POSTER SESSION 1

THE IMAGING EXAMINATION AND QUALITY ASSESSMENT

P218
Right ventricular free wall thickness measured by echocardiography versus cardiac magnetic resonance imaging

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Background: We have previously shown that secondary harmonic imaging overestimates left ventricular wall thickness. The guidelines of the American Society of Echocardiography (ASE) on the assessment of the right heart recommends that fundamental imaging should be used to measure right ventricular (RV) free wall thickness when image quality permits to "avoid the increased structure thickness seen with secondary harmonic imaging". However, no reference is provided to support this. We could not find any data comparing RV free wall thickness measured by echocardiography with secondary harmonic imaging vs. cardiac magnetic resonance imaging (CMR). We hypothesized that RV free wall thickness is similarly overestimated.
Purpose: To compare RV free wall thickness measured by echocardiography versus CMR.
Method: Thirty near-consecutive patients who had both echocardiography and CMR performed in our center in the past 6 months were selected. RV free wall thickness was measured independently by C.W. and N.G. using echocardiography with secondary harmonic imaging, and by C.W. and M.L. using CMR. Patients with significant RV hypertrophy (>1.0cm) were excluded. The results were compared using the Bland-Altman Plot to measure agreement between them. The student's t-test was used to compare the mean.
Results: Among the 30 patients, the mean difference between echocardiography and CMR was 0.29 cm (standard deviation 0.11). The mean difference is statistically different from zero suggesting the measurements between echocardiography and CMR do not agree (p<0.001). Figure 1 illustrates the results using the Bland-Altman Plot showing the mean difference of 0.29 cm (red line) with 95% confidence interval of 0.07 to 0.50 cm (green lines). This confirms the lack of agreement between echocardiography and CMR, with discrepancies of up to 0.50 cm by echocardiography. This discrepancy is too large to accurately measure the RV free wall with a normal reference range of ≤0.5cm.
Conclusion: Compared to CMR, RV free wall thickness is overestimated by echocardiography using secondary harmonic imaging. Fundamental imaging (as per ASE Guidelines) should be used to measure RV free wall thickness.
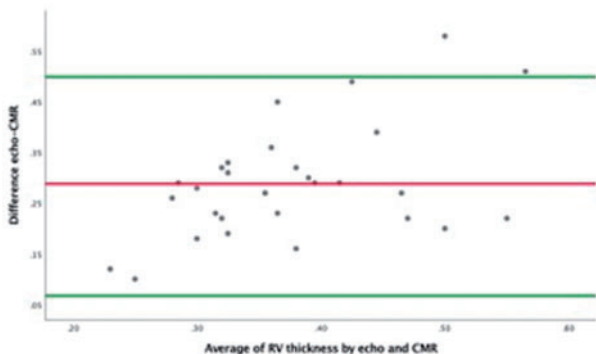
Abstract P218 Figure.: Bland-Altman Plot

P219
The inferior vena cava, not just a homogenous tube but a complex structure which may hold useful information when interpreted correctly

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Introduction: The inferior vena cava (IVC) is a pliable capacitance vessel for circulating volume. Its current use is as an estimate of central venous pressure (CVP) based on maximal diameter (IVCD) and collapsibility index (IVCCI) on echocardiography. The use of CVP to estimate volume status is useful in a range of conditions including heart failure and sepsis.

Further consideration should be given to where and how these metrics are obtained, either on deep inspiration or sniff as well as location on the IVC where measurements are taken. More detailed, quantitative analysis rather than binary cutoffs may yield more clinically useful information, especially in patients who would be considered borderline volume overloaded.
**Methods:** This was a study of IVC behaviour in heart failure patients. In addition to the standard measurements of maximal diameter and collapsibility index, we looked to see if there was variation in IVCCI by method of inspiration - deep inspiration vs sniff - as well as looking for variation in IVC behaviour by station along the IVC where measurements were taken - between the hepatic vein / IVC junction and right atrium vs 1-2cm caudad to the hepatic vein.
IVC metrics were compared to serum B-type natriuretic peptide (BNP) and N-terminal pro-B-type natriuretic peptide (NT pro-BNP) as crude surrogates for volume status. As this was a small study, IVC metrics were detailed using descriptive 634 patients were included in total. 3 subgroups were identified: 1) Patients with IVCCI >40% with both inspiration and sniff with minimal difference (<19%), n=11 2) Patients with IVCCI <40% with both inspiration and sniff with minimal difference (<19%), n=11 3) Patients with difference in IVCCI on inspiration and sniff of >19%, n=12
As expected, the group with IVCCI >40% appeared to have a lower BNP and better renal function than the group with a low IVCCI. However, interestingly, the group with a low IVCCI with deep inspiration and a more normal IVCCI with sniff appeared to behave similarly to the volume overloaded patients with a higher NT pro-BNP.
When comparing position of where IVCCI was calculated along the IVC, patients with similar degrees of collapse at both sites (i.e. difference < +/-9%) had a higher BNP – average of 798 pg/ml, compared to those where there was a more marked discrepancy between IVCCI between the two stations – average of 201 pg/ml, suggesting reduced pliability due to increased circulating volume.
Conclusion: Though a small observational study, there is potential to suggest that the IVC is not a homogenous, predictable collapsible tube. There may be a role for greater understanding of IVC anatomy and behaviour to more accurately assess volume status which could provide a useful tool for heart failure monitoring in volume-sensitive patients.
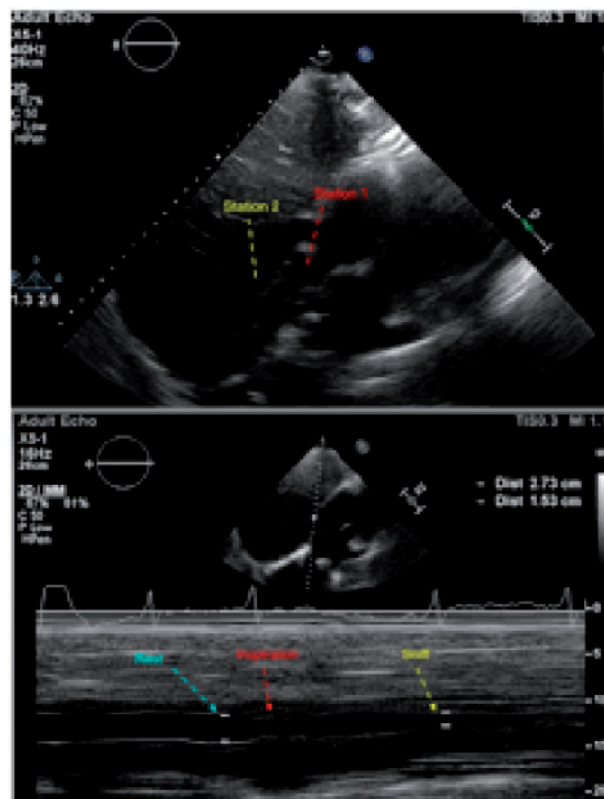
Abstract P219 Figure.

