.3) mm. The value of GLS was 16.5 (+/5.0%). We found a significant positive correlation between TAPSE and FAC (r=0.37; p=0.019) as well as between TAPSE and GLS (r=0.5; p=0.001). Other non geometric indices of the RV function failed to correlate significantly with global (FAC) and regional (GLS) functions.
Conclusions: TAPSE seems to be a simply acquired echocardiographic parameter reflecting global and regional functions of the systemic RV. This observation might be useful in a quite large group of patients with ccTGA and poor acoustic window or contraindications for MRI.

P858 Tricuspid regurgitation duration correlates cardiac magnetic resonance imaging-derived right ventricular ejection fraction in patients with pulmonary artery hypertension
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Background: Right ventricular (RV) failure is known to be the main cause of mortality and closely related to prognosis in patients with pulmonary artery hypertension (PAH). The decrease of tricuspid regurgitation duration corrected for heart rate (TRDc) has recently shown to be associated with advanced RV failure and poor clinical outcome. The aim of the present study was to investigate whether TRDc correlates with RV parameters assessed using cardiac magnetic resonance imaging (CMRI) and has prognostic significance in patients with PAH.
Methods: Thirty seven consecutive patients with PAH (28 females, age 46 ± 14 years) underwent six-minute walk test, right heart catheterization, echocardiography and CMRI within 48 hours. TRDc, tricuspid annular plane systolic excursion (TAPSE), Tei index, and tricuspid valve lateral annular systolic velocity were measured in echocardiography and RV end-systolic and end-diastolic volumes and ejection fraction were in CMRI.
Results: TRDc showed significant correlation with RV ejection fraction derived from CMRI (r = 0.400, p = 0.014). In multivariate regression analysis, TRDc also demonstrated significant correlation with RV ejection fraction, even after adjusting eccentric index, Tei index, and TAPSE (p = 0.034). During a median follow-up of 487 days, there were 7 events (19%) including 2 cardiac deaths and 5 admissions for heart failure. The event-free survival rate was significantly higher in patient with TRDc > 400 msec than those with ≤ 400 msec (p = 0.040).
Conclusion: TRDc correlated with CMRI-derived RV ejection fraction, and decreased TRDc was associated with cardiovascular hospitalization in patients with PAH. Therefore, TRDc could be a useful echocardiographic surrogate marker for predicting RV dysfunction and prognosis in patients with PAH.
Two-dimensional global longitudinal strain of left ventricle can be used as a prognostic marker in patients with acute myocardial infarction

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Background: Global longitudinal strain of left ventricle (GLSLV) is an easy and objective parameter of myocardial function. We want to evaluate the prognostic value of GLSLV in acute myocardial infarction (AMI) patients.

Materials and Methods: From January 2012 to April 2013, all consecutive patients with AMI. All echocardiographic studies were done with Vivid 7 or E9 (GE medical systems) and longitudinal strains were calculated with 2-dimensional speckle tracking with EchoPAC-PC software (GE medical systems). GLSLV was calculated from the mean value of longitudinal strain of apical 4 chamber, apical 3 chamber and apical long axis views.

Results: Total 373 patients (269 males, mean 64 ± 13 years old) were included. Of them, 173 patients (46%) were diagnosed as ST-segment elevation myocardial infarction. GLSLV had good correlations with left ventricular ejection fraction (LVEF; r=0.80, p<0.01), regional wall motion score index (RWM, r=0.46, p<0.01), and log transformation of B-natriuretic peptide level (LogBNP; r=0.46, p<0.01). Sixty-two patients (17%) had complications during hospitalization (mean 7 ± 6 days). Higher GLSLV (≥-12.5%) was associated with in-hospital complications (HR=4.61, 95% CI=2.47-8.58, p<0.01) and death (HR=3.72, 95% CI=1.11-12.42, p=0.03).

Conclusion: GLSLV showed good correlations with LVEF, RWM, and LogBNP. Higher GLSLV (≥-12.5%) was associated with higher incidence of in-hospital complications, adverse clinical events and death. Thus, GLSLV can be used as a good prognostic marker in AMI patients.
Diastolic diastolic by colour tissue doppler imaging as an assessment of diastolic function

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Purpose: The current method for a non-invasive assessment of diastolic dysfunction is complex with the use of algorithms of many different echocardiographic parameters. Total average diastolic displacement, determined by color Tissue Doppler Imaging (TDI) via the measurement of displacement during early diastole and atrial contraction, can potentially be used as a simple and reliable alternative.

Methods: Using GE Healthcare Vivid E7 and 9 and Echopac BT11 software, both diastolic displacement (area under the curve of the e’ and a’ wave), measured in the septal and lateral walls in the apical-4-chamber view by color TDI, and the degree of diastolic dysfunction, using the current guidelines, was determined in 206 patients. Of these 206 patients, 157 had cardiac anomalies that could potentially affect diastolic displacement such as reduced left ventricular (LV) ejection fraction (n=45), LV hypertrophy (n=49), LV dilation (n=30), and mitral regurgitation. (n=33). Intra and interobserver variability was tested using the Bland-Altman method in 125 patients.

Results: A linear relationship between total average diastolic displacement and the degree of diastolic dysfunction was found. A total average diastolic displacement of 10 mm was found to be a consistent threshold for the general discrimination of patients with or without diastolic dysfunction. Patients with LV hypertrophy had preserved displacement measurements despite being classified as having either an abnormal or a pseudonormal relaxation pattern. Reproducibility of displacement measurements was acceptable.

Conclusions: Patients with a total average diastolic displacement under 10 mm almost certainly have diastolic dysfunction.

Method: We studied 100 patients (70 men — mean age 57 yr ± 11 yr and mean body mass index (BMI) 26.3 kg/m² ± 3.5 kg/m² and 30 women — mean age 56 ± 15, p=0.84 and mean BMI 25.8 ± 6.6, p=0.60) in a Norwegian national cross-sectional follow-up study of LS after HDT. Mean time since primary treatment was 10 years for both genders, and all patients received AC (mean cumulative dose 311 mg/m² - 94 mg/m² for men vs 320 ± 80, p=0.61). Echo pulse waveform Doppler was performed to measure peak mitral inflow velocities at early (E) and late (A) diastole and early deceleration time (E’E) and Tissue Doppler echocardiography was performed with the sample volume positioned at the basal septal and lateral part of the mitral annulus to obtain peak (e) diastolic myocardial tissue velocities. We used the mean of e’-septal and e’-lateral to calculate e’.

Results: Both E (female: 72 cm/s ± 19 cm/s vs male: 58 ± 14, p=0.0001) and A (female: 75 cm/s vs 21 cm/s vs male: 64 ± 14, p=0.01) were significantly higher in women than men. Correspondingly there was a significantly higher E’E ratio (8.5 ± 2.9 vs 7 ± 1.8, p=0.001) among women. See table 1 for other results.

Conclusions: Thus, our results indicate a slight impairment in LV diastolic function, in spite of lower blood pressures, in women compared to men in LS after HDT.

P866 Global circumferential strain and apical and basal rotation during exercise in patients with known/suspected coronary artery disease

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Global circumferential strain (GCS) and rotation (Rot) have not been widely evaluated for detection of coronary disease (CAD) or ischemia (ISC). We aimed to assess GCS/Rot during exercise echocardiography (ExE) for CAD detection, and to explore the relationships between GCS/Rot and ISC. From 198 patients (pts) with assessments of SGG/Rot by speckle-tracking during ExE (rest [R] and peak [PK]) we selected those with optimal short-axis views at the papillary muscles and at the apex level were used for GCS/Rot assessments. R and PK basal and apical GCS and basal and apical Rot were similar (p=NS) between pts with/without CAD. Instead, several parameters were different between pts with/without ISC, including basal and apical GCS at PK (Table).

Conclusion: PK GCS parameters were associated with ISC, but not with CAD. PK apical GCS was diminished with ISC, but apical Rot was maintained normal values, suggesting a compensatory role during ISC. PK GCS, and time to peak PK GCS might have a role in the diagnosis of ISC.

P867 Right ventricular systolic dysfunction in patients with ST-elevation myocardial infarction

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Background: Evaluation of right ventricular function in patients with ST-elevation myocardial infarction (STEMI) is crucial for patient management. Echocardiographic TAPSE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Men</th>
<th>Women</th>
<th>p</th>
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<tr>
<td>SBT (mmHg)</td>
<td>130 ± 18</td>
<td>131 ± 27</td>
<td>0.77</td>
</tr>
<tr>
<td>DBT (mmHg)</td>
<td>77 ± 9</td>
<td>72 ± 10</td>
<td>0.03</td>
</tr>
<tr>
<td>E' (ms)</td>
<td>197 ± 41</td>
<td>195 ± 37</td>
<td>0.76</td>
</tr>
<tr>
<td>Ea (cm/s)</td>
<td>93.0 ± 27</td>
<td>100.0 ± 29</td>
<td>0.31</td>
</tr>
<tr>
<td>e’-lateral (cm/s)</td>
<td>10.5 ± 3.2</td>
<td>10.1 ± 3.7</td>
<td>0.68</td>
</tr>
<tr>
<td>e’-septal (cm/s)</td>
<td>7.8 ± 2.3</td>
<td>7.9 ± 2.9</td>
<td>0.81</td>
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Abstract P865 Table.
(Tricuspid Annular Plane Systolic Excursion) measurement allows for a simple evaluation of right ventricular global function.

**Aim:** To assess the prevalence of right ventricular systolic dysfunction among patients hospitalized with acute STEMI and characteristics of this subgroup of patients. Materials and methods: One week after discharge from STEMI, echocardiographic analysis was conducted in 450 STEMI patients. All patients underwent echocardiographic examination with TAPSE assessment. Depending on the result - patients were divided into 2 groups according to ASA guidelines - with RV significant dysfunction (TAPSE ≤ 16) and without RV dysfunction (TAPSE > 16). Then, comparative analysis between groups was conducted.

**Results:** RV dysfunction (TAPSE ≤ 16) was identified in 27 (6%) cases. Mean age among this group did not differ significantly from the patients with preserved RV function - 67.8 ± 12.3 years vs 64.5 ± 11.9 years, p > 0.05. Prevalence of coronary artery disease risk factors showed no significant differences between patients with decreased and normal TAPSE. The sum of STEMI admissions in STECD in a group with low TAPSE was insignificantly higher: 8.6 ± 6.0 mm than in a group with normal TAPSE 7.1 ± 5.8 mm, p > 0.05. However, patients with impaired RV function had significantly higher mean heart rate (84 ± 4 vs. 81 ± 3, p = 0.047) and significantly lower LV ejection fraction (0.57 ± 0.03 vs. 0.54 ± 0.03, p = 0.001) than patients with normal RV function.

**Conclusion:** RV systolic dysfunction occurs rarely among patients with STEMI - in 6% cases. It is associated with more severe left ventricular dysfunction and higher level of myocardial damage markers.

**P871**

**Resting echocardiography as tool for the early diagnosis of circumflex-related acute coronary syndrome.**

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Introduction: There are only few studies that have focused on the clinical characteristics of LCx-related AMI. ECG may be very important to discriminate between right and left circumflex coronary arterial occlusion. In this study we aimed to identify the clinical characteristics and outcomes of LCx-related acute myocardial infarction (AMI) that has been known to be under diagnosed with 12-lead electrocardiogram (ECC), because frequently ECC remains normal. However we know nothing about echo usefulness in LCx-related acute coronary syndrome (ACS).

**Materials:** 411 (299 males, age 58±11) pts were observed in a cardiac-based Chest Pain Unit because of a typical/atypical chest pain, negative ECC, normal T nptonin, normal LV wall motion by echo at admission. Time of monitoring: 11±6 hours. The monitoring protocol was the following: 12 leads-ECC telemetry monitoring; cardiac markers at time 0.4 h, resting echocardiogram at admission; chest X-rays; exercise-ECC or stress-echo before discharge. To achieve the aim of this study we added an echo-monitoring of regional LV wall motion at time 2.4±8 hours from admission.

**Results:** We found 53 ACS (12.8%). The initial mode of ACS detection was: 1) LV Regional Wall Motion abnormalities detected by ECHO (17 pts, 32%); 2) ECC (ST-T modifications (26 pts, 49%); 3) Troponin Televaluation (10 pts, 18.5%). In the ACS echo-detection GROUP (17 pts), the culprit coronary lesion was on left circumflex artery (LCx) in 12 pts (70.5%), on left anterior descending artery (LAD) in 3 pts (17.6%) and on RCA in 2 pts (11.7%) (LCx vs RCA=p<0.001; LCx vs LAD=p<0.001). In other words, 12 out of 17 pts with normal ECG and T-Trop at presenta- tion and echo-detection of ACS had a LCx-culprit lesion. In ACS echo-detection GROUP the culprit lesion was on Circumflex Artery (12 pts), the ECC remained NORMAL during hospitalization period in 96 patients (7%), compared to LAD-culprit lesion pts (0%) and RCA-culprit lesion pts (0%) (LCx vs LAD=p<0.001; LCx vs RCA=p<0.001). Conclusions: The ACS due to a culprit coronary lesion on the circumflex artery (Acute Circumflex Coronary Syndrome) may have a characteristic pattern defined by high percentage of normal ECC; 2) LV wall motion abnormalities detected by resting echocardiography. Resting echocardiography could become an essential tool used in the diagnosis of ACS due to circumflexlesions.

**P872**

**Determinants of peak atrial longitudinal strain in acute myocardial infarction patients.**

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Background: Although peak atrial longitudinal strain (PALS) which represents left atrial (LA) function is known as prognostic factor in acute myocardial infarction (AMI) patients, the implications of PALS are unclear. Thus, we investigated the determinants of PALS in patients with AMI.

**Methods:** Sixty patients of AMI were enrolled in this study. Forty-seven patients (78%) were male and mean age was 62 ± 12 years. Clinical, angiographic and echocardiographic parameters, furthermore, the correlations between global PALS and each parameter were determined.

**Results:** There were no significant differences in PALS according to gender, risk factors, and clinical presentation. The patients were divided into two groups: Group 1. CFR ≥ 2 and Group 2. CFR < 2. Primary endpoints were: cardiac death, non-fatal ACS, PCI or by-pass surgery of the examined vessel. There were 15 events related to the examined vessel. In Group 1, 3 patients had PCI for non-culprit stenosis and 1 patient had by-pass surgery. In Group 2, 9 patients had PCI of examined stenosis and 2 patients had by-pass surgery. Value of CFR in group of patients with events was significantly lower than in group of patients without events, (1.84 ± 0.32 vs. 2.4 ± 0.4, p<0.001, respectively). By Kaplan-Meier method, Group 1 had significantly higher events free survival in follow up time compared to the Group 2, (96% vs 43%; p<0.001, respectively). Furthermore, patients with CFR < 2 had a 20.23-fold increased in cardiovascular risk compared to patients with CFR ≥ 2 (96% CI. 6.3-64.97; p<0.001).

Conclusion: In patients with non-culprit coronary artery stenosis of intermediate severity and CFR <2, deferral of revasculization and continuation of the medical therapy, might be reasonable option since it is associated with good long term clinical outcome.
P873 Detection of occlusions in the three main coronary arteries using transthoracic Doppler

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Background: We aimed to determine whether antegrade flow velocities in septal perforating branches could identify an occluded contralateral main coronary artery, and to assess the feasibility and accuracy of demonstrating main coronary occlusions by use of several parameters indicating collateral flow.

Methods: A total of 108 patients scheduled for coronary angiography because of chest pain or acute coronary syndromes were studied using transthoracic Doppler echocardiography.

Results: Antegrade peak diastolic flow velocities (pDV) in septal perforating branches were higher in patients with angiographically occluded contralateral artery compared with corresponding velocities in patients without significant main coronary disease (0.80 ± 0.31 m/sec versus 0.37 ± 0.13 m/sec, p < 0.001). Receiver operating characteristic curve showed pDV ≥ 0.57 m/sec to be the optimal cutoff value to identify occluded contralateral artery, with sensitivity of 79% and specificity of 69%. Demonstration of at least one positive parameter (findings of retrograde flow in main coronary arteries, reversed flow in septal perforating and left circumflex marginal branches, pDV ≥ 0.57 m/sec, and findings of other epicardial or intramyocardial collaterals) indicating collateral flow to an occluded main coronary artery had sensitivity, specificity, positive predictive value, and negative predictive value of 69%, 94%, 63%, and 99%, respectively, for detection of coronary occlusion. Collateral flow findings identified 25 of 26 main coronary occlusions.

Conclusions: By investigating several parameters indicating collateral flow, we were able to identify most of the main coronary occlusions in the patient cohort, underscoring the value of transthoracic Doppler echocardiography in demonstrating collateral flow to occluded coronary arteries in patients with suspected or documented coronary disease.

HEART VALVE DISEASES

P874 Heart chamber geometry and tricuspid annulus morphology in patients undergoing mitral valve repair with and without tricuspid valve annuloplasty

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Purpose: In the management of tricuspid valve (TV) regurgitation several areas of uncertainty still remain. TV annuloplasty is therefore still the object of debate in terms of timing particularly in the field of concomitant mitral valve (MV) repair (MVR). The aims of this study were: a) to assess right and left heart chamber geometry and function in patients under- going MVR without (G1) or with (G2) simultaneous TV annuloplasty; b) to correlate these findings to tricuspid annulus geometry through 3D transthoracic echocardiography (TTE).

Methods: We studied 80 patients (62 ± 10 years) undergoing MV repair (G1: 40, G2: 40) by 3DTEE imaging before surgery. Selection criteria for TV annuloplasty were: TV insufficiency more than mild and/or TV annulus Ø > 2.1 cm/m2 in presence of pulmonary hypertension. 2D left and 3D right ventricular volumes and atrial areas were evaluated; 3D MV and TV annuli were tracked and end-diastolic diameters (AP anterior-posterior, LL: lateral-lateral) and area were computed and compared between G1 and G2.

Results: Right and left chamber dimensions were enlarged in G2 vs G1 (Table). 2D LVEF (G1: 66 ± 7%, G2: 62 ± 8%, p = 0.05) and TAPSE (G1: 26 ± 4 mm, G2: 23 ± 5 mm, p = 0.01) was lower and pulmonary artery systolic pressure (PASP) was higher in G2 (G1: 33 ± 6 mmHg, G2: 48 ± 16 mmHg, p < 0.001) while 3D-RVEF was similar (G1: 51 ± 6%, G2: 54 ± 8%, p = 0.83). TV geometry in G2 was characterized by increased TV area due to enlargement of both AP and LL diameters. TAPSE was negatively correlated with PASP (r = -0.33, p = 0.003).

Conclusions: Patients undergoing MVR and TV annuloplasty had a more advanced remodeling of the left and right heart chambers. These findings are associated with an increase not only of the tricuspid annulus, but also of the mitral one, as well as pulmonary hypertension. Despite preservation of RVEF, TAPSE is reduced and all these geometric and functional findings probably reflect an advanced stage of the disease.

P875 Echocardiographic characteristics of the patients with severe tricuspid regurgitation undergoing complex tricuspid valve repair by extension of anterior tricuspid valve leaflet

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Purpose: The complex tricuspid valve (TV) repair using pericardial patch is a solution to prevent persistent tricuspid tethering and the risk of recurrent tricuspid regurgitation (TR). The aim of this study was to assess the echocardiographic characteristics of the patients with severe tricuspid regurgitation before and after undergoing a more complex TV repair than annuloplasty alone.

Methods: Fourteen patients with severe functional TR that underwent TV repair by extension of anterior leaflet associated with annuloplasty were included. The measurements of tenting area, coaptation depth and tricuspid annulus were performed using 2D Echocardiography. SPSS 16.0 software was used for statistics.

Results: The patients with severe tethering were in NYHA Functional Class as following: NYHA II (3 patients), NYHA III (10 patients), NYHA IV (1 patient). Six patients had isolated tricuspid valve repair and eight patients had combined surgery (tricuspid valve repair and mitral valve surgery). Preoperative the tethering was present in 25.5% of cases, tenting area and tricuspid valve coaptation depth (TVCD) (mm) were 2.12 ± 0.15 95%CI [1.93-2.30] and 7.73 ± 0.99 95%CI [7.19-9.69] respectively. All these parameters significantly reduced to 5.45% for tethering and 1.15 ± 0.06 95%CI [1.04-1.27] for tenting area and to 6.89 ± 0.3 95%CI [6.29-7.49] (p=0.001) for tricuspid valve coaptation depth.

Conclusions: This group of patients with severe functional TR and severe tethering needs the use of more complex valve repair using the anterior valve extension for reducing the valve tethering, tenting area and valve coaptation depth.

P876 Early aseptic paraprothetic leak after mitral valvular replacement: predictive factors and evolution

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Introduction: Mitral valvular replacement remains the main treatment for mitral disease. However the early postoperative period is burdened by number of acute complications, inter alia the paraprothetic leak (PPL) whose incidence remains very variable.

Objective of study: The aim of this study is to determine the predictive factors and evolution of the PPL assessed by TOE after mitral valvular replacement with mechanical prosthesis.

Methods: We prospectively included 98 patients who underwent a mitral valvular replacement during a period of 5 years. The study of the prostheses comprised an analysis of the kinetics of the wings, and the quantification of the mitral PPL. Major PPL were not included in this study.

Results: Our population included 63 women (63.6%) and 36 men (36.4%), of average age of 44.71 ± 1.71 years. Mechanical prostheses included 55 of type BjM and 10 of type Sorin Bicarbon, 6 of type Carbomedics and 28 of type Mira Edwards. The total incidence of the PFP was 16.16% (16 cases), all of them were minimal or moderate. The predictive factors of the PPL in univariate analysis were the reduced number of points of fixing of the prosthesis, a high ratio diameter of prosthesis/number of points of fixing, and a higher external diameter of the prosthesis. In multivariate analysis, only the high ratio diameter/number of points of fixing was predictive of PPL. After 6 months, only 9 of the mitral PPL persisted. No predictive factor of the persistence of the PPL was isolated.

Conclusion: Minimal and moderate PPL after mitral valvular replacement are of benign evolution, the majority disappears in the early postoperative period.

P877 Remodeling of aortic sino-tubular junction after stentless aortic valve replacement

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Purpose: Understanding of aortic root geometry and its remodeling is essential for the development of reconstructive aortic surgery. The aim of the study was to investigate:

Abstract P874 Table.

<table>
<thead>
<tr>
<th>G1</th>
<th>G2</th>
<th>p</th>
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<tr>
<td>Area/BSA (cm²/m²)</td>
<td>2D Left Ventricular EDV/BSA (mL/m²)</td>
<td>AP, MV/BSA (mm²/m³)</td>
</tr>
<tr>
<td>14 ± 4</td>
<td>74 ± 19</td>
<td>20 ± 3</td>
</tr>
<tr>
<td>20 ± 6</td>
<td>81 ± 17</td>
<td>22 ± 3</td>
</tr>
<tr>
<td>p &lt; 0.001</td>
<td>0.002</td>
<td>&lt; 0.001</td>
</tr>
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</table>

BSA = body surface area; EDV = end diastolic volume; AP = antero-posterior diameter; LL = lateral-lateral diameter; MV = mitral valve; TV = tricuspid valve; P value for comparison between G1 and G2 (unpaired t test)
the post-operative remodeling of sino-tubular junction (STJ) diameter and it’s relationship with stentless valve size.

Methods: 55 patients (age 74 ± 5 yrs) received a stentless aortic bioprosthesis replacement. Two-dimensional echocardiography was performed to measure STJ diameter at peak systole at 2 weeks and 1 year after implantation, respectively. The ratio of STJ diam-eter to valve size (STJ/VS) was thus calculated. Mean systolic pressure gradients (mPG) of aortic bioprosthesis were determined by Doppler. Paired test was used to determine the significance of changes in STJ diameter, STJ/VS, and mPG, from 2 weeks to 1 year follow up. Linear regression analysis of the changes in each variable with respect to its baseline (at 2 weeks) was performed.

Results: There was no significant change in the mean value of STJ diameter from 2 weeks to 1 year (23.4 ± 3.9 vs. 22.7 ± 3.5, mm, P=NS). However, STJ/VS had fallen significantly (0.96 ± 0.12 vs. 0.92 ± 0.07, p=0.048). The changes in STJ/VS during first year follow up were significantly dependent by its baseline value at 2 weeks after implant (r=0.86, p<0.001). The variation of STJ/VS (10-90 percentiles) had significantly reduced from 0.30 to 0.19 at 1 year. At same time, mPG fell from 6.0 to 3.5 mmHg. No significant AR was detected.

Conclusion: During the first 12 months after stentless aortic valve replacement, there is a significant bi-directional remodeling of aortic root geometry at the STJ junction level, which is largely determined by its baseline value and bioprosthesis size, and results in a more efficient bioprosthesis flow dynamics.

B878 Long term follow up after Ross intervention
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Purpose: For children and young adults who require aortic valve replacement, Ross inter-vention is an alternative to prosthetic aortic valve replacement. As this procedure may lead to aortic root dilatation in the future, the long-term follow-up is of crucial importance. We aimed to describe the follow-up of patients who were submitted to Ross procedure. Methods: Since November 1997 to July 2009, a total of 107 patients diagnosed of aortic stenosis, aortic regurgitation or double aortic lesion requiring aortic valve replacement underwent Ross intervention in our center (mean age 30 ± 11 years, 69% male). In all of them a comprehensive clinical and echocardiographic evaluation was performed before the intervention, at discharge, at 6 and 12 months and annually after surgery. Echocardiography was performed at discharge and before planned intervention. The aortic root diameter was measured using bi-plane imaging. The follow-up was complete in 98% of patients. Results: After up to 15 years of follow up (median 11 years, interquartile range 9-13 years), with only 2 lost cases, we have found 11 cases of severe homograft stenosis: 9 patients required percutaneous intervention and 4 of them, an additional surgical procedure, so the rate of homograft stenosis for this procedure was 10%. Conclusions: Ross intervention is an alternative to prosthetic aortic valve replacement in children and young adults, but the event rate up to 15 years of follow up is high, with a not negligible home and autograft reinervention requirement.

P879 Role of medical treatment at discharge to predict long-term outcomes in survivors of prosthetic valve thrombosis
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Purpose: To assess the predictors and rate of adverse events during long-term follow-up of survivors of prosthetic valve thrombosis (PVT) and the possible role of the treatment at discharge: oral anticoagulation (OAC) vs. dual therapy (DT) anticoagulation = antilaggregation. Methods: TTE, TEE and cine-ratio-fluoroscopy were used for PVT diagnosis. According to guidelines, surgery was the treatment of choice in obstructive thrombosis and inoper-able patients were treated with fibrinolysis or optimization of anticoagulation. All non-obstructive were first managed with optimization of anticoagulation. At discharge, survi-vors received OAC or DT, at the discretion of the attending physician. Adverse events were defined as cardiovascular death, recurrence, thromboembolic events or major bleeding.

Results: From January 1984 to January 2013, 158 PVT were diagnosed in our institution, 108 obstructive, 50 non-obstructive (mean age 60 years; women 61%; mitral valve 63%). During hospitalization, surgery was performed in 64 patients (40.5%), fibrinolysis in 33 (21%), and anticoagulation in 61 (38.6%). The overall mortality was 23% (20% with surgery, 27% with fibrinolysis and 15% with anticoagulation). Thus, 121 patients survived and were included in the follow up study. At discharge, DT was prescribed in 68 patients: 83% of the fibrinolyzed patients (19/23), 65% of the anticoagulated (34/53) and 34% of the operated (16/47), (p < 0.001), whereas, 53 received OAC alone: 17% of the fibrinolyzed (4/23), 35% of the anticoagulated (18/51) and 66% of the operated (31/47), (p = 0.001).

At the end of the follow-up (median 43 months; range 0-315 months), treatment with DT or OAC did not involve differences in the rates of mortality (47.5% with DT vs. 38.5% with OAC, p=0.554), thromboembolic events (11.8% with DT vs. 7.5% with OAC, p=0.441), and major bleeding (11.8% with DT vs. 15.1% with OAC, p=0.592). However, the recurrence of PVT was higher in the ones treated with DT (25.0% vs. 9.4%, p=0.029). In the multivariate analysis, ejection fraction (OR: 1.12; p=0.008) and the in-hospital treatment (fibrinolysis in anticoagulation vs. surgery; OR 11.03, p=0.023) where the only variables that pre-dicted PVT recurrences at follow-up.

Conclusion: PVT involves a high morbidity and mortality, not only during hospitalization but also at follow-up. In survivors, lower ejection fraction and medical treatment during ad-mission (fibrinolysis or anticoagulation) are the main determinants for the recurrence of PVT. DT after discharge does not provide any benefit compared to OAC regarding mortal-ity, recurrence or bleeding.

B880 Impact of severe pulmonary hypertension on outcomes late after aortic valve replacement for aortic stenosis compared with aortic regurgitation
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Aim: 1. To evaluate the effect of aortic valve replacement (AVR) on pulmonary hyperten-sion (PH) evolution, comparing patients with aortic stenosis (AS) to patients with aortic re-gurgitation (AR).
2. To determine whether PH remains a risk factor in the modern era for adverse outcomes after AVR for AS compared to AR.
3. To assess the independent echocardiographic predictors for persistence of the severe PH late after isolated AVR.
Methods: 5 years prospective study on 197 patients with severe PH undergoing AVR for AS or AR (115pts). Patients were evaluated clinically and echocardiographically (including TDI) preoperatively and at 10 days, 1, 3, 6 months, 1 year and yearly 5 years postoperatively. Statistical analysis used SYSTAT and SPSS programs for the simple and multiple regression analysis and relative risk calculations. Multivariable analyses were adjusted for age and gender and included left ventricular ejection fraction ≥35%, renal function and log EuroSCORE ≥30%. Primary endpoint was death of any cause within 5 years after AVR.

Results: The evolution of the PH was different in AS group (early after AVR PH improved) compared with AR group. At 1 year postoperatively the percent of the patients with persistent severe PH was 21.9% in AS group and 56.2% in AR group. At 5 years, cardiovascular event-free survival, including hospital visits caused by heart failure symptoms and sudden cardiac death was significantly higher in the patients with preoperative AS (69.7%) compared with AR group (30.4%).

Conclusion: 1. Severe PH is reversible mostly after AVR for AS than for AR, both in the early and late postoperative term.
2. The presence of severe PH had a significant impact on outcomes in patients undergo-ing AVR, decreasing long-term survival and increasing hospitalizations rates, mostly in those with preoperative AR.
3. The main predictors for persistence of severe PH late after AVR were: preoperative AR, E/E' >12, LVEDV >200cm3, LA dimension index >30mm/m2, obstructive pulmonary disease, smoking and associated 2 degree MR.

B881 Transoesophageal echocardiography underestimates hemodynamics during MitraClip implantation compared to daily life
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Aims: MitraClip implantation reduces mitral regurgitation (MR) effectively, but decreases mitral valve area, creating an iatrogenic mitral stenosis (MS). Evaluation with transeso-phageal echocardiography (TEE) peri-procedurally is necessary to measure rest MR and mitral valve pressure gradient (MVPG) as to determine whether it is necessary and safe to place more clips. We investigated whether these peri-procedural measurements of mitral inflow patterns under general anesthesia represent post-procedural measurements and whether exercise is affected by the stenosis.

Methods: In this single-center study we included 51 patients (age 75 ± 10 years, 51% male) who underwent MitraClip implantation. Mitral inflow patterns were measured peri-procedurally by TEE and post-procedurally by transhoracic echocardiography (TTE). In 12 of these patients bicycle exercise echocardiography was performed at follow up.

Results: Peri-procedural mean MVPG was 3.0 ± 1.6 mmHg and increased to 4.3 ± 2.2 mmHg post-procedurally (p<0.001). During exercise mean MVPG increased significantly -compared to rest conditions (from 6 ± 1.7 vs 6.3 ± 2.7 mmHg, p<0.001). Six patients had a mean MVPG > 5 mmHg at follow-up rest and had a significantly higher systolic pulmonary artery pressure than patients with a mean MVPG < 5 mmHg (47 ± 7 vs 15 ± 4 mmHg).

Eur Heart J Cardiovasc Imaging Abstracts Supplement, December 2013
Abstract P881 Figure.

P882
Dynamic behaviour of global longitudinal strain during follow-up in patients with chronic aortic regurgitation and normal left ventricular ejection fraction
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1University of Medicine and Pharmacy Carol Davila, Bucharest, Romania; 2University of Medicine and Pharmacy Carol Davila, Bucharest, Romania; 3University of Medicine and Pharmacy Carol Davila, Bucharest, Romania

Background: At present, left ventricular ejection fraction (LVEF) impacts both therapeutic option and outcomes in patients (pts) with significant chronic aortic regurgitation (AR). Left ventricular (LV) global longitudinal strain (GLS) has been shown to predict cardiovascular outcome and this parameter may determine subtle LV function abnormalities before LVEF declines in these pts.

Purpose: To assess time-dependent behaviour of GLS and its determinants by speckle-tracking echocardiography (STE) in asymptomatic pts with significant AR.

Methods: We prospectively enrolled 42 pts (47±17.6 years, 33 men) with moderate-severe and severe chronic AR and 30 age and gender-matched healthy subjects (45.8±18.0 years, 21 men). Exclusion criteria for AR pts were LVEF > 50%, coronary artery disease, LV wall motion abnormalities, more than mild other valve heart disease, non-sinus rhythm. A comprehensive echocardiogram was performed, including parameters of LV mechanics by STE using a dedicated software (2D strain, EchoPac, GE Healthcare). Analysis of LV GLS by STE was performed from the 4-chamber, 2-chamber, and long-axis apical views. A subgroup of 18 AR pts were follow-up for 13.6±3.6 months.

Results: LVEF was similar in both groups (60±4% in AR group vs 61±3% in control group, p=0.27). At baseline, AR pts had higher LV diameters and volumes, LV mass (all p < 0.001) and lower GLS (17.4±2.3 vs 19.7±2.8%, p=0.001) and peak LV apical rotation (10.6±5.3 vs 17.7±5.9%, p=0.001). During follow-up, all the 18 AR pts remained asymptomatic. At the last follow-up study, compared to baseline, there were higher LV volumes (LV end-systolic volume 33±11 vs 29±9 ml/m2, p=0.028, LV end-diastolic volume 78±20 vs 70±18 ml/m2, p=0.018), but similar indexed LV mass (145±45 vs 144±45 g/m2, p=0.9). Despite similar LVEF at baseline and at the end-of-follow-up (59±4 vs 59±3%, p=0.71), GLS significantly decreased during follow-up (-16.0±2.9 vs -17.3±1.7%, p=0.032). At univariate analysis, GLS measured at the end-of-follow-up significantly correlated with baseline values of LV end-systolic volume (r=0.53, p=0.024), LVEF (r=0.48, p=0.043), LV peak apical rotation (r=-0.71, p=0.001), LV torsion (r=-0.58, p=0.011), and GLS (r=0.64, p=0.006). At multivariable analysis, only baseline LV peak apical rotation emerged as an independent determinant of a decreased GLS at last follow-up (p=0.041).

Conclusion: In pts with significant AR and normal LVEF, GLS decreases during follow-up despite preserved LV mass and EF. The possible role of this parameter to predict outcomes in pts with significant AR before LVEF declines remains to be studied.

Abstract P883 Figure.

P883
Insertion sites of basal chordae on the mitral valve determine the systolic valvar configuration and severity of functional mitral regurgitation
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Purpose: We aimed to investigate the association between individual variations of basal chordae (BC) insertion sites on the mitral valve (MV) and development of functional mitral regurgitation (FMR).

Methods: In 38 patients in sinus rhythm who underwent cardiac transplantation due to dilated or ischemic cardiomyopathy, 3-dimensional full-volume color Doppler echocardiography was performed before transplantation to assess the geometry of MV apparatus, left ventricular (LV) volumes, and FMR severity using proximal isovelocity surface area method. After transplantation, 4 BC lengths and insertion sites were analyzed using direct measurements in the implanted hearts before fixation.

Results: By multiple linear regression analyses, systolic tenting angle and bending angle of anterior leaflet were mainly associated with the distance between insertion sites of the medial and lateral BCs (A in Fig.), while tenting angle of posterior leaflet was linked with LV volume indices. The mean longitudinal distance of 4 BCs from the MV edge (B) was the main determinant of the distal length of anterior MV from the angulation point (C). Among pathologic parameters, the mean longitudinal distance of outer 2 BCs from the MV edge was the only determinant of effective regurgitant orifice area (EROA) (r=0.413, p=0.011), while central MV tenting area (D) was among echocardiographic geometric factors (r=0.477, p=0.002). EROA did not correlate with LV volume indices, LV ejection fraction and BC lengths. The mean longitudinal distance from the MV edge of outer 2 BCs ≥ 1.0 cm predicted EROA ≥ 0.2 cm² with a sensitivity of 75% and a specificity of 72%.

Conclusion: Insertion sites of BCs are associated with systolic anterior MV configuration and the severity of FMR in patients with dilated LV and severe systolic dysfunction.

Abstract P884 Figure.

P884
Clinical efficacy and cardiac reverse remodelling in patients with severe mitral regurgitation and left ventricular dysfunction after percutaneous mitral valve repair with the MitraClip system
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Background: Chronic severe mitral regurgitation (MR) leads to significant structural cardiac changes due to volume overload. It causes left atrial (LA) and left ventricular (LV) dilation, deterioration of LV contractile function and pulmonary hypertension. Surgical mitral valve repair is the therapy of choice when severe MR is associated with symptoms or LV dysfunction. Percutaneous mitral valve repair with the MitraClip system evolved as a promising interventional tool in high risk patients. We report the clinical efficacy and echocardiographic findings in patients with symptomatic severe MR and reduced LVEF 6 and 12 months after MitraClip implantation.

Methods: We included patients with heart failure (LVEF ≤ 35 %) and significant MR ≥ 3, who were declined for surgery. Transhoracic echocardiography was performed before, 6 and 12 months after the procedure. Differences in 6-min-walk test (6-MWT), NT-pro BNP and NYHA functional class were established. The evaluated parameters by echocardiography were LV end-diastolic volume, LVEF, LA-Index and systolic pulmonary artery pressure (sPAP).

Results: The MitraClip procedure was performed in 29 patients. 25 patients had functional MR and 4 patients had a mixed genesis of MR. Clinical and echocardiographic 6-month and 12-month follow-up data were obtained in 22 and 20 patients respectively. At 6 and 12 months, MR ≤ 2 was present in 21 (96.6%) and 17 (85%) patients. Neither LVEF (from 26.2 ± 6.4 % at baseline to 26.9 ± 9.4 % at 6 months and 27.6 ± 9.8 % at 12 months) nor left ventricular enddiastolic volume (from 264.4 ± 81.1 ml to 246.0 ± 62.5 ml and 260.4 ± 79.1 ml) changed significantly. A decrease of LA-Index (from 97.9 ± 32.9 ml/m² to 75.3 ± 20.9 ml/m² and 79.4 ± 22.5 ml/m²) and sPAP (from 60.8 ± 18.8 mmHg to 48.0 ± 12.2 mmHg and 49.8 mmHg) was observed. 6-MWT distance and NYHA-class improved significantly. However, NT-pro BNP levels decreased significantly after 6 months but increased after 12 months.

Conclusion: Percutaneous edge-to-edge valve repair reduces severe MR in high surgical-risk patients with marked LV-dysfunction, leading to an improvement in functional capacity after 12 months. In addition, distinct decrease of LA-Index and sPAP was noticed. However, in contrast to other studies no significant reverse remodelling of the left ventricle was observed in our study population.