P220

Brain lesions and cognitive impairment in neurologically asymptomatic patients undergoing pulmonary vein isolation - long-term observation

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Background: Brain white matter hyperintensities (WMH) are common findings in neurologically asymptomatic patients and are associated with cognitive impairment and dementia. Pulmonary vein ablation (PVI) may exacerbate current WMH lesions.
Purpose: The aim of the study was to compare the occurrence and severity of brain WMH in magnetic resonance imaging (MRI) in patients with paroxysmal non-valvular atrial fibrillation (AF) before and after PVI and to determine the potential relationship between WHM and cognitive decline.
Methods: Sixty-seven patients with symptomatic paroxysmal non-valvular AF were enrolled into the study (age median: 58 (IQR 50-63) y., 64% males). History of stroke or transient ischemic attack were the exclusion criteria of the study. The presence and severity of brain WMH (classified according to the modified Fazekas scale) were obtained in MRI and Mini-Mental State Examination (MMSE) was evaluated one day before PVI (baseline) and at least 6 months after procedure (follow-up).
Results: Baseline WMH were found in 42 (62%) patients. Picture shows the most severe WMH brain lesions (3 points in the Fazekas scale score). Three patients had progression in WMH severity (one point more in Fazekas scale score) – all had successful PVI. Comparing baseline and follow-up data, there were no differences in the Fazekas scale scores (median: 1 (IQR 0-1) vs 1 (IQR 1-1), p=0.11, respectively) and MMSE scores (median 29 (IQR 28-29 vs 29 (IQR 28-30), p=0,08, respectively). In the follow-up a negative correlation between Fazekas scale score and MMSE was shown (gamma -0.31; p=0.03). PVI efficacy was confirmed in 52 (75%) of patients. Comparing to baseline, patients with AF recurrences had identical Fazekas scale score, while patients with successful PVI – similar (median 1 (IQR 0-1), p=0.11). MMSE was similar at baseline and follow-up in patients with successful PVI (both median 29 (IQR 28;30), p=0,28), as well as in those with AF recurrences (median 29 (IQR 28; 29) vs. 29 (IQR 28,5; 30), p=0,2). Conclusions: WMH are common findings in MRI among neurologically asymptomatic patients with non-valvular AF. The PVI procedure does not affect both the presence and severity of WMH in the long-term observation. WMH may be related to cognitive impairment in this population.
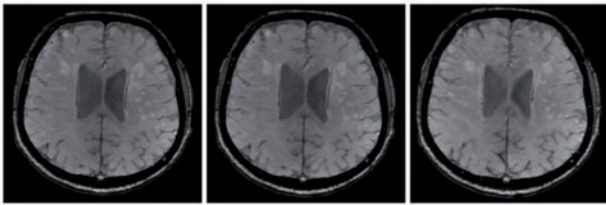
Abstract P220 Figure.

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Low contrast CT angiography prior to TAVI procedure: feasibility and diagnostic accuracy for coronary tree

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Purpose: To evaluate feasibility, image quality and accuracy of a reduced contrast volume protocol for pre-procedural CT imaging in transcatheter aortic valve implantation (TAVI).
Methods: 70 consecutive patients (33F, mean age 81.5±5.2y, mean BMI 25.6±4.6) referred for TAVI were examined with wide-array novel CT scan with a combined scan protocol: retrospective ECG-gated axial CTA of the heart and thoracic aorta followed by a high-pitch spiral CTA for abdominal aorta and iliac-femoral arteries. A total amount of high concentration 50 ml contrast agent was used. Image quality was graded on a visual scale (4-1). Contrast attenuation values (HU) and contrast-to-noise ratio (CNR) were measured at the level of the aortic root, ascending/descending aorta, subrenal aorta and at the level of right and left common femoral arteries. Coronary tree was assessed in a subgroup of 50 pts in comparison with invasive coronary angiography (ICA). Aortic annulus measurements were compared with final procedural results. Patients creatinine was monitored at the baseline and 72h after procedure.
Results: No exams were classified as not diagnostic. Mean quality score was 3.4±0.8. Mean HU and CNR at the aortic root, ascending/descending aorta subrenal aorta and at the level of right and left common femoral arteries were: 576.4±56.5, 581.2±78.4, 551.1±93.4, 515.2±77.6, 509.7±113.4, 495.3±113.09 HU respectively and 13.8±2.3, 15.7±1.7, 14.9±3.1, 15.8±4.7, 21.3±9.9, 21.8±7.9 respectively. 68 out 70 pts underwent TAVI procedure. In 65 pts (95%) CT measurements were comparable to the size of the implanted valve prosthesis (r=0.92). 1 patient had severe aortic regurgitation. In comparison with ICA for coronary assessment CTA showed in a vessel based analysis sensitivity, specificity, negative predictive value, positive

predictive value and accuracy of 92%, 84%, 97%, 67% and 86% respectively. Mean creatinine before CT and 72h after procedure were 1.20±0.45 and 1.22±0.50 mg/dl. Mean DLP was 462.4±121.2 mGy/cm.
Conclusions: CT with low contrast volume for aorta and coronary arteries assessment is feasible and clinically useful, allowing accurate pre-procedural TAVI planning and reducing the risk of contrast induced nephropathy