P885
Human S100/calgranulin accelerates calcific valve disease and cardiac hypertrophy in chronic kidney disease in a RAGE dependent manner
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Purpose: Chronic kidney disease (CKD) is associated with accelerated cardiovascular disease. Elevated serum S100A12 predicts cardiovascular morbidity and mortality in patients with end-stage renal disease. We aim to test the hypothesis that human S100/calgranulin in transgenic mice exposed to the metabolic changes of OKD would develop accelerated cardiovascular disease.
Methods: A novel humanized mouse with transgenic expression of human S100/calgranulin was generated by expression of a bacterial artificial chromosome of the human S100/calgranulin gene cluster containing genes and regulatory elements for S100A8 and S100A12 (60kb) in C57BL/6J mouse (BAC-S100). CDX was induced in BAC-S100 mice and wild type (WT) littermates by surgical ligation of the ureters. The heart and aorta were ana-lyzed after 10 weeks of elevated blood urea nitrogen (BUN). To gain mechanistic insights into the underlying molecular signaling of S100/calgranulin, BAC-S100 mice were bred with mice lacking the receptor for advanced glycation endproducts (RAGE), which is known to mediate pro-inflammatory effects of S100/calgranulin.

Results: BAC-S100 mice express human S100A12 in myeloid cells and S100A12 was present in the serum of BAC-S100 mice (25ng/ml serum), but was not detected in WT mice. Serum S100A12 increased further in the presence of CDX. BAC-S100 mice with CDX had several cardiac abnormalities including the presence of osteoblast-like cells with enhanced ectopic calcification around the mitral and aortic valve upon staining with Alizarin Red S. These osteoblast-like cells expressed fibroblast growth factor 23 (FGF23). Moreover, in vivo ECHO showed abnormal mitral valvop Doppler flow with reduced ratio of early (E) to atrial (A) filling indicative of diastolic dysfunction. Furthermore, hBAC-S100 mice subjected to CDX develop cardiac hypertrophy and fibrosis, as evi-denced by increased heart weight/ body weight ratio and elevated gene expression of hypertrophic and fibrotic markers, such as ANP, β-MHC, TGFB1, CTGF, and Col1a1. This phenotype was not present in WT mice subjected to CDX, and attenuated in hBAC-S100/RAGE-/- subjected to CDX. Furthermore, aortic valve calcification develops spontaneously in 10-12 month old hBAC-S100 mice, indicating that CDX accelerates this process in hBAC-S100 mice, but is not required.

Conclusion: Circulating myeloid-derived human S100/calgranulin promotes ectopic cardiac calcification and hypertrophy in chronic kidney disease in a RAGE dependent manner.

P886
Left ventricular hypertrophy with strain is associated with increased myocardial injury and fibrosis in patients with aortic stenosis

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Purpose: In patients with aortic stenosis (AS), electrocardiographic left ventricular hypertrophy (LVH) and strain are associated with an adverse prognosis. However the mechanism for this pattern is unknown. We sought to investigate the association of strain with structural abnormalities on cardiovascular magnetic resonance (CMR) and serum cardiac troponin I concentrations.

Methods: Patients with AS and no prior myocardial infarction were prospectively recruited. LVH on the electrocardiogram (ECG) was defined by Sokolow-Lyon and Cornell voltage criteria, and strain was identified by ST depression or T wave inversion in leads V4-V6. Standard echocardiographic indices were used to assess AS severity (EES, Philips Medical Systems). Indexed left ventricular mass (LVM) and volumes were measured using 3T CMR (MAGNETOM Vario, Siemens AG). Myocardial late gadolinium enhancement (LGE) was performed using inversion recovery gradient echo and phase sensitive inversion recovery sequences. Presence of LGE was evaluated by two independent observers 8-15 min following gadobutrol 0.1 mmol/kg. Serum cardiac troponin I (cTnI) concentrations were determined using the ARCHITECT STAT high-sensitive troponin I assay (Abbott Laboratories).

Results: Seventy patients were recruited (44 males; 72 years old; aortic jet velocity 0.8m/s). Patients with ECG-defined strain (n=8) had higher LVMi and more severe AS (both p<0.01) than subjects without LVH (n=40) and those with LVH but no strain (n=22). All patients with strain had mid-wall LGE. Indeed the presence of strain had negative and positive predictive values of 73% and 100%, respectively, for identifying LGE. In spite of guidelines, only half of the pts with symptomatic severe mitral regurgitation (MR) underwent surgery. Still, only about 50% of the pts underwent mitral valve repair (MVR) over replacement, even if the advantages of MVR have been well demonstrated.

We developed a geometrical — echocardiographic tool and concept of mitral valve assessment, named ‘triangle of coaptation’ (ToC), which refined the surgical approach. Due to the high elasticity of mitral tissue in degenerative MR the stability of the reconstructed valve may fail over time. ToC as geometric echocardiographic concept aiming to restore MV shape and coaptation is a crucial point to improve surgical approach and the outcome. The freedom of reope-ration was 86% at 6yrs and 90% at 8yrs. The prevalence of cardiac death in patients with severe AS with and without strain defined by the ToC, CL and CH remained stable at mid-term follow-up. A CL <4mm identifies a group of pts who develop significant mitral regurgitation at Fup. Mitral valve repair for degenerative disease can achieve a competent and durable single-orifice native valve in almost all cases, with low mortality and morbidity rates and stable late results.

P888
Mid-term clinical and echocardiographic follow-up in degenerative mitral valve repair using the geometrical concept of coaptation triangle

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Background: In spite of guidelines, only half of the pts with symptomatic severe mitral re-gurgitation (MR) undergo surgery. Still, only about 50% of the pts underwent mitral valve repair (MVR) over replacement, even if the advantages of MVR have been well demonstrated.

We developed a geometrical — echocardiographic tool and concept of mitral valve assessment, named ‘triangle of coaptation’ (ToC), which refined the surgical approach. Due to the high elasticity of mitral tissue in degenerative MR the stability of the reconstructed valve may fail over time. ToC as geometric echocardiographic concept aiming to restore MV shape and coaptation is a crucial point to improve surgical approach and the outcome. The freedom of reope-ration was 86% at 6yrs and 90% at 8yrs. The prevalence of cardiac death in patients with severe AS with and without strain defined by the ToC, CL and CH remained stable at mid-term follow-up. A CL <4mm identifies a group of pts who develop significant mitral regurgitation at Fup. Mitral valve repair for degenerative disease can achieve a competent and durable single-orifice native valve in almost all cases, with low mortality and morbidity rates and stable late results.
strain rate, circumferential strain rate, LV twist and torsion). Preoperative LV twist/torsion was inversely correlated with postoperative LVEF (R = -0.54, p < 0.05). Nine patients presented a delayed LV twist at 115 ± 12% of systolic time. **Conclusion:** Despite preoperative preserved GLS, elevated values of LV twist is associated with postoperative decrease in LVEF in patients with severe primary mitral regurgitation. Thus, the analysis of LV rotational mechanics may be of potential value to detect early subclinical LV dysfunction in these patients.

**Abstract P899 Table.**

<table>
<thead>
<tr>
<th>Preoperative</th>
<th>Postoperative</th>
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<tr>
<td>data (N=20)</td>
<td>data (N=20)</td>
</tr>
<tr>
<td>mean ± SD</td>
<td>mean ± SD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LV EF (%)</th>
<th>67 ± 7</th>
<th>58 ± 8</th>
<th>P = 0.001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac index (L/min/m²)</td>
<td>2.8 ± 0.7</td>
<td>3.3 ± 0.8</td>
<td>P = 0.05</td>
</tr>
<tr>
<td>Indexed end-diastolic LV volume (mL/m²)</td>
<td>72 ± 15</td>
<td>52 ± 12</td>
<td>P = 0.0001</td>
</tr>
<tr>
<td>Indexed end-systolic LV volume (mL/m²)</td>
<td>24 ± 7</td>
<td>23 ± 7</td>
<td>P = 0.805</td>
</tr>
<tr>
<td>Global longitudinal strain (%)</td>
<td>-20.0 ± 3.7</td>
<td>-15.8 ± 3.2</td>
<td>P = 0.001</td>
</tr>
<tr>
<td>Global longitudinal strain rate (s⁻¹)</td>
<td>-1.20 ± 0.20</td>
<td>-0.99 ± 0.20</td>
<td>P = 0.20</td>
</tr>
<tr>
<td>Global circumferential strain (%)</td>
<td>-28.3 ± 7.5</td>
<td>-24.9 ± 5.2</td>
<td>P = 0.090</td>
</tr>
<tr>
<td>Global circumferential strain rate (s⁻¹)</td>
<td>-1.80 ± 0.40</td>
<td>-1.60 ± 0.30</td>
<td>P = 0.05</td>
</tr>
<tr>
<td>Peak systolic twist (°)</td>
<td>15.9 ± 6.2</td>
<td>12.9 ± 4.8</td>
<td>P = 0.071</td>
</tr>
<tr>
<td>Peak systolic torsion (°/cm)</td>
<td>1.90 ± 0.80</td>
<td>1.60 ± 0.10</td>
<td>P = 0.084</td>
</tr>
<tr>
<td>Twist at aortic valve closure (°)</td>
<td>15.2 ± 6.5</td>
<td>11.1 ± 6.0</td>
<td>P = 0.05</td>
</tr>
</tbody>
</table>

**P890**

High-sensitive troponin T in patients with severe aortic stenosis referred to cardiac surgery: association with clinical and echocardiographic parameters. RA. Spampinato1; M. Tasca1; J. Da Rocha E Silva1; E. Strodtrees1; V. Schlamova1; Y. Dmitrieva1; M. Mende2; MA. Borger1; FW. Mohr1

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**Purpose:** The new high-sensitive troponin T (hs-TnT) expands towards non-ischemic myocardial disease like aortic valve stenosis (AS). It is recognized that elevated hs-TnT levels may provide important insights into the decision regarding when to surgically intervene on the tricuspid valve (TV), while optimizing the decision to perform aortic valve replacement (AVR), especially in patients with severe AS. The aim of this study was to determine the association with clinical and echocardiographic parameters.

**Methods:** We prospectively evaluated 81 consecutive HCM patients without severe rest LVOT pressure gradient (PG) at rest, during VM, after sublingual ISDN spray (2.5 mg), and during VM after ISDN. An obstruction was defined as a PG ≥ 30 mmHg.

**Abstract P892 Table.**

<table>
<thead>
<tr>
<th>Rest measurement</th>
<th>Valvular maneuver</th>
<th>ISDN</th>
<th>Valvular maneuver and ISDN</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVT peak gradient (mmHg)</td>
<td>16</td>
<td>28</td>
<td>59</td>
</tr>
<tr>
<td>Median</td>
<td>7</td>
<td>26</td>
<td>12</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>4.4</td>
<td>11.0</td>
<td>7 vs. 14.9</td>
</tr>
<tr>
<td>Peak LVT gradient</td>
<td>19</td>
<td>47</td>
<td>62</td>
</tr>
<tr>
<td>(LVT - left ventricle outflow tract, ISDN - isosorbide dinitrate)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cardiomyopathies**

**P892**

Comparison of sublingual isosorbide dinitrate and Valsaeva maneuver in the detection of hypertrophic cardiomyopathy obstructions. D. Zemanek1; P. Tomsovi1; M. Belehrad1; T. Kara1; J. Vesely1

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**Aims:** An left ventricular outflow tract (LVOT) obstruction assessment with a provoking test should be a routine part of the evaluation of patients with hypertrophic cardiomyopathy (HCM). The aim of the study was to compare the utility of the Valsaeva maneuver (VM) and sublingual application of isosorbide dinitrate (ISDN) spray for the detection of an obstruction.

**Methods:** We prospectively evaluated 81 consecutive HCM patients without severe rest LVOT obstruction. We measured peak LVOT pressure gradient (PG) at rest, during VM, after sublingual ISDN spray (2.5 mg), and during VM after ISDN. An obstruction was defined as a PG ≥ 30 mmHg.
Results: An obstruction was present in 15 patients (19%) at rest, in 38 patients (47%) during VM, in 50 (62%) patients after ISDN and in 55 patients (68%) during VM. The differences among PG and the prevalence of obstruction in different provoking tests were statistically significant (p=0.045 for prevalence of obstruction with ISDN vs VM during ISDN, p<0.001 for all other comparisons). The results are summarized in Table and Figure.

Conclusion: The ISDN test and VM are reliable screening methods for the detection of an HCM obstruction. Although ISDN appears to be more precise than VM, the best option is a combination of both methods which maximize inducement of LVOT obstructions in patients with HCM.

P895

Effectiveness of cardiac magnetic resonance imaging in patients with aborted sudden death and absence of structural heart disease

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A percentage of patients (p) with sudden cardiac death and structural heart disease (SHD) not detected by standard imaging techniques (SIT) was reported. We hypothesized that use of cardiac magnetic resonance (CMR) in this setting can provide relevant information and be an effective strategy. To assess that the CMR data bases and medical records of five institutions (between 2008-2013) were analyzed, and patients with aborted sudden death or syncopal ventricular tachycardia and absence of SHD (echocardiography, coronary angiography and ECG normal or inconclusive) were selected. A descriptive analysis of CMR findings and assessment of effectiveness of CMR was performed.

Results: Twenty five were found, 10 of them had SHD by SIT and were excluded. 15 p were studied, 13 male (86%), mean age 49 years (SD:15). CMR was effective to establish the cause of event in 8p (53%) and provided additional information in 2 p (13%). The diagnoses were: ischemic heart disease (3p) with edema and small necrosis area in lateral wall (2p) and septum (1p); Left dominant arhythmogenic cardiomyopathy with epicardial dissection limited to the anterior basal wall, 1 p with myocarditis showing edema and delayed enhancement and 1 p with severe pattern of septal fibrosis diagnosed as suspected myocarditis. In 2 additional p mild hypertrophy and small septal foi of fibrosis were detected.

Conclusions: In this clinical setting CMR is effective for diagnosis of structural heart disease in 53% of patients. In at least one third of patients acute causes of event were detected therefore family studies should not be performed and implantable defibrillator indication should be carefully evaluated.

Abstract P895 Figure. Edema and small area of necrosis

P894

Combined right ventricular dysfunction and raised left ventricular filling pressures predict limited exercise capacity in reduced ejection fraction heart failure

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Background and Aim: Compromised exercise capacity is the main symptom in patients with heart failure (HF) and reduced left ventricular (LV) ejection fraction (EF). Six-minute walk test (6-MWT) is popular for objective assessment of exercise capacity in these patients but is confined to heart centres. The aim of this study was to prospectively examine functional parameters that predict 6-MWT in patients with HF and reduced LVEF.

Methods: In 111 HF patients (mean age 60±12 years, 56% male), a 6-MWT and an echo-Doppler study were performed in the same day. In addition to conventional ventricular functional measurements, global LV dysynchrony was indirectly assessed by total isovolumic time-

RESULTS [ins/min; calculated as: 60 – (total ejection time – total filling time)], and Tei index (t-IVT/exercise time). Also, LV and right ventricular function were assessed by mri and tricuspid annular plane systolic excursion (MAPSE and TAPSE, respectively). Based on the 6-MWT distance, patients were divided into: Group I: ≤300m and Group II: >300m.

Results: The 6-MWT distance correlated with t-IVT and Tei index (r = -0.37, p < 0.001, for both), and septal e’ velocities (r = 0.41, p = 0.001, and r = 0.46, p < 0.001, respective-

ly), E/e’ ratio (r = -0.37, p < 0.001) and TAPSE (r = 0.45, p < 0.001), but not with the other clinical or echo parameters. Group I patients had longer t-IVT, lower E/e’ ratio, TAPSE and Tei index (<0.001 for all) compared with Group II. In multivariate analysis, TAPSE [0.076 (0.017-0.335), p = 0.001], E/e’ [1.165 (1.017-1.334), p = 0.027], IVT [1.178 (1.104-1.370), p = 0.033] independently predicted poor 6-MWT performance (<300m).

Sensitivity and specificity for TAPSE <1 cm were 66% and 77%, (AUC 0.78, p < 0.001); E/e’ <10.7 were 66% and 62% (AUC 0.67, p=0.002) in predicting poor 6-MWT. Combined TAPSE and E/e’ had a sensitivity of 68% but specificity of 92% in predicting 6-MWT. Respective values for combined TAPSE and t-IVT were 71% and 85%.

Conclusion: In patients with HF, the limited exercise capacity assessed by 6-MWT, is multifactorial being related to severity of right ventricular systolic dysfunction as well as raised LV filling pressures and global dysynchrony.
ventricular isovolumic relaxation time (IVRT) was prolonged in patients (125.5 ± 28.5ms versus 100.2 ± 1.3ms, p<0.01). Left ventricular peak systolic myocardial velocities (S') were significantly lower in patients (9.3 ± 2.7cm/s versus 10.1 ± 0.8cm/s, p<0.01). Peak acceleration during isovolumic contraction (IVV) was similar between patients and controls (5.9 ± 1.8 versus 6.1 ± 0.52m/s², p=0.79). Peak global longitudinal systolic strain (GLS) was significantly lower in patients (-13.2 ± 3.7% versus -19.3 ± 1.1%, p<0.01). When only patients with preserved LVEF were included in the analysis, IVRT was still prolonged and S' velocity was lower in patients compared to controls (p<0.01, p=0.02 respectively). Patients with preserved LVEF had similar IVV with controls (p=0.69) and lower GLS (p<0.01).

Conclusions: Changes in more sensitive indices of cardiac function may be present in patients with preserved LVEF late after chemotherapy treatment. The long-term clinical and prognostic significance of these findings requires further investigation

P897
Association between left ventricular endocardial trabecular volume and left ventricular function in cardiac diseases by cardiac magnetic resonance imaging

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Purpose: Left ventricular (LV) trabeculae are important in LV contraction and the papillary muscle structure. We measured the LV endocardial trabecular volume (TV) in order to evaluate the association between TV and cardiac function in healthy subjects and cardiac patients by cine cardiac magnetic resonance (MR) imaging with true fast imaging with steady-state precession (FISP).

Methods: Nine healthy subjects (H) and 109 consecutive patients were entered to the present study: dilated cardiomyopathy (DCM, n=21), ischemic cardiomyopathy (ICM, n=63), mitral regurgitation (Mr, n=13) and aortic stenosis (AS, n=10). Nine short-axis views encompassing the entire LV were acquired by using true fast LVP LV endocardial contours and the area of trabeculae were traced manually to calculate LV endocardial-diastolic volume (EDV), LV end-systolic volume (ESV), LVEF, ejection fraction (EF) and TV. Results: EDTV (mL) in DCM (49 ± 22) and in LV (20 ± 9) was significantly (P<0.01) larger than that in H (23 ± 6). EDTV in Mr and AS were 30.6 ± 9.1 and 25.1 ± 7.0, respectively. In all subjects, EDTV was positively correlated with EDV (p<0.001) and ESV or EF (p=0.001). In DCM, EDTV was correlated with ESV (p=0.001) and ESV (p=0.001). Positive correlation (EDTV and ESV) and negative correlation (EDTV and EF) were observed independently in DCM or in ICM. The ratio of EDTV/EF was progressively higher in DCM (2.33 ± 1.70) than in ICM (0.52 ± 0.32). Using the ROC curve, EDTV/EF was significant factor for distinguishing of DCM from ICM. The diagnostic point was 1.16, the sensitivity of EDTV/EDV was 84%, and the specificity 96%.

Conclusion: These data suggest that EDTV increases with LV volume increase and it does with EF decrease. To distinguish low EF DCM from ICM, measurement of EDTV/EF ratio is useful, especially when the contrast enhancement is contraindicated.

P898
Left ventricular twist assessment by 2-D speckle tracking in patients with Takotsubo cardiomyopathy

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Purpose: Left ventricular twist (VT) and torsion (VTOR) are cardiac deformation parameters that are usually assessed in healthy volunteers. In the infarction territory, this MPI (Myocardial Perfusion Imaging) signal might not recover completely in long-term observation.

Methods: We included 67 patients with TC. Total recovery of LV function was observed at hospital discharge in 24 patients (35.8%) and at 15 days after admission in 28 patients (41.8%). The recovery of LV function during the hospital stay was not associated with death (0% vs 2.8%, p=0.463), stroke/TIA (5.6% vs 5.3%, p=0.964) or TC recurrence (0% vs 8.3%, p=0.196) in the follow-up. In the multivariate analysis, the faster recovery of LV function was not an independent predictor of events.

Conclusion: In this multicenter study, the patients with TC that present a faster recovery of LV function do not have a better medium term prognosis. However, the low rate of complications in the follow-up may have limited the study results. Our results need further confirmation in larger studies.

P900
Evaluation of estrogen receptors polymorphisms in Takotsubo cardiomyopathy

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Purpose: Takotsubo cardiomyopathy (TCKM) has a higher prevalence in females and primarily affects menopausal age when estrogen levels are particularly low. Cohort studies suggest an association between polymorphisms of ESR1 and ESR2 genes and myocardial infarction (MI), but data are lacking about the role of the estrogen receptor genes in TCKM.

Methods: Two polymorphisms of ESR1 gene (397 T>C, rs2234693) and ESR2 gene (-1839 G>C, rs1271572 and 1082 G>A, rs1256049), with their associated haplotypes, were evaluated in 18 women affected by TCKM (70 ± 6.9 y), 50 women with myocardial infarction (76 ± 3.9 y) and 30 healthy controls (66 ± 3.4 y).

Results: Homozygous for T in ESR1 -397, was found being prevalent in patients with TCKM (Table 1). As haplotypes of ESR1 genes, we observed a higher prevalence of haplotypes T in patients with TCKM both in ESR1 -397 and ESR2 -1839 (Table 2). On logistic regression analysis the haplotype T of ESR1 -397 was significantly associated with TCKM.  

Abstract P900 Table. Pearson’s chi square - ESR1 -397 T>C

<table>
<thead>
<tr>
<th>TT</th>
<th>CT</th>
<th>CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controls</td>
<td>32.4%</td>
<td>47.1%</td>
</tr>
<tr>
<td>Takotsubo</td>
<td>61.1%</td>
<td>38.9%</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>26.2%</td>
<td>61.9%</td>
</tr>
</tbody>
</table>

p = 0.04
whereas the haplotypes G for ESR1 -351 and for ESR2 -1839, respectively, were associated with MI (Table 3).

**Conclusions:** Polymorphism ESR1-397 T>C; particularly haplotype T is associated with ThCM.

| Abstract P900 Table. Simple Logistic Regression Analysis Polymorphisms |
|-----------------|-----------------|-----------------|
| **TAKOTSUBO**  | **OR (95% CI)** | **p** |
| ESR1 -397 T     | 3.27 (1.6-8.49)  | 0.015           |
| ESR1 -351 G     | 0.85 (0.37-1.97) | 0.71            |
| ESR2 -1839 G    | 1.11 (0.49-2.50) | 0.79            |
| ESR2 -1082 G    | 1.57 (0.68-3.60) | 0.28            |

**P901**

Echocardiographic predictors of adverse cardiac events in beta thalassemia major

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Cardiac dysfunction secondary to chronic iron overload represents the leading cause of mortality and morbidity in patients (pts) with thalassemia major (TM). Echocardiography is a fundamental tool for the close follow ups and the identification of predictors of long-term cardiac adverse events (AEs).

**Purpose:** To identify echocardiographic parameters related to the development of future AEs in a group of asymptomatic TM pts.

**Methods:** In the study were included 58 TM pts (TM group) and a control group of 23 healthy subjects (HS group), matched for age and sex. All subjects underwent standard echocardiography by using a GE Vivid 7. Standard M-Mode and 2D parameters of left ventricular (LV) function were obtained. Tissue Doppler Imaging was applied in the pulsed wave Doppler mode (PW-TDI) at the septal and lateral sides of the mitral annulus to obtain the averaged values of systolic (S’ wave), early (E) and late (A’) diastolic myocardial velocities. AEs were considered in a composite endpoint including: cardiovascular death, heart failure onset (HF), conduction disturbances requiring permanent pacemaker (PM) implantation, new detection of supra-ventricular arrhythmias. The overall population was followed up for 575 ± 152 days.

**Results:** TM group revealed a significant increase in the mean value of LV diastolic diameter, diastolic volumes and LV Mass indexed for BSA compared to HS (p=0.006; p=0.003; p=0.003 respectively). All the TDI derived parameters were significantly reduced in TM. The mean value E/E’ ratio was significantly increased in TM (p=0.003).

10 AEs were observed in the TM including: one death from cardiac cause, 6 pts developing HF S3 new detected supra-ventricular arrhythmias one of which required PM implantation, ROC curve analysis identified LV diastolic volumes >121 ml/L (AUC = 0.84, p<0.001, Sensitivity 100%, Specificity 66.7%), LV Mass Index >89.7 g/m2 (AUC = 0.86, p<0.001, Sensitivity 100%, Specificity 76.6%), S’ wave >7.0 cm/sec (AUC = 0.81, p<0.001, Sensitivity 80%, Specificity 62.5%), E’ wave <10.0 cm/sec (AUC = 0.75, p=0.02, Sensitivity 50%, Specificity 91.7%). E/E’ ratio >7.45 (AUC = 0.83, p<0.0003, Sensitivity 90%, Specificity 70%) and A’ wave <5 cm/sec (AUC 0.79, p=0.002, Sensitivity 70%, Specificity 81.3%) as cut off values differentiating TM patients with AEs. LV ejection fraction was indeed not useful for this purpose (AUC 0.64, p=0.21).

**Conclusions:** TDI derived parameters are able to identify subclinical myocardial dysfunction in asymptomatic TM pts and are also useful for the prediction of AEs before the impairment of conventional parameters.

**P902**

Increased oxidative stress and arterial stiffness related to genetic polymorphism in the development of taxanes-induced cardiotoxicity

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**Background:** The applicability of taxanes, widely used chemotherapy drugs in breast cancer, is limited by cardiotoxicity, leading to increase of morbidity and mortality. Therefore, better understanding of mechanisms of taxanes-induced cardiac dysfunction is essential.

**Aims:** To test the role of oxidative stress and increased arterial stiffness, related to a specific genetic polymorphism, in the development of cardiotoxicity in patients with breast cancer, treated with taxanes.

**Methods:** We studied prospectively 25 women with breast cancer (49 ± 17.1 g/m2). Conventional, 2D Speckle Tracking, and 4D auto LV quantification echo was used to assess LV baseline, and after the completion of treatment (cumulative dose of 451 ± 171 g/m2). Time course of left ventricular myocardial dysfunction by cardiotoxicity of anthracycline

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**Background:** Anthracyclines cause dose-dependent left ventricular (LV) myocardial dysfunction associated with a poor prognosis. Therefore, interest is high in the time course of LV dysfunction in these patients as a result of the cardiotoxicity of anthracyclines because of its potential for predicting future global LV dysfunction.

**Method:** We designed the following two study models. Study 1: Forty patients with preserved ejection fraction (EF) (all ≥55%) after receiving anthracyline chemotherapy (292 ±134mg/m2) were recruited. Time elapsed from final anthracyline administration and the echocardiographic examination was 14 ± 24 months. Twenty age- and gender-matched normal volunteers were studied for comparisons. Study 2: Eight consecutive patients prospectively recruited before anthracyline chemotherapy, and followed 6 and 12 months after anthracyline administration. For both study models, three-dimensional (3D) radial, circumferential, and longitudinal myocardial function was quantified as a peak global strain curve using 3D speckle-tracking from all 16 LV segments, and LV endocardial area change ratio (area strain) was quantified as peak global area strain curve (3D-GAS) to determine LV endocardial function.

**Results:** Study 1: Only 3D-GAS and peak 3-D global circumferential strains of the atrial and ventricular myocardium were significantly worse than those of the control group (42.7 ± 2.9 vs. 45.8 ± 4.3% and -31.1 ± 3.5% vs. -34.4 ± 2.2%, respectively; both p<0.002) even though global LV systolic and diastolic functions were similar (EF: 65 ± 4% vs. 66 ± 3%; E/E’; 8.3 ± 2.4 vs. 8.9 ± 3.2). It was noteworthy that multivariate analysis showed only 3D-GAS (p=0.365, p<0.002) was independently associated with cumulative anthracycline dose. Study 2: EF significantly decreased from baseline to 6 months and 12 months after anthracyline administration (69.5 ± 2.8%, 65.8 ± 3.9%, 64.8 ± 4.3%, p<0.049, but E/E’ did not.

**Conclusions:** Patients who received anthracyline have LV endocardial dysfunction even if global LV function was preserved. Early detection of minor LV myocardial dysfunction may thus play a clinical role in predicting future global LV systolic dysfunction.

**P904**

Prognosis of apical hypertrophic cardiomyopathy according to coronary artery disease

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**Background:** Apical hypertrophic cardiomyopathy (HCM) is very rare form of HCM. It has been known to have a better prognosis than classical type of HCM, but its natural history is not thoroughly investigated because of its rarity. Furthermore the prognosis related to coronary artery disease is not well known.

**Method:** We analyzed 98 consecutive patients with apical HCM who received coronary angiography (n=71) or coronary CT scan (n=27) in two general hospitals. Mean age was 61.5 ± 9.8 years and proportion of female was 36.7% (n=36). Prevalence of diabetes and hypertension was 24.5% and 61.2% each. Proportion of the pure and mixed type was 65.6% and 34.4% each. Mortality was 5% (cardiovascular/CV) death n=3, non CV death n=2) for 1770.7 ± 1010.8 days follow up period. We analyzed risk factors for major adverse vascular events (MACE) which include all-cause mortality, non-fatal myocardial infarction & stroke, admission due to CV cause in apical HCM. Mean follow up period was 53.0 ± 50.8 months and event rate was 20.4%. Presence of coronary artery disease (CAD) in coronary angiography or CT scan is an independent risk factor for MACE after adjusting DM, hypertension, age, sex, old CVA, type of apical HCM (OR 3.34 p<0.002, 95% CI 1.16-9.63, Cox regression survival analysis) MACE free survival rate over 80 month in patients without CAD was about 90%.

**Conclusion:** Apical HCM showed good survival rate and it is nearly comparable with general population. MACE free survival was dependent to presence of coronary artery disease and apical HCM patients without coronary artery disease has excellent MACE free survival rate.

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**Abstracts**

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SYSTEMIC DISEASES AND OTHER CONDITIONS

P905

The efficacy of hand held echocardiography for community based pre-participation screening
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Aims: Current European and North American guidelines disagree on their recommendations for pre-participation cardiac screening (PPCS). Although echocardiography improves the diagnostic accuracy and specificity of screening it is generally considered a second line investigation due to its additional costs and inconvenience. We evaluated the efficacy of using a novel highly portable, high quality echocardiography system as a first-line investigation for PPCS in the community.

Methods: Volunteers were recruited following a presentation to the sixth form of a local school. PPCS occurred within the school but outside of normal school hours and was performed by a primary care physician with a special interest in Sports Medicine and trained clinical physiologists. Each student had a 12-lead ECG performed and completed a custom designed questionnaire. Echocardiography was performed using a portable hand held device. Standardized views were recorded and a preliminary report generated by the physiologists. The images were analysed off-line by a blinded expert cardiologist.

Results: 97 male students aged 16-18 years were recruited. Average screening time was 15 ± 5 minutes. Potential abnormalities were identified in 8 subjects (8%); 5 by ECG (5%) and 3 by echocardiography (3%). 3 participants (3%) had elevated blood pressures above the 99th Centile (> 150 systolic). Expert cardiologist analysis did not identify any additional pathology. Cost of the screening, including staff and equipment, was $53 per student.

Conclusions: PPCS in the community using hand-held echocardiography is practical and not expensive. The increased portability of new hand-held echocardiography equipment allows cardiac imaging to become a first line investigation and move PPCS away from the hospital into the community or school. The additional sensitivity and specificity provided by hand-held echocardiography will enhance screening and reduce the need for more expensive follow-on testing.

P906

Cardiac magnetic resonance in pulmonary arterial hypertension: noninvasive assessment of the ventriculo-arterial unit
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Background: Ventriculo-arterial unit assessment is an important tool for the diagnosis and follow-up of patients with pulmonary arterial hypertension (PAH). Exercise echocardiography might improve the early diagnosis of PAH by unmasking exercise-induced PAH (ex-PAH) but is not feasible in all SSC patients. We sought therefore to investigate whether pulmonary artery enlargement and subtle right ventricle (RV) dysfunction can be used as predictive markers of ex-PAH.

Methods: The study group consisted of 38 normotensive patients with APE (18F, mean age 52 ± 16y) recruited from CT. Patients with AF after MI and with any valvular disease were not included. TTE was performed within 48 hrs after admission and blood was taken for NT-proBNP assay, a marker of RVO. The control group (C) formed 21 healthy persons (11F; mean age 44 ± 13). The DTI for RV function was acquired at the level of tricuspid annulus and for LV function at the level of mitral lateral annulus. The IVV (cm/s) for RV and LV were measured and IVVr was calculated.

Results: RV IVV was decreased in APE when compared to controls (10.01 ± 4.7 vs 13.03 ± 3.3; p=0.01), while the LV IVV was higher in the former (11.4 ± 3.5 vs 7.3 ± 2.7; p<0.001). The IVVr was 0.95 ± 0.5 in APE and 2.01 ± 0.9 in controls (p=0.001). Mean NT-proBNP was 1579 ± 1777 pg/ml in APE. The IVR correlated with NT-proBNP (r=0.55; p=0.001), and also with set of classical echo parameters used for describing RVO: apical 4C RV diameter (r = 0.6; p < 0.001); apical 4C RV/LV diameter (r = 0.5; p = 0.001); IVVr (r = 0.6; p < 0.0001). Mean NT-proBNP was 1579 ± 1777 pg/ml in APE. The IVR correlated with NT-proBNP (r=0.55; p=0.001), and also with set of classical echo parameters used for describing RVO: apical 4C RV diameter (r = 0.6; p < 0.001); apical 4C RV/LV diameter (r = 0.5; p = 0.001); IVVr (r = 0.6; p < 0.0001). Additionally, the ROC curve for prediction of abnormal IVS movement and McConnell sign reveal the IVR value > 1 (AUC 0.87; p<0.001, sensitivity 84.2%, specificity 74.4%, PPV 61.4%, NPV 90.6% and AUC 0.86, p<0.001, sensitivity 82.6%, specificity 80%, PPV 73.1%, NPV 87.7%; respectively) for being abnormal.

Conclusion: IVR, the ratio of RV to LV DTI isovolumic velocities could be a new good parameter reflecting the RV overload and impairment in APE.

P907

The ratio of right ventricle to the left ventricle isovolumic velocities reflects right ventricular overload in acute pulmonary embolism
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Background: Acute pulmonary embolism (APE) impairs right ventricular (RV) function and can also influence LV function. Isovolumic velocities (IVV) in doppler tissue imaging (DTI) reflect systolic function. The ratio of RV IVV to LV IVV (IVVR) was recently used to reflect RV and LV contractility disturbances in APE, but the evidences are limited.

Purpose: We assessed IVR in APE and tried to evaluate their potential relationship with classical marker of RV overload (RVO).

Material and Methods: The study group consisted of 38 normotensive patients with APE (18F, mean age 52 ± 16y) diagnosed at CT. Patients with AF after MI and with any valvular disease were not included. TTE was performed within 48 hrs after admission and blood was taken for NT-proBNP assay, a marker of RVO. The control group (C) formed 21 healthy persons (11F; mean age 44 ± 13). The DTI for RV function was acquired at the level of tricuspid annulus and for LV function at the level of mitral lateral annulus. The IVV (cm/s) for RV and LV were measured and IVVr was calculated.

Results: RV IVV was decreased in APE when compared to controls (10.01 ± 4.7 vs 13.03 ± 3.3; p<0.01), while the LV IVV was higher in the former (11.4 ± 3.5 vs 7.3 ± 2.7; p<0.001). The IVVr was 0.95 ± 0.5 in APE and 2.01 ± 0.9 in controls (p<0.001). Mean NT-proBNP was 1579 ± 1777 pg/ml in APE. The IVR correlated with NT-proBNP (r=0.55; p=0.001), and also with set of classical echo parameters used for describing RVO: apical 4C RV diameter (r = 0.6; p < 0.001); apical 4C RV/LV diameter (r = 0.5; p = 0.001); IVVr (r = 0.6; p < 0.0001). Additionally, the ROC curve for prediction of abnormal IVS movement and McConnell sign reveal the IVR value > 1 (AUC 0.87; p<0.001, sensitivity 84.2%, specificity 74.4%, PPV 61.4%, NPV 90.6% and AUC 0.86, p<0.001, sensitivity 82.6%, specificity 80%, PPV 73.1%, NPV 87.7%; respectively) for being abnormal.

Conclusion: IVR, the ratio of RV to LV DTI isovolumic velocities could be a new good parameter reflecting the RV overload and impairment in APE.

P908

Exercise pulmonary hypertension is associated with increased pulmonary artery diameter and subtle right ventricular dysfunction in systemic sclerosis
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Purpose: Systemic sclerosis (SSc) is a connective disease characterized by fibrosis and vascular remodeling with poor long-term survival of patients who develop pulmonary arterial hypertension (PAH). Exercise echocardiography might improve the early diagnosis of PAH by unmasking exercise-induced PAH (ex-PAH) but is not feasible in all SSC patients. We sought therefore to investigate whether pulmonary artery enlargement and subtle right ventricular (RV) dysfunction were parameters indicative of ex-PAH.

Methods: We analyzed different parameters of RV structure/function (RV EDV / RV ESV, RV mass, RVEF, CO), ventricular interdependence (ratio volume RV / LV), dynamic afterload (PA pulsatility) and V-A coupling (surrogate parameter = RVESV / RV SV). Cardiopulmonary exercise test parameters, and NTproBNP levels were also obtained. The correlation (Pearson) between PA systolic and VA coupling, and other parameters was analyzed.

Results: 29 patients (83 female, mean age 40 ± 14 years, 65% FC III-IV) all under specific PAH treatment, mPAP 58 ± 15 mmHg, CI 2.6 ± 0.9 (ml2/m2). NTproBNP median was 896 pg/ml (range 51-6300). CMR parameters obtained: RV EDV 119 ± 46ml/m2, RV EF 37 ± 12%, ratio vol. RV / LV 2 ± 0.9, CO 396 ± 1099 ml / min, PA pulsatility 20 ± 11.6% (normal= 40%) and VA coupling 2.6 ± 2.2 (normal <1). Correlations between these variables and other parameters are shown in table. VA coupling showed also significant correlation with peak O2 consumption (r=-0.47, p<0.04) and UEF (r=-0.53, p<0.01).

Conclusions: CMR allows noninvasive assessment of novel parameters of RV function and afterload, such as VA coupling and PA pulsatility. Increased dynamic afterload and increased RV systolic output is associated with worse RV function and a more adverse RV remodelling. NTproBNP and peak VO2, as surrogates of RV function, also correlate with these new indexes. The clinical and prognostic significance of these parameters needs however further evaluation.
Methods: 89 SSC patients with normal resting systolic pulmonary artery pressure (SPAP) and without severe pulmonary function abnormalities underwent exercise echocardiography and multislice computed tomography (MSCT). They were divided into two groups according to the presence of ex-PAH, defined by SPAP >45 mmHg, right ventricular (RV) function was evaluated using 2D strain. The ratio of main pulmonary artery diameter (mPA) over the diameter of ascending aorta (Ao) was determined using MSCT.