ASSESSMENT OF MORPHOLOGY AND FUNCTION

P222

The impact of aging on left atrial size and function: a systematic review and meta-analysis

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Background: the cardiovascular system is affected by aging, however conflicting results cloud this relationship and data on LA myocardial function and aging are scanty. The aim of this study was to evaluate the impact of aging on LA size and function in healthy subjects.
Methods: We conducted a systematic literature search of MEDLINE database. We included only studies evaluating healthy subjects, with age ranged between 18 and 80 years. Parameters were compared among 4 age groups, <30, 30-45, >45-60, >60 years.
Results: Three hundred twenty-six studies met the inclusion criteria and the final population consisted of 62,821 subjects. LA area and LA volume index did not differ among groups. LA function estimated by speckle-dimensional echocardiography did not change with aging (p=0.25). A decrease in E/A ratio and an increase in E/e' ratio with advancing age (p<0.0001 and p=0.001, respectively).
Conclusions: In healthy subjects LA area and LA volume index are not influenced with advancing age. Also LA function assessed by speckle-tracking is not affected by age. Thus, an increase in LA area or in LA volume index and a decrease in LA function should be considered as an expression of pathology rather than part of normal aging.Table 1

	Mean ± SE	95% CR	p value for age
LA area (cm^2)			0.35
Age ≤30 years			
Age > 30 & Age ≤45	14.9 ± 0.9	11.3 - 18.4	
Age > 45 & Age ≤60	15.3 ± 0.6	12.1 - 18.6	
Age > 60	15.8 ± 0.5	12.6 - 19.1	
	16.3 ± 0.9	12.7 - 19.8	
LA volume index (mL/m^2)			0.21
Age ≤30 years			
Age > 30 & Age ≤45	22.2 ± 0.6	20.8 - 23.5	
Age > 45 & Age ≤60	22.6 ± 0.3	21.7 - 23.5	
Age > 60	23.1 ± 0.3	22.1 - 24.0	
	23.5 ± 0.6	22.1 - 24.9	
E/A ratio			< 0.0001
Age ≤30 years			
Age > 30 & Age ≤45	1.65 ± 0.03	1.50 - 1.80	
Age > 45 & Age ≤60	1.41 ± 0.02	1.27 - 1.56	
Age > 60	1.18 ± 0.01	1.04 - 1.32	
	0.95 ± 0.02	0.81 - 1.10	
E/e' ratio			0.001
Age ≤30 years			
Age > 30 & Age ≤45	6.8 ± 0.3	4.8 - 8.9	
Age > 45 & Age ≤60	7.3 ± 0.2	5.3 - 9.3	
Age > 60	7.8 ± 0.2	5.8 - 9.9	
	8.3 ± 0.3	6.2 - 10.4	
PALS (%)			0.25
Age ≤30 years			
Age > 30 & Age ≤45	39.1 ± 2.4	34.1-44.2	
Age > 45 & Age ≤60	37.8 ± 1.3	35.1-40.5	
Age > 60	36.5 ± 0.8	34.8-38.3	
	35.2 ± 1.7	31.7-38.8	

Left atrial size and function according to age.

P223

The relation between blood pressure components and left atrial volume in the context of left ventricular mass index

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Background: Left atrial enlargement (LAE) is a risk factor for cardiovascular complications and death. In hypertensive patients, LAE is usually due to left ventricular (LV) hypertrophy and diastolic dysfunction. We aimed to identify factors associated with LAE in patients with increased and normal left ventricular mass index (LVMI) with reference to pulsatile and steady components of blood pressure (BP).
Methods: We divided study population into 2 groups based on LVMI median value (LVMI+ and LVMI-). We measured office, ambulatory and central BP, carotid-femoral pulse wave velocity (PWV), as well as echocardiographic indices.
Results: The mean (SD) age of 205 patients (men, n= 69 (34%) and women, n=136 (66%)) was 53.6 (8.3) years. We found higher values of PWV, office, ambulatory and central BPs in LVMI(+) group. This group had also greater left atrial volume index (LAVI), which correlated with LVMI (r=0.36, p=0.0002) and ratio of early mitral peak flow velocity to early mitral annulus velocity in tissue Doppler imaging (E/e') (r=0.24, p=0.035). In LVMI(-) group, LAVI correlated with pulsatile and steady BP components. LAVI was independently predicted by mean arterial pressure (MAP) obtained from both ambulatory (MAP 24h, β=0.15; p=0.045) and office measurements (MAPoffice, β=0.35; p = 0.004), but not by pulse pressure.
Conclusions: LV mass and function are the main determinants of LAVI. However, in persons with lower LV mass, LAVI depends on the steady component of blood pressure, but not pulsatile one. Increased LAVI reflects early changes in response to systemic blood pressure elevation.