Results: As compared with non ex-PAH group, ex-PAH group was older (60 ± 10 vs 50 ± 13 years, P<0.001), had higher exercise SPAP (54 ± 10 vs 34 ± 6mmHg, P<0.001), increased mPA diameter (33.6 ± 4.5 vs 30.6 ± 3.9mm, P=0.003) and mPA/Ao ratio (1.1 ± 0.1 vs 1.0 ± 0.1, P=0.001). Global RV free wall strain was lower in ex-PAH group than in non ex-PAH group (24 ± 5 vs 30 ± 5, P<0.001). Ex-PAH significantly correlated with mPA/Ao ratio. Sensitivity and specificity of mPA/Ao ratio >1 to identify ex-PAH was 80% and 81%, respectively. Multivariate analysis identified age, RV strain and mPA/Ao ratio as independent parameters indicative of ex-PAH.

Conclusions: In SSC patients with normal resting SPAP, increase in mPA/Ao ratio and decreased RV free wall strain are parameters that can indicate the presence of exercise PAH.

P909
Impact of albuminuria on diastolic cardiac mechanics in 1064 patients with type 1 diabetes mellitus (TIDM) without known heart disease

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Background: Heart disease due to diabetes is increasing pandemically and albuminuria is a cardinal risk factor. Knowledge about diabetic heart disease and early diagnosis is essential. The E’/A’ pattern is a physiological hallmark of diastolic function. We investigated how diastolic function was affected by albuminuria in patients with TIDM without known heart disease.

Methods: Two-thousand patients with TIDM from an outpatient diabetes clinic were invited to participate. Patients with known heart disease were excluded. All conventional and advanced echo exams were performed and analyzed by the same physician (MTJ). LVEF was determined by Simpson’s biplane, velocities by cTDI. Data were analyzed in uni-and multivariate regression models.

Results: A total of 1064 patients were included. Mean age 49.6 years (± 14), 52.8% men. 732 patients had normoalbuminuria (NOA), 225 micro (MIA), and 107 macroalbuminuria (MAA). LVEF did not differ between albuminuria groups (p=0.58), mean LVEF=58%, all patients. E’/A’ ratio decreased with age (Fig T). Patients with MIA and MAA were more likely to have reversed E’/A’ pattern at an earlier age than patients with NOA. In a regression model including significant predictors age, gender, diabetic blood pressure, BMI, duration of diabetes and Hba1c, patients with MAA had reversed E’/A’ ratio 10.2 years earlier than patients with normoalbuminuria.

Conclusion: This large echo study provides insights into the impact of albuminuria on cardiac mechanics and diabetic cardiomyopathy. In patients with TIDM without known heart disease the physiological hallmark of diastolic function, the E’/A’ ratio, is reversed 10 years earlier in patients with macroalbuminuria and 2.5 years earlier in patients with microalbuminuria compared to patients with normoalbuminuria.

P911
Early mechanical dyssynchrony in patients with systemic disease

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Purpose: The aim of this study was to explore the prevalence of left ventricular (LV) systolic and diastolic dyssynchrony in patients without clinical heart disease but had underlying systemic conditions.

Methods: Three hundred and seven patients without overt clinical heart diseases (131 with hypertension, 94 with psoriatic arthritis [PsA] and 82 with systemic lupus erythematosus [SLE]) were studied by tissue Doppler echocardiography to evaluate systolic and diastolic dyssynchrony using the standard deviation (TSDD & TEDD) and difference (TDSD & TEDF) of time to peak myocardial systolic and peak early diastolic velocity respectively in a 6 basal, 6 mid-segmental model.

Results: All subjects had normal LV ejection fraction (>50%) and mean QRS duration was 91.6 ± 14.2ms. The mean of TSDS (HT 39.3 ± 20.6ms, PsA, 36.5 ± 18.5ms; SLE, 38.5 ± 19.8ms) were higher than current TDI-derived Dyssynchrony criteria (TSDS >33ms) in all three patient groups. In all participants, the prevalence of systolic and diastolic dyssynchrony was 62% and 10% respectively and similar proportions were found in patients with or without LV hypertrophy, hypertensive patients with optimal or suboptimal BP control, patients with only PaA or SLE, or patients with active or inactive disease with a minimal prevalence of dyssynchrony of 45%. No correlation was found between systolic and diastolic dys-synchrony in any group.

Conclusions: LV systolic dyssynchrony was common in patient without overt clinical heart disease and may be a sensitive marker of early myocardial involvement in systemic conditions.

P912
Notch ratio in pulmonary flow predicts prognosis after pulmonary endarterectomy for chronic thrombo-embolic pulmonary hypertension

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Purpose: The notch ratio (NR) in the pulmonary flow predicts in hospital mortality after pulmonary endarterectomy (PEA) for chronic thromboembolic pulmonary hypertension (CTEPH). We studied whether this echocardiographic finding can also discriminate long term outcome.

Methods: All patients who underwent PEA between June 2002 and June 2005 were studied. Clinical, hemodynamic and echocardiographic variables were assessed pre-operatively. The follow up ended in April 2013 and census data was collected. NR was the time from onset pulmonary flow until notch divided by the time from notch until end of pulmonary flow assessed with pulsed Doppler.

Results: Fifty-nine consecutive patients (aged 53, (18-78 years, 20 males) were included. Pre-operatively, seven patients had no notch, 33 had NR <1.0 and 19 had NR > 1. Six patients died in hospital, 7 patients died during the follow up till April 2013. There were no differences in plasma BNP (37, p 0.23), TPR (809, p 0.12), 6-mwt (406, p 0.23), mean PAP (14.2ms. The mean of TSSD (HT, 39.3 ± 20.6ms, PsA, 36.5 ± 18.5ms; SLE, 38.5 ± 19.8ms) were higher than current TDI-derived Dyssynchrony criteria (TSDS >33ms) in all three patient groups. In all participants, the prevalence of systolic and diastolic dyssynchrony was 62% and 10% respectively and similar proportions were found in patients with or without LV hypertrophy, hypertensive patients with optimal or suboptimal BP control, patients with only PaA or SLE, or patients with active or inactive disease with a minimal prevalence of dyssynchrony of 45%. No correlation was found between systolic and diastolic dys-synchrony in any group.

Conclusion: Notch ratio is a powerful echocardiographic tool which predict operative mortality and long term survival in CTEPH patients scheduled for PEA

CONGENITAL HEART DISEASE

P913
Identification of risk factors for prediction of outcome in fetal spectrum of atrioventricular septal defects

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Purpose: Atrioventricular septal defects (AVSD) are very common lesions diagnosed in utero. Heterotaxy and chromosomal abnormalities frequently coexist with AVSD. However, outcomes of fetal AVSD are not precisely known. We attempted to define risks factors for mortality in AVSD.

Methods: We retrospectively searched our fetal database, electronic medical records, and fetal echocardiograms with diagnosis of AVSD from 2003-2012. We investigated the following risk factors for outcome: atrial situs, fetal heart rate, rhythm, ventricular dominance, hydantoin, atrioventricular valvular regurgitation, cardiovascular ratio, ejection fraction, and associated extra-cardiac anomalies.

Results: Forty-five fetuses with a median gestational age of 28 weeks (17.5 -37.1) were determined to have AVSD during the 10 year follow-up, of which 12 were either lost to follow-up (6), or underwent termination (6). There were 16 deaths (44%); two died in utero. Isomerism was identified in 17 of 45 (37%) fetuses (11 left atrial and 6 right atrial isomerism) and chromosomal abnormalities were identified in 12 (27%). Twenty-eight out of 33 fetuses, not lost to follow-up or terminated, had extra-cardiac anomalies which had associated increased mortality (57% versus 0%, p = 0.04). Heart block (75% versus 43%, p=0.12), left ventricular noncompaction (40% versus 43%, p=0.17) and isomerism (63% versus 41%, p=0.28) were associated with mortality but without achieving statistical significance. Twenty-five of 45 (56%) had unbalanced AVSD. Positional abnormalities of the great arteries or semilunar valve stenosis were present in 20/45 (44%) while atrioventricular valve stenosis was present in 16/45 (36%). Presence of ventricular dominance, atrioventricular valvular regurgitation, elevated cardiovascular ratio, or diminished ejection fraction were not associated with mortality.
Conclusion: Overall mortality rate for fetuses with AVSD was 48%. The presence of extra-cardiac anomalies, heart block, isomerism, and noncompliance in fetal AVSD are independent risk factors for prediction of fetal or neonatal demise. This information is useful for counseling parents with fetus AVSD.

P914
Assessment of the proximal aorta by transthoracic echocardiography late after tetralogy of Fallot repair
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Purpose: Aortic (Ao) dilatation is a recognized complication late after tetralogy of Fallot (ToF) repair. We aimed to assess the proximal aorta by transthoracic echocardiography (TTE) and to find possible predictors of Ao dilatation.

Methods: We included adults (≥ 18 years) after ToF repair from March 2011 till December 2012. We measured by two-dimensional TTE the maximal inner diameters of the proximal aorta, including the Ao sinus of Valsalva, sinotubular junction and proximal ascending aorta, in parasternal long-axis view. Two groups were defined based on the Cornell data-based z-score (AoZ) formulae: group 1 - with Ao dilatation (AoZ ≥ 2) and group 2 - without Ao dilatation (AoZ < 2). Exclusion criteria were: associated congenital heart disease, genetic syndromes, unrepaired ToF and pregnancy.

Results: We included 126 consecutive patients (pts), mean age 30 ± 9 years (52% male); mean follow-up 11.5 years (23.6 ± 7.2 years since ToF repair). Aortopathy was present in 45 pts (36%), an aortic root (Ap) shunt was done prior to complete repair, with a median interval of 3 years, and 57 pts had a transannular patch for surgical repair. A right Ao arch was found in 29 pts. Only 2 pts had moderate aortic regurgitation.

In 37 pts (29%) we found Ao dilatation (mean age 32 ± 11 years; 62% male). There were no significant differences between groups regarding age (32 ± 11 vs 29 ± 8 years; p = 0.21), body surface area (1.75 ± 0.23 vs 1.69 ± 0.18 m2; p = 0.11) and time since ToF surgical repair (23 ± 8 vs 23 ± 6 ± 0.84; p = 0.01), but group 1 had a higher left ventricle end-diastolic volume (LVEDV 101 ± 26 vs 83 ± 22 mL; p < 0.001). There was effacement of the sinotubular junction in 44%, associated to a bigger proximal ascending aorta (35 ± 5 vs 33 ± 4 mm; p = 0.006). We found an excellent correlation between the AoZ Ao sinuses, sinotubular junction and the proximal ascending aorta diameter (r = 0.617, r = 0.773 and r = 0.796 respectively; p < 0.001).

In multivariate analysis, after adjusting for age, gender, right Ao arch, Ap shunt prior to ToF repair, transannular patch, time to and time since ToF surgical repair, LVEDV ≥ 101 ± 26 vs 83 ± 22 mL; p = 0.001). There was effacement of the sinotubular junction in 44%, associated to a bigger proximal ascending aorta (35 ± 5 vs 33 ± 4 mm; p = 0.006). We found an excellent correlation between the AoZ Ao sinuses, sinotubular junction and the proximal ascending aorta diameter (r = 0.617, r = 0.773 and r = 0.796 respectively; p < 0.001).

In multivariate analysis, after adjusting for age, gender, right Ao arch, Ap shunt prior to ToF repair, transannular patch, time to and time since ToF surgical repair, LVEDV was an independent predictor of Ao dilatation (OR 1.021, 95% CI: 1.000-1.042; p = 0.049).

Conclusions: The sinotubular junction effacement can be a sign of dilatation of the proximal ascending aorta, and left ventricle end-diastolic volume can predict the occurrence of aortic dilatation, possibly reflecting the long-standing systemic volume overload even after ToF repair. This study emphasizes the need for a close surveillance of the proximal aorta diameters late after ToF repair.

P915
Pregnancy outcome and offspring risk in congenital heart disease: a single experience in a tertiary center
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Background: Women with congenital heart disease (CHD) are at an increased risk for pregnancy and adverse fetal events. We aimed to evaluate the pregnancy outcome and offspring risk in this population.

Methods: During 12 months, consecutive adult women with CHD followed at an outpatient clinic in a tertiary care center completed a questionnaire regarding their pregnan- cies and neonatal events (fetal death, preterm delivery and small for gestational age). The clinical records were reviewed for maternal demographics, CHD severity and echocardiographic parameters.

Results: We included 72 women (mean age 38 ± 10 years) with CHD (25% cyanotic CHD) who had 132 pregnancies. Forty-five (56%) had undergone ≥ 1 surgical or percutaneous intervention before pregnancy. In 40 pregnancies (56%) delivery was by cesarean section. Neonatal events occurred in 28 pregnancies: 24 (18%) fetal deaths; 21 (16%) preterm delivery; and 19 (14%) small for gestational age. Offspring CHD was diagnosed in 4 neonates (5%) and it was associated with subaortic ventricular outflow tract obstruction. Fetal death was correlated with previous maternal systemic hypertension (OR 33.0; 95% CI: 15.6-697.96; p = 0.027), systemic right ventricle (OR 3.7; 95% CI: 1.17-77.55; p = 0.048) and late cardiac surgery before pregnancy (OR 1.9; 95% CI: 0.8-4.92; p = 0.045). The predictors of preterm delivery were cyanosis (OR 12.7; 95% CI: 1.22-132.09; p = 0.032), older maternal age at first pregnancy (26.34 ± 5.34 vs 23.20 ± 4.69 years; p = 0.037) and at corrective surgery (30.00 ± 3.00 vs 14.40 ± 2.91 years; p = 0.001). There was a correlation between small for gestational age and maternal right ventricular outflow tract obstruction (OR 8.5; 95% CI: 1.33-63.67; p = 0.048).

Conclusion: Early maternal surgical correction of CHD improves pregnancy outcome and can decrease fetal events, namely fetal death and preterm delivery. An early maternal and fetal screening is important and referral to a specialized CHD center in order to avoid maternal and offspring adverse events is advised.

P916
Is a normally functioning bicuspid aortic valve associated with abnormal left ventricular morphology and/or function? An analysis of 215 adults and children in a multi-center study
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Background: Small studies have suggested that in patients (pt) with bicuspid aortic valve (BAV) left ventricular (LV) size as well as systolic and diastolic function might be affected independently from valvular dysfunction. Additionally, LV non-compliance (LVNC) has been described to occur in these pt.

Methods: From the echocardiographic databases of 2 adult and 1 pediatric hospital all pt with bicuspid aortic valves and normal aortic valve function (maximal systolic velocity < 1.55m/s and 3.2 cm2/m2 or Z score >2.0), abnormal systolic function as LVEF > 55% and diastolic dysfunction based on echocardiographic mitral inflow and tissue Doppler with dilated left atrium.

Results: There were 215 pt: median age 40 years (range 0.1-86); 30 pt (14%) were < 18 years, 140 males (65%). Arterial hypertension was present in 62 pt (29%). Associated CHD was present in 51 pt (24%) including ventricular septal defect in 18 (8%), Shone’s complex in 11 (5%), and coarctation in 38 pt (18%). Mitral valve abnormalities were found in 70 pt (33%) (degenerative in 28pt in 42 pt congenital including parachute mitral valve (Pm)); mitral valve prolapse (19), hypoplasia/mitral stenosis (6), and others. Coronary artery disease (CAD) was present in 16 pt (7%). In the subgroup of 150 patients without hypertension or CAD, 12 patients (8%) had a dilated LV, 16 pt (11%) had systolic and 29 of 136 pt (21%) had diastolic dysfunction. LVNC was only described in 2 pt (1%). Dilatation of the LV was associated with lower body mass index (p = 0.005), and absence of an abnormal mitral valve (P = 0.046). A diminished LV-EF could not be predicted by the presence of coarctation or associated mitral valve disease. Predictors of diastolic dysfunction included diminished LVEF (P = 0.0004) and age> 18 years (P = 0.04).

Conclusion: Patients with BAV without significant valvular dysfunction may have a diminished LV-EF in 11% and diastolic dysfunction in 21%. LVNC in these pt is rare (1%). Some pt do have a diminished LV-EF and LV dilatation without a reasonable explanation, therefore intrinsic LV abnormalities in BAV can not be excluded.

Abstract P917 Figure. Tenting of aortic cusps
p=0.02. The coaptation height was larger in patients with AR, 6.4 ± 1.5mm compared to 3.0 ± 1.1 mm, p=0.005

Conclusion: In this long-term study with follow-up of a minimum of 5.6 years and a mean of 7.1 years, mild AR was found in 2% of patients and was unchanged compared to priorTTE closure. No moderate or large AR was found. Trace AR was seen in 17% and presence of any AR was associated with hypertension and mild dilatation of the aortic root and thereby increased tenting of the aortic valve leaflets. There was no indication that device closure per se increased the risk of developing aortic regurgitation.

MASSES, TUMORS AND SOURCES OF EMBOLISM

P918

Giant left atrial mass stemming from pulmonary vein in a patient with lung adenocarcinoma and significant improvement after chemotherapy-radiotherapy combination

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We present a very rare case with left atrial extension of lung adenocarcinoma stemming from the right upper pulmonary vein and subsequent marked regression of the mass with combined administration of chemotherapy and radiotherapy. A 66 years-old male presented with fatigue, weakness, hemoptysis for 2 months and shortness of breath for the last 2 weeks. His physical examination and ECG was unremarkable. Transthoracic and transesophageal echocardiographic evaluation revealed moderate depression of left ventricular function (EF:≤35-40) and a left atrial tubulated mass 30x25mm in diameter, compression of the mass to the superior vena cava (Fig5, Fig6). Thoracic computer tomography demonstrated 52x26mm of mass in the right lung hilum, atelectasis distal to the mass and same sized pleural effusion which were consistent with lung carcinoma and a suspicious extension of a mass to the left atrium via right upper pulmonary vein. Bronchoscopic evaluation and pathologic investigation confirmed the diagnosis of lung adenocarcinoma. PET-CT scan with F-18 FDG revealed increased uptake in mediastinum consistent with pulmonary arterial, venous and left atrial involvement (Fig 3). Cardiac MRI confirmed the findings in echocardiography(Fig1A, Fig2A). The patient was considered inoperable and cisplatin and taxotere chemotherapy in combination with radiotherapy was initiated. Five months later significant decrease in size of the mass was observed (Fig1B, Fig2B, Fig 4).

To date, very few patients were reported with lung adenocarcinoma, its transverse metastasis to the heart chamber and significant regression of the metastatic mass with combination of chemotherapy and radiotherapy. This case is a nice example of integrated multimodality imaging in order for timely diagnosis and appropriate management of a clinical scenario.

Abstract P918 Figure. Multiple modalities

P919

Echocardiography guided surgical intervention in cardiac hydatid cyst: single center experience

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We present a very rare case with cardiac hydatid cyst in a patient with previous aortic valve replacement and hemothorax. Preoperative transthoracic and epicardial echocardiographic evaluation was done for location of lesions; imaging appearance of each lesion (unilocular or multilocular, solid or semi-solid); echocardiographic classification of lesion (active, transitional, or inactive); number of lesions; relationships to cardiac chambers and vascular structures; and presence/absence of blood flow within the lesion. After cystectomy, the lesion sites were reassessed with echocardiography to ensure that no residual parasitic material remained. Recurrence was seen in only one patient.

Conclusion: Cardiac hydatid cyst classified as 3 different lesion types by echocardiography is a reliable diagnostic modality in diagnosis of cardiac echinococcosis. This method guides the treatment of the patients and the selection of logical surgical approach.

STRESS ECHOCARDIOGRAPHY

P920

Predictive signs of 5-year cardiovascular death in patients after exercise echocardiography in present condition

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Stress echo is an established technique for the diagnosis and stratification of patients with CAD. However, in the last decades aggressive pharmacological and surgical treatments have improved and changed the structure of clinical outcomes. The aim of the study was to create a formula using exercise stress echo parameters to detect patients with a high risk of cardiac death in the present condition.

Methods: There is a single center prospective cohort study of 580 consecutive patients who underwent a bicycle exercise echocardiography in May 2006 – February 2007. Three hundred and twenty-four patients were accessible for analysis (53.9 ± 8.4 years, 247 ± 0.2 years in another center experience) and two lesions was detected with computed tomography (HR 22.3, p=0.0001). Five patients with 0-4 points of these factors had a 5-year cardiovascular mortality of very high (25.3% in the group who had 5 to 10 of the signs noted above. The group with 0-4 points of these factors had a low mortality – 0.6.

Conclusion: Exercise echocardiography a useful predictive tool for adverse events.

P921

Therapeutical and prognostic implications of flow reserve during dobutamine echocardiography in patients with severe aortic stenosis, low flow, low gradient and reduced ejection fraction

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Introduction: Cardiac echinococcosis (CE) is increasing health problem in Mediterraneaean basin. Echocardiography is safe for diagnosis and planning for curative surgery. Methods: Between November 2001 and April 2013, 29 patients (13 women and 16 men; mean age 39±1.1 mm, p=0.005) were reassessed with echocardiography to ensure that no residual parasitic material remained. Between November 2001 and April 2013, 29 patients (13 women and 16 men; mean age 39±1.1 mm, p=0.005) were reassessed with echocardiography to ensure that no residual parasitic material remained.
Also three patients without contractile reserve were intervened, with two deaths during the follow-up time.

**Conclusions:** Irrespective of the result of flow reserve evaluation still a significant proportion of patients with severe aortic stenosis, low-flow, low-gradient and reduced EF are considered non-eligible for AVR.

In this group of patients, dobutamine echocardiography could identify a subgroup of severe aortic stenosis with significant flow reserve that gained benefit from aortic valve replacement.

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**P922**

**Left ventricle contractile reserve and septal flash presence in prediction of positive remodeling during 1 year CRT: the multicentre VIACRT study**


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**Purpose:** Cardiac Resynchronization Therapy (CRT) has been shown to improve quality of life and survival in a significant number of patients with systolic heart failure (HF). However, relatively high non-responder rates persist significant challenge in improving patient selection. No single parameter of mechanical dysynchrony has yet been identified in prediction of response to CRT. The aim of the multicentre myocardial Viability in Cardiac Resynchronization Therapy (VIA CRT) trial was to investigate the potential impact of myocardial viability on CRT efficacy. The aim of the study was to determine the prognostic role of myocardial contractile reserve determined in low dose dobutamine stress echocardiography (LDSE) in prediction of positive remodeling of left ventricle 12 months post CRT device implantation in ischemic and non-ischemic LV dysfunction in comparison to septal flash presence in M-mode ECHO before implantation of CRT device.

**Methods:** 133 (102 males, mean age: 63 ± 10 years) patients who met clinical criteria for CRT (NYHA class II-16, III-107, IV-10, LVFV ≤ 25 ± 6%, QRS 165 ± 25 ms) were enrolled prospectively into the VIACRT trial. An ischemic etiology of HF was recognised in 51% of patients. The preserved contractile reserve to dobutamine stimulation was defined as LVEF increase by 20% or improved contractility in ≤ 4 segments. The septal flash was demonstrated as a fast inward and outward motion of the septum within the isovolumic contraction time.

**Results:** Patients with contractile reserve during LDSE experienced only nonsignificant improvement in LVEF, LVEDV and LVESV. But in pts with septal flash registered before CRT implantation significant increase in LVEF (p < 0.05), LVEDV decrease (p < 0.05) and LVESV decrease (p < 0.05 after 12 months of CRT were observed (table).

**Conclusions:** The presence of septal flash but no contractile reserve of the LV is a predictor of positive remodeling of the LV after 12 months of resynchronization therapy.

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**P923**

**Prognostic role of dobutamine stress contrast echo in patients with known or suspected coronary artery disease in various age groups and its additive value over traditional risk factors**

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**Purpose:** Dobutamine stress contrast echo (DSCE) has been successfully implemented in clinical practice for the assessment of coronary artery disease (CAD). The aim of this study was to evaluate the prognostic role of DSCE in patients with known or suspected CAD in different age groups and its additive value over traditional risk factors.

**Methods:** We retrospectively studied 3502 (63.1 ± 9.1 years, male) consecutive patients who were referred to our department for clinically indicated DSCE. A full medical history with regards to risk factors was recorded. Ischemic response was defined as wall-motion deterioration and/or perfusion abnormality in two or more consecutive myocardial segments. Patients were divided into 3 groups according to their age: young adults (age <45yrs), middle-aged (453 months) and hospitalizations.

**Results:** In 1194 (34.1%) patients, ischemic response was illustrated, whereas the remaining patients had no abnormal finding during DSCE. During follow-up end-points were noted in 616 (17.6%) patients. Logistic regression analysis revealed that DSCE response was the strongest predictor for adverse outcomes (OR 6.3, 2.1 to 18.4, 95% CI), especially for middle-aged patients. 5-year event-free proportion was 0.67 ± 0.07 for ischemic responders, while for non-ischemic responders the respective rate was 0.93 ± 0.03 (p < 0.05). Hazard ratio was 4.7 for patients with positive DSCE (2.02 to 11.04, 95% CI). Sequential Cox regression models were fit to test the incremental value of dobutamine stress contrast echocardiography over clinical variables on outcome prediction. Abnormal stress increased the $y^2$ from 22.4 to 78.9 in comparison with clinical variables (P < 0.005).

**Conclusion:** Dobutamine stress contrast echo is a strong predictor of end points in patients with known or suspected CAD, especially for middle-aged patients. In addition, it appears to offer incremental value on outcome prediction over traditional risk factors.

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**P924**

**Temporal changes in the use and results of exercise echocardiography**


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**Purpose:** Although the management of coronary artery disease has changed significantly over the last years, limited data are available regarding the use and results of non-invasive imaging techniques for the detection of myocardial ischemia. Our aim was to evaluate the temporal trends in the frequency of detection of myocardial ischemia by exercise echocardiography and in the clinical profile of patients referred for this technique.

**Methods:** A total of 12359 patients who underwent exercise echocardiography between January 1997 and December 2012 were included. We divided the 16-year period into four 4-year periods, and evaluated the changes in demographics, clinical data, symptoms and results of the tests. Myocardial ischemia was defined as the appearance of new or worsened wall-motion abnormalities during exercise. An abnormal exercise echocardiogram was defined as a peak wall motion score index >1.

**Results:** During the periods 1997-2000, 2001-2004, 2005-2008 y 2009-2012, we observed a gradual decrease in the frequency of detection of myocardial ischemia (35.3%, 32.2%, 29.2% and 25.4% respectively, p < 0.001) and in the percentage of abnormal exercise echocardiograms (52.2%, 43.3%, 37.9% and 34.2%, p < 0.001). However, relatively high non-responder rate poses significant challenge in improving the percentage of patients with myocardial infarction within 30 days before the tests (16.7%, 10.9%, 5.1% and 3.8%, p < 0.001) and beyond 30 days before the tests (16.7%, 13.4%, 13.2% and 12.6%, p < 0.001) also decreased. Although no significant differences in the global percentage of patients with a history of coronary revascularization were observed, there was a gradual decline in the frequency of those with a history of coronary artery bypass grafting (15.1%, 10.8%, 8.8%, 7.4%, p < 0.001) and a progressive increase in the frequency of those with prior percutaneous coronary revascularization (8.7%, 12.9%, 13.2%, 16%, p < 0.001). We also observed a decrease in the prevalence of non-interpretable baseline electrocardiograms (35.1%, 28.3%, 23.2% and 17.9%, p < 0.001), and an increase in the frequency of non-ischemic chest pain (11.6%, 12.4%, 24.6%, 29%, p < 0.001) and dyspnea (1.5%, 1.8%, 5.7% and 12.8%, p < 0.001), as well as in the use of betablockers within 48 hours before the tests (4.9%, 5.9%, 8.4% and 16.2%, p < 0.001).

**Conclusions:** Over the last years, there was a gradual decrease in the frequency of inducible myocardial ischemia detected by exercise echocardiography, which parallels changes in clinical profile of patients referred for this technique.

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**TRANSESOPHAGEAL ECHOCARDIOGRAPHY**

**P925**

**Evaluation of chronic mitral regurgitation by 3-D color Doppler echocardiography vs cardiac magnetic resonance imaging as the reference method**

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**Introduction:** Assessment of mitral regurgitation (MR) by 2-D echocardiography using the Proximal Isovelocity Surface Area (PISA) method assumes the PISA to be hemispheric. Three-dimensional color Doppler echocardiography (3-DE) with direct measurement of MR should overcome the inaccuracies relating to this erroneous assumption, which is required in the context of 2-D PISA determination.

**Method:** In patients suffering from chronic MR, a transesophageal echocardiogram and a cardiac magnetic resonance imaging (CMR) were performed the same day. Cine loops were acquired using electrocardiographically triggered multiple-beat 3-DE. For each patient, all PISA visible during systole were 3-D reconstructed using a customized software (figure 1). Regurgitant volume (RVol in ml) of each PISA was calculated as: Nqyst velocity x PISA x time between frames. Total RVol equals the sum of these volumes. By CMR, RVol was derived as ventricular stroke volume (SV) minus the SV in the ascending aorta and the regurgitant fraction (RF) as RVol divided by the ventricular SV.

**Figure 1**

Abstract P925 Figure.
RESULTS: Thirty-seven patients were included. 69% had organic MR. Temporal resolution of 3-DE was 31 ± 7 Hz. One patient was excluded because of poor image quality of the S-D cine loops. PISA-3-D total RVol was directly associated with CMR-RVol (figure 2), and with CMR-RF (R² = 0.75, p < 0.001). Patients having a severe MR according to CMR-RVol ≥ 60 ml were all correctly classified as severe by PISA-3-D. Two cases of MR were misclassified as severe by PISA-3-D. Therefore, the sensibility was 100% and the specificity 94% for the diagnostic of severe MR.

Conclusion: Mitral regurgitation measurement by PISA-3-D is feasible and directly and closely related to CMR-derived mitral regurgitation assessment.

P926
Acute changes in LAA ostium size after AF ablation could affect sizing and stability of occlusion devices
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INTRO: Implanting a left atrial appendage (LAA) occlusion device immediately after ablation could conceivably address both the symptoms and the thromboembolic risk of AF. During AF ablation, the LAA-left pulmonary vein (LPV) ridge is targeted for ablation; this can cause oedema of the LAA ostium, and may affect sizing and stability of immediately implanting an occlusion device.

METHODS: 12 patients underwent AF ablation using irrigated-tip radiofrequency energy with electro-anatomic mapping software and fluoroscopy. TOE was used to measure the the LAA ostium in the 30 °, 60 °, 90 ° and 120 ° mid-oesophageal views before ablation and immediately afterwards. At the end of the procedure, visual assessment of the TOE images was used to assess the extent of oedema.

RESULTS: There were significant changes in LAG ostium size after AF ablation (from -33% with severe oedema to +43% with no oedema).

CONCL: Immediately after AF ablation, there was a significant change in the size of the LAA ostium, and using this size may impact on the effectiveness of immediate deployment of an LAA occlusion device. Oedema of the LAA-LPV ridge from ablation reduced LAA ostium diameter, whereas fluid infusion increased left atrial pressure and consequently increased ostium diameter. These data suggest that optimal sizing for an LAA occlusion device should be undertaken with a normal left atrial pressure and before ablation is performed.

CONTRAST ECHOCARDIOGRAPHY
P927
Use of intravenous contrast in exercise stress echocardiography for patients with suboptimal acoustic window
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Purpose: Stress echocardiography is a very useful test for the evaluation of patients with suspected or known coronary artery disease. Exercise stress echocardiography (ESE) should be the modality of choice in most cases for patients who can perform an exercise test. However, one of the main limitations is the inappropriate quality of echocardiographic images that prevents from the right interpretation in a significant number of studies. The use of ultrasonic contrast agents (UCA) to improve the images quality is widely extended in pharmacological stress echocardiography, but there are few data about its use in ESE, though its use is recommended. The aim of our study was to analyze how the administration of UCA to patients with suboptimal acoustic window performing an ESE affected the interpretation of the tests.

Methods: We retrospectively analyzed 457 treadmill ESE studies performed in our department between January 2012 and April 2013. UCA was used in 75 studies (17.1%), all of them with an inappropriate baseline acoustic window. The UCA administered was sulphur hexafluoride (0.5-1 cc bolus through a peripheral vein) and both rest and peak exercise images were acquired. The quality of images (graded as good, acceptable, suboptimal, poor) and the validity of the studies (capability of analyzing properly the contractility of all left ventricle segments) was assessed by two experienced observers. We followed up clinical events in all the 75 patients. Major adverse cardiac events (MACE) were defined as cardiovascular death, non mortal myocardial infarction and coronary revascularization.

Results: 62 studies (82.7%) were considered to be valid/interpretable. The baseline acoustic window was suboptimal or poor in all 75 patients. The quality of the resulting images after the administration of UCA was good or acceptable in 40 cases (53.3%), suboptimal in 27 (36.0%) and poor in 8 cases (10.7%). In studies performed to patients with suspected coronary artery disease, 46 were reported as negative for myocardial ischemia. During a mean follow-up of 7.58 months (SD 5.12), only two patients had a MACE, therefore the negative predictive value for adverse events was 96.7%.

Conclusions: The administration of UCA in ESE to patients with a limited acoustic window improves images quality allowing a right interpretation of the studies in most cases and avoiding further tests. In our study, the negative predictive value for MACE was very high in patients with suspected coronary artery disease.

P928
Prevalence of subclinical atherosclerosis and intraplaque neovascularization in patients with familial hypercholesterolemia
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Purpose: Patients with heterozygous familial hypercholesterolemia (FH) are at severely increased risk of developing atherosclerotic disease at relatively young age. The purpose of this study was to assess the prevalence of subclinical atherosclerosis and intraplaque neovascularization (IPN) in patients with FH, using contrast-enhanced ultrasound (CEUS) of the carotid arteries.

Methods: The patients had no cerebrovascular symptoms and underwent bilateral carotid ultrasound and CEUS to evaluate the presence of subclinical atherosclerosis and IPN. Far wall plaques were excluded for assessment of IPN due to a hindering pseudo-enhancement artifact. IPN was assessed in near wall plaques using a visual grading scale and dedicated semi-automated quantification software. Mann-Whitney U test was performed to compare the output of the semi-automated software in groups.

Results: The study population consisted of 69 patients (48% women, mean age 55 ± 8 years, mean LDL 3.7 ± 1.7 mmol/L). Carotid plaque was present in 62 patients (80%). A total of 49 patients had plaques that were eligible for the assessment of IPN. 7 patients (14%) had no IPN, 39 (80%) had mild to moderate IPN and 3 (6%) had severe IPN. Individual carotid artery analysis (n=68) showed that plaques with irregular or ulcerated surface (n=18) had significantly more IPN than plaques with a smooth surface (n=50) (p<0.05)(figure 1).

Conclusion: Carotid ultrasound demonstrated atheromatous plaque in 90% of asymptomatic patients with FH without known atherosclerosis. IPN assessed with CEUS, was present in 86% of these patients. Irregular and ulcerated plaques exhibited significantly more IPN than plaques with a smooth surface.
REAL-TIME THREE-DIMENSIONAL TTE

P929
Left ventricular outflow tract planimetry by 3D echocardiography predicts obstruction and heart failure symptoms in hypertrophic cardiomyopathy
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Purpose: Three-dimensional echocardiography (3DE) enables a fast and reliable measurement of left ventricular outflow tract area (LVOT(A)) in patients with hypertrophic cardio-myopathy (HCM). Whether 3DLVOT(A) at rest could predict symptomatic status in HCM is currently uncertain.

Methods: In 31 HCM patients (pts) with LV ejection fraction (EF) >50%, 3D LV full-volume datasets (36 ± 6 vps) were obtained by transesophageal 3DE. A comprehensive LV analysis by 3DE was done (including volumes and mass) and the smallest 3DLVOT(A) during systole was planimetered on 3D LV rendered images using Echopac BT12 (GE Vingmed, N). LVOT maximal gradient was assessed by continuous Doppler, and Valsalva maneuver was performed if no significant LVOT obstruction at rest (gradient <30 mmHg) was present. Symptomatic status was defined by NYHA class (II-IV).

Results: Pts with obstructive HCM (n=11) had smaller LVOT(A) than those with non-obstructive forms (n=20): 1.98 ± 0.28 cm2 vs. 2.45 ± 0.45 cm2 (p<0.001). Impaired LVOT(A) was related with NYHA class (r=0.70, p<0.001) and emerged as a clinical predictor of heart failure symptoms in HCM patients.

Conclusion: Quantification of the EROA by direct planimetry in RT3D TEE was feasible in all patients with organic mitral regurgitation. It gives higher values than those obtained by 2D TEE, but there are good correlation between these two methods. This difference could be explained by the presence of non-spherical EROA in most patients.

P931
Three-dimensional (3D) and Speckle Tracking echocardiography assessment of right heart in young people: atrial and ventricular volumes and deformation properties study
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Background: RV (right ventricle) plays an important role in determining cardiac symptoms in several diseases and RA (right atrium) is a quantitative marker of RV dysfunction severity. Real-time 3D echocardiography (3DE) enables accurate ventricle and atrial volume measurement. Speckle Tracking is a sensitive tool to quantitatively assess regional deformation properties.

Purpose: To obtain normal reference ranges for RA volumes, RA EF by 3D (both software Auto LVO GE Healthcare and TomTec 4D), RV volumes, RF EF, by 3D (TomTec) and RA and RV deformation properties by Speckle Tracking and intra and inter-observer reproducibility.

Methods: 70 subjects, 38 males and 32 females, aged 25 ± 7 yrs, without any cardiovascular disease, were included. By E9GE we measured RA (maximum and minimum) both by biplane method and by 3D and 4D methods, and RV volumes (in apical 4-chamber, short-axis, and coronal views) by tracing endocardial borders at ventricular end-systole and end-diastole. Volumes were indexed for body surface. By Speckle tracking we measured normal longitudinal RA and RV Strain (S) and Strain rate (SR) in apical 4-chambers view, at level of RA and RV free wall (basal, medium and apical segments).

Results: We have reported, in young people, references range of RA and RV volumes: 2DRA maximum 32.35 ± 8.2 ml, indexed 18.27 ± 4.14 ml/m², minimum 15.46 ± 4.12 ml; indexed 8.71 ± 1.89/ml/m²; 4DRA maximum 43.98 ± 11.21 ml, indexed 24.25 ± 5.25 ml/m²; minimum 22.32 ± 5.25 ml/m²; indexed 12.75 ± 2.26/ml/m², 3D TomTec 41.68 ± 12.22 ml/m², indexed 23.35 ± 5.69/ml/m²; minimum 23.33 ± 7.91/ml/m², indexed 13.06 ± 3.7 ml/m²; 3D RV end-diastolic: 33 ± 11/ml/m²; end-systolic volume:16 ± 6/ml/m²; RA and RV ejection fraction: 2D RAEF 52.7 ± 7.55%; 4D RAEF 47.8 ± 7.35%; 3D RAEF 44.36 ± 7.63%; 3D RVEF 67.8 ± 8%. We found a gradient between different segments for RA S (basal>80%, medium 62.51 ± 9.66%, apical 26.54 ± 3.56%); RA SR (basal 5.1 ± 0.71S-1; medium 3.33 ± 0.61S-1; apical 2.1 ± 0.26S-1); RV S (apical -24.4% ± 5.4; medium -29.69 ± 4.78%; basal -30.1 ± 5.88%; RV SR (apical -1.44 ± 0.25 S-1; medium -1.78 ± 0.37 S-1; basal -2.0 ± 0.4 S-1). For RA volumes we found significant differences only between 2D and 3DE methods (p<0.0001) and not between the two 3D methods (p=0.6). Inter and intraobserver variability coefficients were 7% and 4% for 3D volumes and 8% and 4% for S-SR measurements, respectively.