P224

Increased left atrial volume predicts atrial fibrillation recurrence after electrical cardioversion: a systematic review and meta-analysis

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Background and Aim: Atrial fibrillation (AF) incidence and outcome is related to Left atrial (LA) cavity enlargement. Electrical cardioversion (ECV) is widely used for restoration of sinus rhythm patients with persistent AF, but most of them experience recurrence of the arrhythmia after ECV. A number of AF recurrence predictors have already been proposed but patients' selection criteria remain controversial. The aim of this meta-analysis was to analyze the potential association between LA volumes and AF recurrence after ECV.
Methods: We systematically searched PubMed-Medline, EMBASE, Scopus, Google Scholar and the Cochrane Central Registry, up to January 2017 in order to select clinical trials and observational studies, which reported the predictive role of LA volume index (LAVI) for AF recurrence after ECV. 1193 patients from 12 studies with persistent AF were included.
Results: The pooled analysis showed that after a mean follow-up period of 8.4 months, patients with AF recurrence had larger LAVI in comparison with those without AF recurrence [45.1 (40.5-49.7) vs. 38.4 (34.6-42.1)] with a weighted mean difference (WMD) of 6.27 [(95% CI 4.01 to 8.5) P < 0.0001]. Meta-regression analysis, ascertained this difference being independent of the follow-up period.
Conclusions: Left atrial volume index is associated with increased risk of atrial fibrillation recurrences after electrical cardioversion, thus adding to the clinical armamentarium for optimum patient selection.
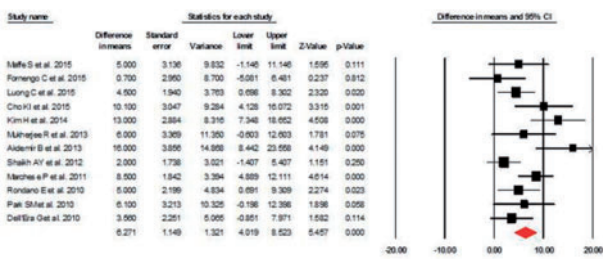
Abstract P224 Figure.

P225

Left atrial enlargement as a supportive marker of atherosclerosis

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The clinical utility of left atrial (LA) enlargement detection concerns mainly the likelihood of developing atrial fibrillation (AF) and the consequent increased risk of stroke. We investigated if LA size may independently correlate with carotid stenosis (CS). Patients who had comprehensive echocardiography and carotid ultrasonography were included. Antero-posterior LA Ø was measured at the aortic valve level and considered as a categorical variable (quartiles). Any degree of CS and traditional cardiovascular (CV) risk factors (RF) were assessed.
Patients studied were 834 (65±9 years, 61% male). LA was enlarged in 240 patients (29%). Patients were divided into three groups: without CS (N=424, 49%), with

CS<50% (N=320, 39%) and CS≥50% (N=90, 12%). Each CV RF was significantly more frequent in patients with CS (p=0.01 for family history, p<0.0001 for the others). CS degree was also associated with: a LA Ø ≥2.4 cm (fourth quartile), a reduced EF, a greater LV mass and the presence of valves calcification (for all p<0.0001). Even when AF patients were excluded (n= 118), a LA Ø ≥ 2.4 cm was associated with higher CS degree (p=0.004). Comparing patients without CS vs with CS≥50% a greater LA Ø was independently associated with a higher CS degree (Table).
An enlarged LA could represent a marker of atherosclerosis useful in further CV risk stratification of patients.

Clinical model	CS<50% vs no CS, N=744		CS ≥50% vs no CS, N=414	
	OR (95%CI)	p value	OR (95%CI)	p value
Male gender	2.6 (1.8-3.7)	<0.0001	4.0 (2.2-7.2)	<0.0001
Age >65 y	3.3 (2.3-4.6)	<0.0001	4.0 (2.3-6.9)	<0.0001
Hypertension	1.6 (1.1-2.5)	0.01	0.9 (0.4-1.8)	0.8
Dyslipidaemia	1.7 (1.1-2.6)	0.009	1.6 (0.8-3.2)	0.1
Diabetes	2.4 (1.3-4.3)	0.002	3.2 (1.4-7.3)	0.005
Smoking	1.5 (0.8-2.9)	0.1	1.3 (0.4-3.4)	0.5
Family hystory	1.02 (0.6-1.6)	0.9	1.2 (0.5-2.5)	0.5
LA/BSA	1.1 (0.9-1.2)	0.2	1.5 (1.2-1.9)	0.001
Echocardiographic model				
EF <50%	2.1 (1.3-3.4)	0.001	1.7 (0.9-3.4)	0.09
LV mass >126 g	1.4 (1.06-2.0)	0.01	4.1 (2.1-7.8)	<0.0001
Aortic sclerosis	2.1 (1.5-3.0)	<0.0001	2.8 (1.6-4.7)	<0.0001
Mitral valve calcification	0.9 (0.6-1.6)	0.9	1.4 (0.7-2.7)	0.3
LA/BSA	1.1 (0.99-1.3)	0.07	1.2 (1.01-1.6)	0.04

P226

Can simple linear and areal dimensions be used to calculate the total left ventricular myocardial mass adequately? - A cardiovascular magnetic resonance study

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Background: Accurate assessment of the total left ventricular myocardial mass (LVM) is of utmost clinical importance. The first line diagnostic tool is two-dimensional echocardiography, which uses left ventricular (LV) linear and/or areal dimensions for its calculations but faces several limitations. In the present study, we sought to determine if simple, easily obtainable linear and/or areal LV dimensions can be used to determine the total LVM with acceptable precision under the superior contrast conditions of cardiovascular magnetic resonance using the slice summation technique (SST) as reference.
Methods: The study comprised a total of 20 healthy volunteers, 37 patients with aortic and 37 patients with mitral regurgitation, which were subsequently divided into two subgroups (Derivation and Test group). CMR imaging was performed at 1.5 T using balanced steady-state free precession sequences. The total LVM was obtained using the SST (reference standard) and according to the truncated ellipsoid technique (TET). In the derivation group, the length of the cylindrical (CL) and elliptical part (EL) of the left ventricle in 4-chamber view and the myocardial cross-sectional area (MCSA = epicardial minus endocardial cross-sectional area) in short-axis view were obtained.
Results: Linear regression analysis (Derivation group) showed that a regression equation (RE) including CL, EL and MCSA could best predict the total LVM as determined by the SST (LVM = -196.3 + (32.5 x CL) + (9.4 x EL) + (7.8 x MCSA), r = 0.97, p <0.0001). All three mass quantification methods determined overall a significantly different total LVM (Test group, Table). The TET overestimated the total LVM and our own RE underestimated the total LVM in relation to the SST (mean difference ± SD 24 ± 24 g (limits of agreement -23 to 71 g) and -9 ± 16 g (limits of agreement -40 to 22 g) respectively) although the limits of agreement were narrower than for the TET.
Conclusion: Our results show that simple, easily obtainable linear and areal LV dimensions can be used to obtain the total LVM with acceptable precision. Our findings are of interest for the quantification of the total LVM using two-dimensional echocardiography, although further studies are needed to evaluate feasibility and applicability.Determined myocardial mass

	TET	RE	SST	Overall P-value	TET vs RE	Post-hoc analysis TET vs SST	RE vs SST
Myocardial mass (g)	159 ± 63	125 ± 51	135 ± 45	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Data are presented as mean ± SD. The significance of the differences between the different methods are presented as P-values. RE, regression equation; SST, slice summation technique; TET, truncated ellipsoid technique.

P227

The EINSTEIN I-RAP study Evaluation of INferior vena cava by Semi-automaTEd tracking as non INvasive estimation of Intermediate - Right Atrial Pressure (a pilot study)

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Background: Inspiratory collapse of the inferior vena cava (IVC) and the measurement of its diameters are validated as indirect indexes for the noninvasive estimation of the right atrial pressure (RAP). However, there are some well known critical issues about its reliability and reproducibility, especially in patients with intermediate values of RAP.

Purpose: In order to standardise the measurement of the IVC, we suggested the use of a previous published software that can highlight in semi-automatic mode the vein's edges, measure the diameters at different sites in a wide IVC region and then define a multiparameter algorithm to predict with high accuracy even small changes of the diameters of the vessel. To assess the validity of this technique the measured data with the semi-automatic tracking system applying the algorithm (SATA), the simple mean of diameters obtained by the semi-automatic tracking (SATM) and the B-Mode edge to edge measurement of the IVC at one site (standard echocardiographic measurements, SEM) were each compared with the gold standard invasive technique represented by the right-heart catheterization (RHC).

Methods: We prospectively enrolled 33 patients undergoing RHC for any indication. A scan of at least 10 seconds of the IVC in the longitudinal axis was performed and IVC diameters were measured during resting breath by B-Mode echocardiography. All the clips were then analyzed with the software. The algorithm considered the respiratory variations of the IVC diameters, age and body surface area. The analysis was performed with Bland and Altman (B&A) method and Pearson correlation coefficient (r) to validate the technique (we arbitrarily considered as an acceptable limit of agreement (loa) for RAP estimation a value of 5 mmHg). Pearson correlation was performed also in patients with right ventricle dysfunction (RVD).

Results: We performed a general analysis of the sample comparing the RHC data with SATA and SEM with B&A method, that showed a better correlation with SATA (mean differences (md) 0.29 mmHg, loa [-9; 9.58], r=0.59, p=0.0003, in comparison to SEM md -0.72, [-12.75; -11.30], r=0.32, p=0.07 with SEM). In particular, the new software was able to successfully identify patients with intermediate RAP as showed in B&A plot: RHC vs SEM: md -2.45, [-12.31; 7.40]; RHC vs SATM: -1.82, [-12.11; 8.47]; RHC vs SATA: md -1.47 [-7.59; 4.64] (Figure 1). The SATA showed a good correlation with RHC both in RVD group (r=0.74, p<0.001) and non RVD group (r=0.5, p=0.05).

Conclusions: In our pilot study the SATA of the IVC was able to estimate with higher accuracy than SEM the RAP, in particular in patients with intermediate values of RAP. We believe that, if these data will be confirmed in a more representative sample size, clinicians could benefit of this new tool in the management of patient's fluid balance.
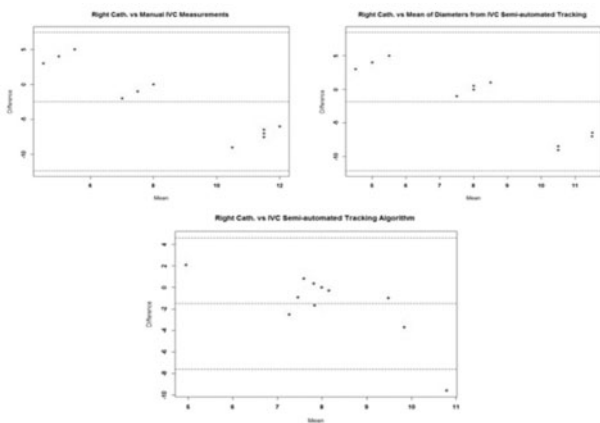
Abstract P227 Figure. B&A plot for intermediate value of RAP

P228

Clinical significance and prognostic value of L wave in heart failure patients

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L wave is easily recorded as mid-diastolic mitral forward flow with conventional Doppler echocardiography. L wave is occasionally detected in heart failure (HF) patients but its mechanism to produce L wave and the prognostic value is still unknown.

The aim of this study is to clarify the related factors of L wave in patients of HF with preserved ejection fraction (HFPEF) and reduced ejection fraction (HFREF) and the prognostic impacts of L wave in HF patients.

Methods and Results: One hundred fifty one HF patients were enrolled (HFREF: 82, HFPEF: 69). Both in HFPEF and HEREF, transmitral E velocity (E), E to mitral annulus velocity ratio and Left atrial volume index were higher with L wave than in those without L wave. Relative wall thickness (RWT) was lower in HFREF with L wave than those without L wave (0.26 ± 0.07 vs 0.30 ± 08). Meanwhile, in HFPEF patients, RWT was higher in patients with L wave than those without L wave (0.42 ± 0.07 vs 0.39 ± 0.07). Kaplan-Meier survival curve revealed that the patients with L wave demonstrated significant poorer prognosis compared those without L wave in HF patients ($P<0.05$).

Conclusion: L wave is associated with LV diastolic dysfunction and LV geometry. Also L wave has potentially predicting value for the prognosis in patients of HF.