Conclusions: The present study provides normal reference values for RA and RV volumes and EF by 3D and normal longitudinal RA and RV deformation values in young people. 3DCE overcomes the limitations of 2DCE to assess the complex anatomy of the RV and 2DCE underestimation of RA volumes.

TISSUE DOPPLER AND SPECKLE TRACKING

P932
Early detection of the cardiotoxicity with 2D and 3D deformation imaging in patients with chemotherapy
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University of Leipzig, Department of Cardiology-angiology, Leipzig, Germany

The aim of our study was to find a sensitive method in deformation imaging and an early indicator of cardiotoxicity in patients with chemotherapy(CE). 25 probes were divided into two groups: patients with cancer disease (group 1) and 25 patients with different cancer (group II) underwent 2D and 3D transhemochocardiographic (TTE), followed by offline speckle tracking(ST) measurements. All patients in group II were investigated before cardiotoc GE (group IIa) and under CE at 3 months follow-up with both methods (r = 0.833, p < 0.0001) but EROA by RT3D TEE was significantly higher than estimated by 2D (0.45 ± 0.25 vs. 0.35 ± 0.16 cm², p < 0.001). The major and minor diameters of the EROA were 10.4 ± 3.3 mm and 4.7 ± 1.8 mm respectively. The SI was 2.42 ± 1.00 (range 1.14 to 5.94) and only 8 patients had a SI of less than 1.5. In 13 patients was considered a greater degree of severity of mitral regurgitation after being studied by RT3D TEE.

Conclusion: Quantification of the EROA by direct planimetry in RT3D TEE was feasible in all patients with organic mitral regurgitation. It gives higher values than those obtained by 2D TEE, but there are good correlation between these two methods. This difference could be explained by the presence of non-spherical EROA in most patients.

Abstract P932 Table. Conventional, 2DST and 3DST parameters

<table>
<thead>
<tr>
<th>End systolic volume (ml)</th>
<th>End diastolic volume (ml)</th>
<th>LV mass (g)</th>
<th>Global radial 2D strain (%)</th>
<th>Global longitudinal 2D strain (%)</th>
<th>Global circumferential 2D strain (%)</th>
<th>Global radial 3D strain (%)</th>
<th>Global longitudinal 3D strain (%)</th>
<th>Global circumferential 3D strain (%)</th>
<th>Rotation (deg)</th>
<th>Twist (deg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>50.49 ± 24.51</td>
<td>113.79 ± 26.96</td>
<td>138.45 ± 15.84</td>
<td>27.25 ± 9.36</td>
<td>-15.7 ± 2.9</td>
<td>-22.59 ± 3.77</td>
<td>34.48 ± 16.67</td>
<td>-14.49 ± 1.52</td>
<td>-28.46 ± 1.71</td>
<td>3.52 ± 0.28</td>
</tr>
<tr>
<td>Group II</td>
<td>57.4 ± 19.33</td>
<td>114.8 ± 26.87</td>
<td>100.2 ± 28.16</td>
<td>14.83 ± 14.64</td>
<td>-4.32</td>
<td>-21.06 ± 7.62</td>
<td>28.24 ± 12.75</td>
<td>12.85 ± 2.55</td>
<td>-21.49 ± 4.5</td>
<td>3.36 ± 2.17</td>
</tr>
<tr>
<td>Group II a</td>
<td>53.24 ± 13.73</td>
<td>106.30 ± 24.15</td>
<td>153.75 ± 29.68</td>
<td>21.94 ± 15.34</td>
<td>-15.76 ± 2.93</td>
<td>-17.72 ± 8.21</td>
<td>26.21 ± 14.48</td>
<td>-12.42 ± 2.23</td>
<td>-22.21 ± 4.7</td>
<td>3.32 ± 2.34</td>
</tr>
<tr>
<td>p &lt; 0.005</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
<td>&lt;0.001</td>
<td>n.s.</td>
<td>n.s.</td>
<td>&lt;0.001</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Comparison between the control and patients with chemotherapy (mean ± SD)
P933
Aerobic interval training improves diastolic dysfunction in patients with type 2 diabetes, a tissue Doppler study
SM. Hollek1; MR. Bjorøaas2; AE. Tjonna1; U. Wisloff1; CB. Ingul1
1Norwegian University of Science and Technology, Department of Circulation and Medical Imaging, Trondheim, Norway; 2Norwegian University of Science and Technology, Department of Cancer Research & Molecular Medicine, Trondheim, Norway

Background: Type 2 diabetes (T2D) is associated with diastolic dysfunction (DD) Purpose: To compare the effect of high-intensity exercise (HIE) and moderate-intensity exercise (MIE) in accordance to present guidelines in patients with T2D (duration <10 years) and DD.

Methods: 47 subjects (56.6 years, 31 male) with DD defined as early diastolic tissue velocity (E) < 8 m/s were included and randomized to HIE (4x4 minutes) at 90-95% of HRmax at 90-95% of HRmax 3 times/week (n=24) or MIE 210 min/week (n=23), both 12 weeks. Echocardiography including tissue Doppler, VO2peak-test and biochemical measurements were performed at baseline pre-, post- and 12 months after inclusion.

Results: There were no differences between groups and 38 completed the intervention (MIE n=17, HIE n=21). HIE significantly improved DD; E' by 21%, early mitral filling velocity (E) by 16% and shortened isovolumic relaxation time (IVRT) by 11% (Table). Systolic tissue Doppler velocity (S) increased with 15% and stroke volume with 11%, waist circumference (WC) reduced with 2 cm, VO2peak increased with 4.1 ml/kg/min, HbA1c reduced with 6% (Table). The MIE group reduced WC with 2,1 cm and reduced insulin resistance (IR) with 8% (Table). There were no changes in resting heart rate or blood pressure after intervention. At 12 months, fat percent decreased (1.5%, p<0.001) and all results (except HbA1c) were sustained in the HIE group. VO2peak, WC and HOMA-IR returned to baseline values in the MIE group at 12 months.

Conclusions: In patients with T2D, HIE improved diastolic dysfunction and decreased HbA1c, in contrast to MIE.

Abstract P933 Table. Baseline- and post exercise results.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Moderate-intensity Pre</th>
<th>Moderate-intensity Post</th>
<th>High-intensity Pre</th>
<th>High-intensity Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (kg/m2)</td>
<td>29.7 ± 3.7</td>
<td>29.4 ± 3.8</td>
<td>30.2 ± 2.7</td>
<td>29.7 ± 2.4</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>106.5 ± 8.7</td>
<td>104.5 ± 7.3</td>
<td>108.6 ± 7.7</td>
<td>106.0 ± 6.7</td>
</tr>
<tr>
<td>VO2peak (mL/kg/min)</td>
<td>33.1 ± 7.4</td>
<td>34.4 ± 7.7</td>
<td>31.5 ± 6.0</td>
<td>35.6 ± 6.3</td>
</tr>
<tr>
<td>E' (cm/s)</td>
<td>7.1 ± 0.8</td>
<td>7.5 ± 1.3</td>
<td>7.0 ± 0.7</td>
<td>8.5 ± 1.2</td>
</tr>
<tr>
<td>E (cm/s)</td>
<td>64 ± 10</td>
<td>66 ± 12</td>
<td>63 ± 10</td>
<td>73 ± 10</td>
</tr>
<tr>
<td>IVRT (ms)</td>
<td>66 ± 10</td>
<td>66 ± 12</td>
<td>70 ± 9</td>
<td>62 ± 8</td>
</tr>
<tr>
<td>S' (cm/s)</td>
<td>7.7 ± 1.0</td>
<td>8.4 ± 1.0</td>
<td>6.8 ± 0.8</td>
<td>7.8 ± 1.2</td>
</tr>
<tr>
<td>SV (ml)</td>
<td>77.7 ± 22.0</td>
<td>79.2 ± 19.0</td>
<td>76.4 ± 14.0</td>
<td>85.2 ± 18.0</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>6.6 ± 0.2</td>
<td>6.5 ± 0.1</td>
<td>7.0 ± 1.0</td>
<td>6.9 ± 0.9</td>
</tr>
<tr>
<td>HOMA-IR</td>
<td>2.5 ± 0.2</td>
<td>2.4 ± 0.2</td>
<td>2.7 ± 0.1</td>
<td>2.7 ± 0.2</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD, p < 0.001, b < 0.01, c < 0.05.

P934
Impaired rotational mechanics and strain revealing subclinical left ventricular dysfunction in children with neuromuscular disorders: a speckle tracking study
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1Cardiology, Department of Clinical and Experimental Medicine, University of Messina - Messina, Italy; 2University Hospital of Messina, Department of Paediatrics, Messina, Italy; 3Department of Neurosciences, University of Messina; “Nemo Sud” Clinical Centre, University of Messina, Italy

Background: Neuromuscular disorders (NMD) progressively involve cardiovascular system over time. Overt heart failure usually manifests in the second decade, while younger children show apparently normal cardiac function. We aimed to identify early subclinical left ventricular (LV) dysfunction in children affected by Duchenne Muscular Dystrophy (DMD) and Becker Muscular Dystrophy (BMD), evaluating myocardial strain and rotational patterns.

Methods: We analyzed, through an Echopac (GE, Vivid 7) workstation, echocardiographic recordings from 28 asymptomatic children with NMD (22 DMD, 10; 3 yrs and 6 BMD, 11; 2.8 yrs), with normal LV function (ejection fraction (EF) >50%). Beyond conventional echocardiographic parameters, LV longitudinal (LS) and circumferential strain (CS) as well as rotations, twist and untwisting rate were evaluated.

Results: were compared to those collected from 22 age-matched healthy children. LV function was within the normal range in our population (61 ± 5% and 99 ± 4%, respectively for DMD and BMD, respectively), although lower than in normal controls (69 ± 4%, p=0.012 and p=0.020; vs. DMD and BMD, respectively). Results from LV strain and rotations analysis are detailed in the table.

Conclusions: Global myocardial deformation is impaired in children with NMD, despite a normal EF. Furthermore, different changes in regional rotational patterns can be identified in DMD and BMD patients: a significant impairment of basal rotation is identified in DMD patients, likely an expression of inferior and lateral wall dysfunction, whereas prevalent alterations of apical rotation, twist and untwisting is observed in BMD group, which might reflect a far more widespread myocardial damage. Evidence of subtle impairment of LV function could be useful to guide patient-tailored cardio-protective therapy, in order to delay progression of the disease.

Abstract P934 Table. ANOVA (one-way analysis of variance)

<table>
<thead>
<tr>
<th></th>
<th>Controls</th>
<th>DMD</th>
<th>BMD</th>
<th>Ctrl vs DMD</th>
<th>Ctrl vs BMD</th>
<th>DMD vs BMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global LS, %</td>
<td>-23.7 ± 3.0</td>
<td>-20.5 ± 2.2</td>
<td>-19.3 ± 2.9</td>
<td>2.93 ± 0.023</td>
<td>0.013 ns</td>
<td></td>
</tr>
<tr>
<td>Global CS, %</td>
<td>-22.4 ± 5.5</td>
<td>-18.2 ± 3.8</td>
<td>-17.2 ± 1.7</td>
<td>1.74 ± 0.005</td>
<td>0.012 ns</td>
<td></td>
</tr>
<tr>
<td>Basal Rotation, %</td>
<td>-20.3 ± 3.3</td>
<td>-37.7 ± 3.0</td>
<td>-31.5 ± 1.8</td>
<td>2.05 ± 0.033</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Apical Rotation, %</td>
<td>6.8 ± 3.5</td>
<td>5.8 ± 2.6</td>
<td>6.2 ± 2.4</td>
<td>2.38 ± 0.023</td>
<td>0.023 ns</td>
<td></td>
</tr>
<tr>
<td>Twist, %</td>
<td>12.9 ± 4.7</td>
<td>8.9 ± 7.6</td>
<td>6.5 ± 4.0</td>
<td>0.009 ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unwitting, %</td>
<td>-122.9 ± 32</td>
<td>-118.8 ± 51</td>
<td>-82.6 ± 41.6</td>
<td>0.025 0.045</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

References:
1. undergoing CRT implantation
2. DMD and BMD, respectively
3. through an Echopac (GE, Vivid 7) workstation
4. 2D and 3D TTE was performed using the Artida system. LVEF, ESV, EDV, LV mass (Paired sample t test p < 0.0005). The LV EF and strain values documented decreased myocardial contractility in comparison to normals in all patients. These differences, however, did not attain statistical significance. Ejection fraction (49.3 ± 6.9 vs.57.6 ± 6.9%) and global 2D CS were significantly different between group I and II (see table). No significant differences of the other parameters were observed before and after the CE in the group II. Conclusion: The progression of the myocardial dysfunction due to cardiotoxic CE can be detected surprisingly by LVEF as well as by global 2D CS. Changes in global LS possibly need a longer time than a 3 month follow up to detect myocardial damage. There is no difference between deformation parameter measured by 2D or 3DST. With both methods changes of global CS attained statistical significance. Circumferential strain seems to be a very sensitive parameter to detect subclinical stages of myocardial affection during cancer treatment. Affection of rotation and twist during 3 month CA treatment seems to be not detectable by 3D tracking at this time indicating that circumferential strain is more robust than rotation and twist.
Conclusion: 3D contractility maps reconstruction using ICE and CARTO is feasible with low prolongation of implantation time. Color coded mechanical activation map clearly highlights areas of LV dyssynchrony during cardiac resynchronisation therapy procedures.

P936

Speckle tracking echocardiography using a 12 segments model of the right ventricle identifies better right ventricular dysfunction in patients with acute myocardial infarction
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Background: Right ventricular (RV) dysfunction has been associated with increased morbidity and mortality in patients with acute myocardial infarction (AMI). Conventional 2D parameters, such as RV diameters, TAPSE, and fractional area change (FAC), may be limited for the assessment of RV dysfunction, since they ignore the outlet tract, and the anterior and inferior walls contribution to RV ejection.
Aims: To investigate the role of RV myocardial deformation defined by 2D speckle tracking echo (STE) for the detection of the RV dysfunction in patients with AMI and proximal right coronary artery occlusion (RCA), treated with primary PCI.
Method: 50 patients (57 ± 11 years, 25 men) with AMI and primary PCI on proximal RCA were evaluated by 2D conventional (RV diameters, TAPSE, FAC) and STE echo (4C and 2C RV views) within 48 hours after PCI, and compared with 40 normal subjects (N), age- and sex-matched. RV function was assessed by mean lateral (LS), septal (SS), anterior (AS), and inferior strain (IS); 2C, 4C, and global RV strain (RVGS) were measured.
Results: RV dysfunction was identified in patients with AMI, defined as TAPSE <16 mm and FAC <32%, was identified in 25 patients (AMI RV dysfunction). However, even in patients with AMI and no RV dysfunction (AMI RV normal), STE found significantly decreased parameters of RV deformation (table) (p < 0.05 for all comparisons). We defined cut-offs values in order to diagnose RV dysfunction as predefined by conventional echo: -19% for 4CGC, -21.7 % for 2CGS, and -21% for RVGS. Sensitivity and specificity were >80% and AUC > 0.8 for all these cut-off values.
Conclusion: Assessment of RV function in patients with AMI and proximal RCA involvement using a 12-segments model by STE might identify better RV dysfunction than parameters of conventional echo. Further studies are needed to prove the prognostic role of the integrated 4C and 2C RV STE analysis.

P937

Exercise echocardiographic determinants of BNP level in asymptomatic patients with aortic stenosis and preserved left ventricular function
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1Cochrane Collaboration, European Society of Cardiology, Paris, France; 2University Medical Center Utrecht, Utrecht, The Netherlands
Purpose: The risk stratification of asymptomatic patients with severe aortic stenosis (AS) remains challenging. Recently updated European Society of Cardiology guidelines suggest that B-type natriuretic peptide (BNP) level measurement and exercise stress echocardiography may be useful for the management of these patients. The goal of this study is to correlate exercise echocardiographic data and BNP level in asymptomatic patients with AS and preserved left ventricular (LV) function.
Methods: We studied 61 asymptomatic patients (age: 70 ± 13 years, 64% of males) with moderate AS (0.98 ± 0.25 cm2) and preserved LV ejection fraction (68 ± 6%) who underwent resting and exercise Doppler echocardiography with concomitant BNP level measurement. None of the patients developed symptoms during test.
Aims: To investigate the role of 12 segments RV myocardial deformation defined by 2D speckle tracking echo (STE) for the detection of the RV dysfunction in patients with AMI and proximal right coronary artery occlusion (RCA), treated with primary PCI.
Method: 50 patients (57 ± 11 years, 25 men) with AMI and primary PCI on proximal RCA were evaluated by 2D conventional (RV diameters, TAPSE, FAC) and STE echo (4C and 2C RV views) within 48 hours after PCI, and compared with 40 normal subjects (N), age- and sex-matched. RV function was assessed by mean lateral (LS), septal (SS), anterior (AS), and inferior strain (IS); 2C, 4C, and global RV strain (RVGS) were measured.
Results: RV dysfunction was identified in patients with AMI, defined as TAPSE <16 mm and FAC <32%, was identified in 25 patients (AMI RV dysfunction). However, even in patients with AMI and no RV dysfunction (AMI RV normal), STE found significantly decreased parameters of RV deformation (table) (p < 0.05 for all comparisons). We defined cut-offs values in order to diagnose RV dysfunction as predefined by conventional echo: -19% for 4CGC, -21.7 % for 2CGS, and -21% for RVGS. Sensitivity and specificity were >80% and AUC > 0.8 for all these cut-off values.
Conclusion: Assessment of RV function in patients with AMI and proximal RCA involvement using a 12-segments model by STE might identify better RV dysfunction than parameters of conventional echo. Further studies are needed to prove the prognostic role of the integrated 4C and 2C RV STE analysis.

P938

A novel tool for the quantification of local temporal delays in myocardial activation: application to hypertrophic obstructive cardiomyopathy with biventricular pacing
N. Duchateau1; G. Giraldeau1; L. Gabrielli1; D. Penela1; R. Evertz1; L. Mont1; J. Brugada1; CD. Olympios1; 2Clinic for Cardiology and Angiology, Triage, Athens, Greece
Purpose: Diastolic dysfunction (DD) affects left atrial (LA) properties and in particular LA stiffness. 2D Speckle Tracking Echocardiography (2D STE) estimates deformation mechanics of LA and has recently been applied to the study of LA function. The aim of our study was to test the hypothesis that LA strain is affected even in early stages of DD.
Methods: We studied 70 consecutive patients (51 men, with mean age 56 ± 14 years) with normal values of LA diameter (LAD) and volume (LAV) measured by 2D echo. Patients had dilated LA, mitral valve disease, coronary artery disease, heart failure and left ventricular hypertrophy were excluded. Diastolic function was estimated by PW Doppler and TDI and peak atrial longitudinal strain (PALS) of LA was estimated by 2D STE.
Results: Thirty six % of patients had hypertension (HT), 25% diabetes mellitus type 2 (DM2), 16% both (HT and DM2) and 21% had no cardiovascular risk factor. 42.6% of all patients had normal diastolic function and 57.4% had grade I DD. Mean values of LAD and LAV were 35.5 ± 2.9mm and 53.1 ± 10ml respectively. Fractional shortening of the LV was 35.5 ± 2.7%, LA PALS was 25.6 ± 8.9%. Multivariate analysis revealed that LA PALS was correlated significantly with diastolic function (r = 0.41; p < 0.001), independently of age, sex, LAD, LAV, FS and the underlying risk factor.
Conclusion: LA PALS is reduced even in early stages of DD, indicating that impaired LA deformation mechanics may be the first pathophysiological consequence of DD.