P229

A novel simplified method to estimate global longitudinal strain in oncology patients with difficult acoustic windows

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Background: Global longitudinal strain (GLS) is currently a widely acceptable method to evaluate early left ventricular dysfunction in the oncology population. A significant limitation is its dependency on image quality resulting in suboptimal tracking of the myocardium.

Purpose: To overcome this limitation we developed a simplified method to obtain a surrogate of global longitudinal strain using few tracking points, which can be identified in most patients irrespective of the image quality.

Methods: Using a tool provided in a commercially available post-processing software for 2D images; we looked for areas around the LV that have prominent speckles and are less confounded by noise. Tracking of the hinge points of the mitral leaflets and the epi-pericardial apical border had been feasible in a previous study involving patients with impaired image quality. We hypothesized that a surrogate of GLS can be obtained from assessing the change in distance between the tracking points at the mitral ring and the apex (Fig.1). The peak systolic strain was obtained from the percentage shortening of the straight lines between the mitral ring and the apical pericardium and the average value of the measurements of the LV walls in the apical views was reported as simple global strain. In order to compare the novel method with standard GLS 106 consecutive oncology patients with acceptable acoustic windows were scanned with a commercially available 2D echo scanner. The patients were assessed for possible cardiotoxic effects of cancer medications as per ASE/EACVI expert consensus.

Results: The mean age was 56 ± 13 years, 84% were females. The mean ejection fraction was 61.18 ± 8.5. The strain measurements by the simplified strain method were smaller than those derived from standard GLS (12.3 ± 2.6 % vs 20.5 ± 2.6 %, $p < 0.05$). There was a good correlation between GLS and the simplified strain method (Ãĉ=9.87+0.87(x), r=0.87, p< 0.001). The mean relative standard error was $2.4\% \pm 2.1$ for the simplified method and $5.6\% \pm 6.7$ for standard GLS. Further analysis using Bland-Altman plots showed a small bias (0.11) with a narrow limit of agreement (1.96 x SD) -0.5 to 0.73.

Conclusion: The novel simplified strain method showed very low inter-observer variability and a good correlation with the standard speckle-tracking global longitudinal strain method in the oncology population. The simplified strain method has the potential to provide a surrogate for strain measurements in patients with poor acoustic windows.

Fig.1: Position of ROIs at the mitral ring and the apical pericardium for simplified strain measurements in end-diastole (lower left) and end-systole (lower right), corresponding strain curves (bottom). A surrogate of GLS is calculated using the average peak strain values obtained from distances between the mitral and apical tracking points.
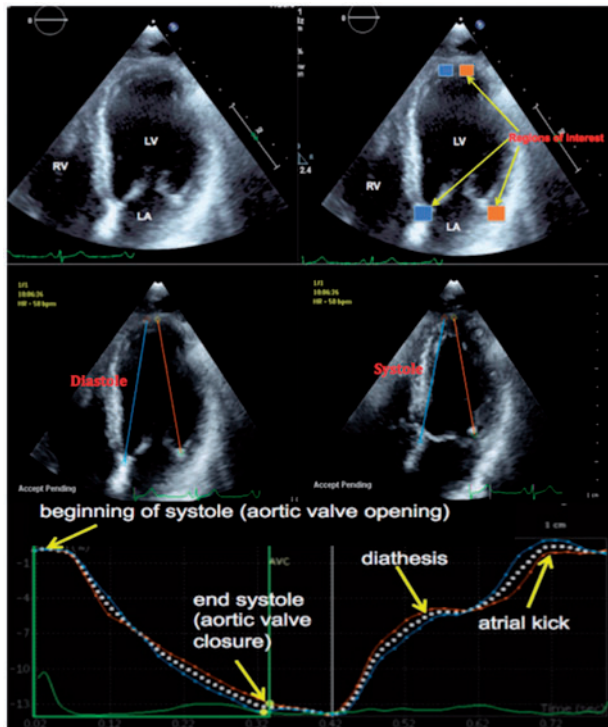
Abstract P229 Figure. Fig. 1

P230

The effect of atrial fibrillation on left ventricular deformation and twist in mitral regurgitation

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Background: Atrial fibrillation (AF) in patients with mitral regurgitation (MR) is independently associated with adverse cardiac events and worse long term outcome after surgery. Our previous speckle tracking echocardiography (STE) study of MR in sinus rhythm (SR) demonstrated a major shift of LV regional systolic deformation from bass towards apex when compared with normal controls.
Aim: The present study was sought to test the hypothesis that AF with MR may significantly attenuate normal physiological adaptation in volume overload, and explains its adverse effects on patient's outcome in MR or after its correction.
Methods: We studied 91 patients (age 50 ± 16yr, 18 males) with primary MR. Of whom 28 with AF and 63 with SR. Left ventricular (LV) contractile functions were assessed by conventional 2D TTE and 2D strain image. Global and regional systolic peak strain in longitudinal, radial and circumferential was measured at LV base, middle and apex.
Results: AF group has a greater LVEDV, LVESV and MR volume than those in SR group (all p=0.001). Its LVEF and global long axis strain reduced significantly when compared with that of SR group ($59.8\pm8.6\%$ vs $68.4\pm7.4\%$; $-15.4\pm4.9\%$ vs -20.3 ± 4.0 %, both p<0.001). Regional systolic long axis and circumferential peak strain at LV base, middle and apex all reduced in free wall and septum when comparing with those of SR group (p<0.05). At radial direction, compared with SR group, AF group had significantly reduced systolic strain at basal and middle segments (p<0.05) but not at apex (p=NS). LV twist also reduced in AF group compared with that in SR group (10.0 ± 7.2 vs. 16.6 ± 6.5, degree, p<0.001).
Conclusion: MR with AF not only has a greater LV cavity size and lower EF, but more importantly is associated with a significantly lower LV longitudinal, circumferential deformation and twist. Thus AF has significantly attenuated the shift of greater regional deformation from base towards apex as occurs in MR with SR, therefore profoundly limited the normal adaptation of LV physiology when responding to volume overload in MR.