Abstracts

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Methods: We screened 110 subjects (age 42 ± 15 yrs, range 14-67) with normal history, ECG, echocardiography, blood pressure, laboratory data and stress echocardiography using GE Vivid 7 machines (offline analysis on Echopac v12). 2D speckle tracking Peak maximum (%) and time to peak (TTP ms) longitudinal strain was calculated from the apical views, and radial and circumferential peak time and time to peak values from LV short axis, mid and apical levels, using a LV 16 walls segments model. PALS was measured as the difference between TTP strains (% time to end-ejection (pulsed Doppler LV outflow), taking as reference beginning of isovolumic contraction (= first positive / negative deflection on the pulsed tissue Doppler mitral annulus velocity tracing).

Results: Mean global maximum Long strain was -21.7 ± 1.9%, and mean Circ strain at base, mid and apex were respectively -17.5 ± 4.1%, -18.2 ± 3.7% and -26.6 ± 4.6%. The Table shows the mean maximum PALSs for the 3 strains (means from 18 individual segments): all calculated SDs were below the upper 76 ms cutoff used as marker for “global” myocardial ischemia. We also found that calculated strain (max.) was not significantly different from myocardial ischemia in any of the 3 strains.

Conclusion: The results of our study suggest that speckle tracking can be used as a new tool for early detection of myocardial deformation change and it would be interesting to test the prognostic value of this information compared to LVEF.
LV multi-strain dysynchrony, but all the 95% CI of the PSTDs were above the 130 ms cutoff used to diagnose segmental LV dysynchrony. The highest delays were found for the Circ strain of the basal and papillary lateral and posterior segments. Age did not influence significantly PSTDs.

Conclusions: Longitudinal strain shows the lowest and circumferential the highest variability of PSTDs. Although the SD cutoffs appear adequate in order to separate physiologic from pathologic PSTDs, some degree of overlap is observed when the absolute PSTD values are used.

Abstract P944 Table. Maximum strain post-systolic time delays

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
<th>Range</th>
<th>5% CI</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long.</td>
<td>97</td>
<td>34</td>
<td>-2</td>
<td>170</td>
<td>172</td>
<td>35</td>
<td>150</td>
</tr>
<tr>
<td>Rad.</td>
<td>83</td>
<td>50</td>
<td>-79</td>
<td>251</td>
<td>330</td>
<td>6</td>
<td>148</td>
</tr>
<tr>
<td>Circ.</td>
<td>149</td>
<td>65</td>
<td>15</td>
<td>329</td>
<td>314</td>
<td>60</td>
<td>300</td>
</tr>
</tbody>
</table>

P945

Maximal difference of time to peak strain: a useful strain imaging parameter for detection of left ventricular dyssynchrony

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Background: Various echo-Doppler and tissue Doppler parameters have been used to detect left ventricular dyssynchrony (LVD). Timing of peak strain (Ts) might have the potential to assess LVD better than timing of peak myocardial velocity as it distinguishes active contraction from passive motion. The aim of this study was to evaluate the maximum difference of Ts between any two LV segments (Ts-max) and to determine its cutoff value as an index of LVD assessment regardless of the QRS duration.

Methods: We studied 60 patients (pts), mean age 55.7±8.9 yrs, with dilated myopathic heart and EF ≤35%. Time to peak systolic (TsS) & time to peak systolic strain (Ts-Max) was measured in 12 LV segments with calculation of maximum delay of Ts (Ts-max) or TsS (TsS-max) between any 2 segments; and standard deviation of Ts or TsS in the 12 segments (TS-SD & TS-S-D). Time delay between Ts of the basal septal & lateral segments (Ts-BS-BSL) was also calculated. Combining the previously reported cutoff values of 2D strain (22 ms), Ts-max (85 ms) and TsS-max (60 ms) was used as a reference to identify pts with LVD. The cutoff values of Ts-max and TsS-BSL that can distinguish pts with from those without LVD were determined using the ROC curves. According to QRS duration pts were classified into 3 groups (G1: QRS = 150 ms (8 pts), G2 QRS 120-150 ms (26 pts) & G3 QRS > 120 ms (26 pts).

Results: 26 pts fulfilled all of the 3 previously reported cutoff values of TS-SD, TS-max & TsS-BSL were identified as having LVD. Value ≤ the reported cutoff points of TS-SD was found in 30 pts, TS-max in 35 pts & TsS-BSL in 33 pts. A cutoff value of 185 ms for the Ts-max identified pts with LVD with 96.2% sensitivity & 90.5% specificity (area under the curve AUC: 0.936±0.039). The positive predictive value (PPV) was 96.2%, negative predictive value (NPV) was 95% and test accuracy was 93.6%. All pts in G1 (100%), 12 pts in G2 (46.2%) and 13 pts in G3 (50%) had their Ts-max ≥ the cutoff value of 185 ms. A cutoff value of 75 ms for the Ts-BS-BSL identified pts with LVD with 69.2% sensitivity & 66.7% specificity (AUC 0.76±0.057). The PPV was 72%, NPV was 63% & test accuracy was 68.1%. Ts-max was higher in G1 compared to G2 (101±20 vs 81±50 ms, p=0.013), with no significant differences between G1 vs G2 or G3 vs G3. There were no significant differences of Ts-BS between the 3 groups.

Conclusion: Ts-max is a useful dysynchrony parameter with a good sensitivity and specificity of 110 ms as a cutoff value to detect LVD. Further studies on a larger scale of pts are recommended to validate such cutoff value in LV dysynchrony detection.

P946

Feasibility and agreement between different speckle tracking echocardiographic techniques for the assessment of left ventricular longitudinal deformation

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Background: Feasibility and agreement between different speckle tracking echocardiographic (STE) techniques in the assessment of longitudinal deformation are feasible as conventional 2D strain. 4D echo however has a fewer feasibility in the number of ventricular segments suitable for analysis. 3P-echo has a good relationship with 2D strain but 4D echo analysis of longitudinal deformation is therefore not interchangeable with other techniques.

Abstract P946 Figure. Kaplan-Meier according late H/M ratio

P947

Prognostic value of 123I-metiodobenzylguanidine imaging in patients with heart failure evaluation for implanta ble cardiac defibrillator

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Introduction: The cardiac innervation scintigraphy with 123I-metiodobenzylguanidine (123I-MIBG) assess sympathetic activity in patients with heart failure (HF) and provide prognostic information independent of left ventricular ejection fraction. Recent studies suggest that it may be useful in risk stratification in patients evaluated for implantable cardioverter defibrillator implantation (ICD).

Objective: Analyze if the quantitative assessment of cardiac sympathetic innervation by 123I-MIBG scintigraphy predicts cardiac events (CE) in patients with HF evaluated for ICD implantation.

Methods: We prospectively included 65 patients (73% males, mean age 63.7±10.2 years) with HF, severe left ventricular systolic dysfunction (LVSD) and optimal medical treatment referred for ICD implantation in which we assessed the cardiac innervation 123I-MIBG with calculation of early and late heart-to-mediastinum (H/M) ratios and washout rate.

Results: During a mean follow up of 480 days, 23 patients (35.4%) presented a CE (2 deaths, 8 appropriate ICD therapies, 2 ventricular tachycardia episodes, 10 hospitalizations for HF and 1 myocardial infarction). 92% (60/65) had a late H/M ratio ≥ 1.6. Patients with a cardiac event had an early H/M ratio < 1.0 (1.9±0.17 vs 1.51±0.22, p=0.030) and a late H/M ratio (1.26±0.1 vs 1.37±0.1, p=0.015) significantly lower. The presence of late H/M ratio ≤ 1.33 (mean value) was associated with an increased risk of CE (HR 2.88, 95% CI 1.17-7.4, p=0.027) and arrhythmic events (HR 1.95, 95% CI 0.57 to 6.67), the last one without statistical significance figure.

Conclusion: Cardiac innervation gammagraphy with 123I-MIBG identifies patients with HF and severe LVSD evaluated for ICD implantation with an increased risk of CE in the long term follow up.
Methods: Between October 2012 and March 2013, we studied 26 patients that had in hospitalization both myocardial perfusion imaging by gated-SPECT on CZT camera and a rest echocardiography. Gated-SPECT was proceeded on the CZT camera Discovery NM 530c (GE Healthcare) in a standard stress-rest protocol with Thallium-201 injection at peak exercise or after a pharmacologic stress with dipyridamole or adenosine. A second dose of Thallium-201 could be reinjected before rest imaging in case of severe perfusion defect at stress. Rest images were analyzed with the QGS software (Cedars-Sinai Medical Center) to measure end-diastolic volume (EDV), end-systolic volume (ESV), and LV ejection fraction (LVEF). LV regional function was evaluated on the 17 segments model by measuring segmental wall motion (WM) and wall thickening (WT). Echocardiographic LV EDV, ESV and EF were derived from the biplane Simpson rule. LV regional function was assessed by segmental visual wall motion and segmental longitudinal strain derived from the speckle tracking technique on GE Echocorp software.

Results: The diagnostic accuracy of the two methods was good for EDV (r = 0.74, P < 0.0001), ESV (r = 0.79, P < 0.0001) and LVEF (r = 0.82, P < 0.0001), with a good agreement on Bland-Altman test (mean bias respectively -9.3 mL, -12.2 mL and -5.2 %). Correlation was good for the segmental evaluation of regional function since gated-SPECT derived segmental WM and WT correlated well with echocardiographic segmental longitudinal strain (respectively r = 0.59 and r = 0.62, both P < 0.0001). At the patient level, correlation was excellent between mean gated-SPECT derived WM and echo WM index (r = 0.86; P < 0.0001) and between mean gated-SPECT WT and echocardiographic global longitudinal strain (R = -0.86; P < 0.0001).

Conclusion: This study is the first to validate absolute quantification of global and regional LV function by gated new CZT camera versus rest echocardiography. This opens further perspectives in the field of ischemia and viability assessment by ECG-gated myocardial perfusion imaging.

P950
Can atrial to total tricuspid annular plane diastolic excursion ratio be a preload independent predictor of right ventricular diastolic function
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Purpose: Percentage of the amplitude of tricuspid annular plane excursion during atrial contraction to the total tricuspid annular plane motion is suggested to be a measure of right ventricular (RV) diastolic functions. This study investigates the effect of postural preload changes on atrial tricuspid excursion and determine its correlation with standard pulsed wave (PW) Doppler or Pulsed wave tissue Doppler imaging (PWDI) derived diastolic parameters.

Methods: 26 healthy volunteers were included. RV PW Doppler and PWTDI measurements were recorded. M-mode cursor was placed in lateral tricuspid annulus for the measurement of total tricuspid annular motion (TAM) and the fraction occurring during atrial contraction (Figure). Atrial/Total TAM was calculated. Same recordings were repeated after 45 degrees passive leg raising (PLR) and at upright position.

Results: Baseline TAM values were 25.9 ± 3.3 mm, atrial excision during atrial contraction was 10.8 ± 1.54 mm and atrial/total TAM ratio was 42 ± 7%. Atrial excision during atrial contraction after PLR (11.43 ± 2.00 mm, p = 0.14) was similar to baseline but was significantly lower in upright posture (9.07 ± 1.74 mm, p = 0.001). However atrial/total TAM ratio was not changed in either posture (PLR 46 ± 11% p = 0.13, upright 42 ± 6.4%, p = 0.54). Atrial excision during atrial contraction or atrial/total TAM ratio were not correlated with tricuspid inflow early (E), late (A) diastolic velocities and deceleration time as well as PWTDI derived E’ and A’ velocities or E/E’ ratio.

Conclusion: Atrial/total TAM is an easy measurement that is not affected by preload changes. However it was not correlated with other diastolic parameters. Further research is necessary to validate the value of this measurement as a preload independent measure of RV diastolic functions.

P951
Pulmonary arterial systolic pressure is associated with disease activity in rheumatoid arthritis
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Objective: Rheumatoid arthritis (RA) is associated with inflammatory pulmonary vasculitis and may subsequently contribute to the development of pulmonary artery dysfunction. The aim of this study was to investigate the relation between pulmonary artery systolic pressure (PASP) and disease activity in RA patients.

Methods: A total of 67 consecutive inpatients with active RA were enrolled, the control group was recruited from a local health exhibition and consisted of 60 age- and sex-matched healthy subjects. The disease activity score (DAS28) based on the number of tender and swollen joints (n = 28) were recorded for each RA subject. Doppler ultrasound was used to measure the peak velocity of TR(max), and PASP was calculated as 4 x TR(max) + 1015 mm Hg (to account for right arterial pressure).

Results: RA patients had higher ESR, CRP and Anti-CCP as compared with controls (P < 0.05). Moreover, RA patients had significantly higher right ventricular diastolic diameter (RVEDD), pulmonary artery diameter (PAd) PASP and right ventricular myocardial performance index (RVPMI) as compared with controls (P < 0.05). Among RA patients, 20 (29%) of them were pulmonary arterial hypertension (PAH). Furthermore, PASP were positively correlated with CRP and DAS28 (r = 0.538; P < 0.05 and r = 0.477; P < 0.05, respectively, whilst there was a slightly positive correlation between PASP and Anti-CCP (r = 0.188; P < 0.05), CRP and DAS28 were independently associated with PASP (0.007, 95% CI 0.003 to 0.018, P = 0.004 and 1.161, 95% CI 0.793 to 2.114, P = 0.042, respectively).

Conclusions: The study demonstrated that immune and inflammatory processes and disease activity played an important role in the development of PAH in RA patients.

P952
Accuracy of systolic aortic regurgitation in the diagnosis of heart failure: a predictive approach
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Background: Systolic aortic regurgitation (SAR) is a curious phenomenon that has been found to be associated with heart failure (HF) in a case series report. We aimed to determine diagnostic value of SAR as a black box predictive tool in patients with suspected HF admitted to hospital with dyspnea as leading symptom with the STARDards for Reporting of Diagnostic accuracy studies (STARD) approach.

Methods and Results: Cross-sectional study including 269 consecutive patients admitted to hospital with dyspnea as leading symptom without definite clinical diagnosis. Flow of patients from inclusion to the 2x2 table of feature and diagnosis was followed. SAR was defined echocardiography as the presence of blood flow from the aorta to the left ventricular outflow tract during a complete systole. The reference standard was the presence of HF diagnosis at discharge. SAR was present in 9 (3.3%) patients. Prevalence of HF was

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Material/Methods: We have constructed a patient specific computer model of the left ventricle (LV). Assessing the effect of cardiac treatment in advance would enable optimal, Technology and Health, Stockholm, Sweden.

Results: We successfully recreated the dynamic geometry of the LV as measured by several heart cycles to obtain a stable blood flow to compare with Doppler measurements. Using high performance computing the simulation ran Stokes equations. Left atrial pressure and aortic pressure were added at inflow and mesh to which a volume-mesh was added for simulation of blood flow using the Navier-Stokes model is needed and will be addressed. Computational simulation is a promising supplement, effect of valve intervention, effect of pacing, etc. However, further development of the model is needed and will be addressed. The three main features requested for the “ideal” pre-participation screening (PPS) in sports are cost-effectiveness, high diagnostic accuracy and feasibility in large populations. Controversy exists concerning increasing an efficacy of the PPS by using echocardiography (ECHO).

500 healthy athletes (age: 16-32 years, average 21 ± 5 years, 446 males and 54 females [8:1], participating in sports like football, athletics, handball, cycling, basketball, gymnastics) were examined in 2011-2013 in a pilot study focused on prevention of cardiovascular complications in sports. All athletes were screened according to European PPS protocol with history taking, physical examination and 12-lead ECG registration. Cardiovascular abnormalities were not detected in any case. After that conventional ECHO (M-mode and 2D modalities) exam was performed in all athletes and a broad spectrum of cardiovascular abnormalities was found in 14 cases (2.8%). In 7 (1.4%) it was mitral valve prolapse (hemodynamically significant in 2 cases), in 3 (0.6%) - bicuspid aortic valve (significant aortic stenosis in 1 case) and in other 4 cases (0.8%) it was myocarditis, myocardial bridging, noncompaction of left ventricle and coronary artery fistula. In 4 athletes abnormalities that were found required a temporary or permanent sports activities cessation.

The postulate that including ECHO into the PPS protocol is not cost-effective should be revised today. Currently conventional techniques like M-mode and 2D are expensive (about 6, 00 Euros in Slovakia), technically simple to be performed in field in large athletic population by pocket-size ultrasound systems, enough powerful for efficient screening and thus hold the potential to enter a screening protocol.

Well-constructed, sufficiently powered, randomized and long-term controlled studies will allow an objective evaluation of ECHO contribution to the diagnostic evaluation of life-threatening cardiovascular abnormalities in athletes. On the basis of these evidences, a modified PPS protocol should probably be applied to the sports cardiology practice.

P955 The predictive value of cardiac calcifications on transthoracic echocardiography in the detection of coronary artery disease

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Background: Assessing the effect of cardiac treatment in advance would enable optimal, individual treatment. By development of advanced patient specific computational simulations, we expect this could assist in optimizing treatment in the future. As a first step in this direction we have constructed a patient specific computer model of the left ventricle (LV) and simulated the movement of the endocardium and blood flow.

Material/Methods: From echocardiographic images of a healthy subject, the geometry of the LV, including the inflow and outflow regions, was reconstructed as a dynamic surface-mesh to which a volume-mesh was added for simulation of blood flow using the Navier-Stokes equations. Left atrial pressure and aortic pressure were added at inflow and outflow regions, respectively. Using high performance computing the simulation ran several heart cycles to obtain a stable blood flow to compare with Doppler measurements and with normal intra-ventricular blood flow pattern.

Results: We successfully recreated the dynamic geometry of the LV as measured by echocardiography. Pressure-volume loops, workload, flow-velocities, etc. could be calculated in the simulation. The simulated flow profiles at the inflow and outflow areas match the Doppler recordings. The simulated 3D intra-ventricular flow pattern seems realistic when compared to MRI quantifications.

Conclusion: Creating a patient specific simulation of the LV with realistic blood flow is possible and opens for addressing different clinical questions, such as risk of thrombus formation, effect of valve intervention, effect of pacing, etc. However, further development of the model is needed and will be addressed. The presence of calcium deposits at the aortic valve and/or the mitral apparatus (annulus, leaflets, papillary muscles) or a relevant thickening of the ascending aorta walls, as detected by echocardiography, is associated with a worse outcome in several studies.

Purpose: To evaluate the predictive role of cardiac calcification in the detection of significant coronary artery disease (CAD) in a large setting of subjects undergoing coronary angiography for clinical purposes.

Methods: 405 patients with a clinical indication for CA and no previous acute coronary syndrome or myocardial revascularization, underwent complete physical examination, blood samples, CV risk stratification with Framingham Risk Score (FRS) and a transthoracic echocardiography exam with particular attention to the detection of calcium deposits expressed with a numeric score (calcium score). After CA, patients were divided in two groups, G1 (n = 164) and G2 (n = 238), according to the absence or presence of CAD (i.e. at least one vessel with a lumen stenosis ≥ 50%).

Results: G2 patients were older (67 ± 10 vs 64 ± 10.5yrs mean ± SD, p < 0.01), more likely to be affected by arterial hypertension (60.26% vs 66.26%, p < 0.01) and diabetes mellitus (33.48% vs 18.40%, p < 0.001), had higher FRS (17 ± 11 vs 11 ± 8, p < 0.0001) and calcium score (2.55 ± 1.86 vs 1.51 ± 1.44, p < 0.0001) while the two groups did not differ for the presence of dyslipidemia (70.26% vs 60.74% p = NS), familiarity for CV disease (56.71% vs 50.0% p = NS) and smoking habit (25.97% vs 32.72% p = NS). ROC curves were similarly significant for calcium score alone and in combination with FRS in predicting CAD (AUC 0.67 and 0.69, p < 0.05). Furthermore a higher calcium score was associated with the number of stenotic coronary arteries (p < 0.001).

Conclusions: Our data underline the importance of the detection of calcium deposits at the aortic valve, mitral apparatus and ascending aorta. Their semiquantitative assessment (calcium score) is an easy and non-invasive approach that strongly correlates with the presence of CAD and its extent.