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Phenotyping heart failure with mid-range vs preserved ejection fraction by functional assessment with exercise gas exchange and echocardiography

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Latest ESC guidelines on the management of heart failure (HF) has reviewed patients' classification, identifying a new class named as HF with mid-range ejection fraction (HFmrEF; EF 40-49%), supposed to have its own pathophysiologic picture. The aim of this study was to evaluate whether HFmrEF patients exhibit distinctive echo and functional phenotype in comparison to HF with preserved EF population (HFpEF; EF > 50%). Methods: We performed simultaneously combined exercise stress echocardiography (ESE) and cardiopulmonary test (CPET) in 57 HF patients, divided in two cohorts according to the ESC definition criteria: HFpEF (24 pts: 20 F and 4 M; age 72 + 9) and HFmrEF (33 pts: 12 F and 21 M; age 65,58 + 8,61). 30 individuals were considered as control group (14 F and 16 M; age 52 + 17). Results: Both HF groups had significantly enlarged left atrium (LA) (HFpEF p= 0.002; HFmrEF p< 0.001) and higher left ventricle (LV) mass (HFpEF p< 0.001; HFmrEF p< 0.001) but, HFmrEF showed greater hypertrophy than HFpEF (p= 0.005). TAPSE resulted depressed in HFmrEF, compared both to HFpEF (rest p= 0.002; peak p 0.038) and controls (rest and peak load p< 0.001), while HFpEF patients exhibited normal values. TAPSE/PASP was reduced in both HF groups (rest HFpEF p= 0.003, HFmrEF p< 0.001; peak HFpEF and HFmrEF p< 0.001). E/e' showed pathological values (HFpEF p= 0.002; HFmrEF p< 0.001) in all HF patients. Both HF cohorts got significantly lower peak oxygen consumption (VO2%, HFpEF p = 0.002; HFmrEF p = 0.009) nonetheless, only HFmrEF presented significantly abnormal ventilatory efficiency (VE/VCO2 slope, p= 0.002). Conclusion: HFmrEF revealed a more pronounced degree of ventricular remodeling, suggesting a progressive morphological evolution from HFpEF. Moreover, HFmrEF had a worse functional profile as suggested by impaired ventilatory efficiency at gas exchange analysis.ESE and CPET parameters

p-value < 0.05 control † pEF ¥ mrEF §	control group	HFpEF group	HFmrEF group	p-ANOVA
LA volume indexed, ml/m² (mean + SD)	24.07 + 7.67	41.8 + 24.11 †	43.33 + 21.33 †	< 0.001
LV mass indexed, gr/m² (mean + SD)	77.64 + 16.45	103.56 + 26.55 †	125.14 + 24.59 †¥	< 0.001
TAPSE rest, mm (mean + SD)	25 + 3.49	22.82 + 4.03	18.33 + 4.40 †¥	< 0.001
TAPSE peak, mm (mean + SD)	28.65 + 4.33	25.26 + 4.86	21.37 + 5.1 †¥	< 0.001
TAPSE/PASP rest, mm/mmHg (mean + SD)	1 + 0.25	0.71 + 0.27 †	0.65 + 0.23 †	< 0.001
TAPSE/PASP peak, mm/mmHg (mean + SD)	0.73 + 0.21	0.46 + 0.17 †	0.4 + 0.14 †	< 0.001
E/e' ratio, (mean + SD)	9 + 2.64	16.95 + 7.71 †	17.56 + 8.68 †	< 0.001
Peak VO₂, % (mean + SD)	72.9 + 19.84	54.96 + 14.48 †	58.52 + 16.92 †	< 0.001
VE/VCO₂ slope, (mean + SD)	25.32 + 2.71	29.06 + 3.61	30.81 + 7.88 †	0.001

P232

Levosimendan improves hemodynamics in STEMI pts with left ventricular dysfunction by reducing arterial elastance: a non invasive human study by means of ventriculo-arterial coupling

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Background: Levosimendan is a calcium sensitizer that enhances myocardial contractility without increasing myocardial oxygen consumption independently of interactions with adrenergic receptors. Furthermore, it causes vasodilatation of peripheral arterial vessels through its effect on K+ channels. The effective functional interaction between the heart and vessels can be evaluated by ventriculo-arterial coupling (VAC) that can be represented by the ratio of ventricular elastance (Ees) and arterial elastance (Ea). The aim of this study was to evaluate VAC in STEMI patients treated with levosimendan.
Methods: A total of 28 (82% male, age 64 ± 12 yrs) STEMI pts admitted to Department of Intensive Cardiac Care Unit in our Hospital from December 2015 to December 2016 were enrolled in this study. All patients underwent primary PTCA and, subsequently, echocardiographic evaluation and levosimendan administration (clinical decision). Before and 24 h after the administration of levosimendan we evaluated Ea, Ees and VAC (Ea/Ees ratio) by a specifically implemented calculator designed for measuring non invasive single beat Ees and Ea. The measurement of Ea and Ees required systolic and diastolic blood pressure, stroke volume (Doppler VTI method), ejection fraction (Simpson Method), total systolic time (msec) and pre-ejection time (msec).
Results: After levosimendan, stroke volume increased significantly (from 46.30 ± 13.44 to 53.64 ± 12.90 mL, p < 0.01) in all patients, while Ea significantly reduced (from 2.55 ± 1.23 to 1.84 ± 0.61 mmHg/ml/mq, p <0.01). Ees showed a reduction (from 1.79 ± 0.97 to 1.32 ± 0.64 mmHg/ml/mq, p=0.01), VAC slightly decreased from 1.73 ± 0.96 to 1.65 ± 0.72 (p=NS). The heart rate E/A ratio and WMSI remained substantially unchanged (from 89 ± 22 to 86 ± 21 bpm, p ns; from 1.70 ± 1.95 to 1.15 ± 0.76, p ns; from 2.10±0.38 to 1.96±0.48 respectively), while ejection fraction (EF) and lung comet tales showed a significant improvement (from 29 ± 12 to 34 ± 15 %, p< 0.01; from 93 to 71%, p< 0.01 respectively).

Conclusion: In this preliminary study the use of levosimendan in STEMI pts with low EF increases significantly the stroke volume after 24 hours of treatment, irrespective of heart rate. The increase in stroke volume and the concomitant improvement of EF may have been facilitated by Ea reduction. Moreover, there is a clear reduction of lung congestion (comet tail) and a statistically significant correlation between Ea reduction and SV increasing. We speculate that in the setting of STEMI with reduced EF requiring hemodynamic support despite successful primary PTCA, levosimendan cardiovascular effect seems associated with an improvement of arterial elastance and a trend to a better ventriculoarterial coupling, as demonstrated by noninvasive pressure-volume analysis.
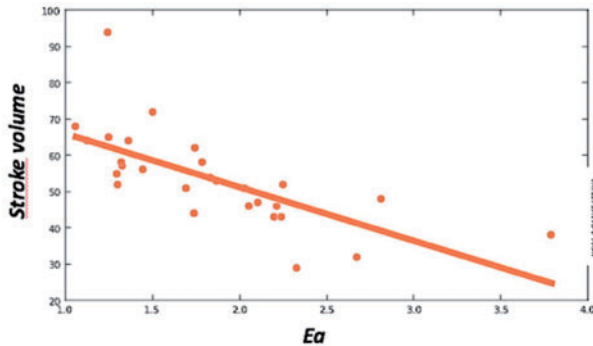
Abstract P232 Figure. fig 1

P233

Enhanced echocardiography in left ventricular function assessment after percutaneous coronary intervention in patients with preserved ejection fraction

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Background: Many patients (pts) with stable coronary artery disease (CAD) have no visual segmental wall motion abnormalities and left ventricular ejection fraction (LVEF) $\geq$50% at rest, despite significant coronary artery stenosis. Percutaneous coronary intervention (PCI) improves symptoms and prevents the subsequent need for revascularisation in these pts, but the impact of PCI on systolic LV function has not been revealed.

Aim: The aim of the study was to determine the impact of PCI on LV function assessed by enhanced echocardiography in pts with stable CAD and LVEF $\geq$50%.

Methods: Pts with CAD and EF $\geq$50%, admitted to hospital for planned coronary angiography, were prospectively assessed. PCI was performed for coronary artery stenosis >70%. Extent of CAD was assessed with SYNTAX and EXTENT scores. To assess LV function LVEF, global longitudinal strain (GLS) and left ventricular systolic myocardial velocity (Sm) were measured and Tei index was calculated before and 3 months after PCI. GLS was assessed with automatic function imaging. Multivariate linear regression analyses were performed to evaluate the impact of selected factors on LV function after PCI, expressed as changes (Δ) of LVEF, GLS, Sm and Tei index. The selected factors included: DM presence, DM duration, SYNTAX and EXTENT scores, sex and age.

Results: Consecutive 66 pts with CAD and LVEF $\geq$50% (67$\pm$8.2 years, 43 males, 34 pts with DM) undergoing PCI were enrolled in the study. LV functional indices improved significantly after PCI in all pts (table). The improvement of LV function after PCI expressed as ΔGLS was associated only with SYNTAX score. Higher values of SYNTAX score were related to greater improvement in GLS and led to greater LV function improvement after revascularization (β=0.67, 95% CI:0.23-1.11, p=0.004). No significant impact of any tested factors on other LV functional indices was shown.

Conclusions: PCI significantly improved LV function in CAD patients with preserved LVEF. Enhanced echocardiography allows an assessment of subtle changes in LV function.Parameters of LV function

Parameter (mean$\pm$SD)	before PCI	post PCI	P-value
LVEF (%)	59$\pm$4	62$\pm$4	<0.001
GLS (%)	-17.5$\pm$2.3	-20.5$\pm$2.2	<0.001
Sm (cm/s)	7.0$\pm$0.9	7.8$\pm$0.9	<0.001
Tei index	0.57$\pm$0.09	0.42$\pm$0.08	<0.001

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Mechanisms of cardiovascular adaptation in endurance sports or strength sports. An echocardiographic study using speckle tracking 2D

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Background and objectives: strain (S) and strain rate (SR) analysis using 2D transthoracic echocardiography (TTE) speckle tracking image (STI) detects changes in left ventricular (LV) systolic and diastolic function, depending on the type of sport: endurance sport (ES) or strength sports (SS). The objective of our study is to know these changes.

Method: We performed a standard TTE with STI in runners (ES), canarian wrestlers (SS) and healthy controls (HC). We compared the usual morphological and functional findings in TTE of LV, in addition to S and SR longitudinal (L), circumferential (C) and radial (R).

Results: 68 TTE with STI (25 ES, 27 SS and 16 HC) all males, mean age 29 $\pm$ 4 years, mean age training of ES and SS 13.2 $\pm$ 7.3 years, body mass index (BMI) and echocardiographic variables, as well as differences of means between groups (Table 1). Regarding the LV deformity, there were significant differences between groups: systolic LSR (s-1) ES -0.80 $\pm$ 0.35, SS -0.21 $\pm$ 0.30 and HC -0.30 $\pm$ 0.25, being p < 0.05, between ES vs SS and HC, as well as systolic CSR (s-1) ES -1.9 $\pm$ 0.27, SS -0.60 $\pm$ 0.46 and HC -0.73 $\pm$ 1.02, p <0.001 between ES vs SS and HC. In the early diastole, the LSR also showed significant differences (s-1) 1.27 $\pm$ 0.58 in ES vs 0.37 $\pm$ 0.29 in SS and 0.29 $\pm$ 0.30 in HC, respectively, p < 0.05.

Conclusions: in our ES sample, there is a significant increase, in relation to SS and HC, both in the systolic SR and CSR, and in the diastolic LSR-E, showing no such differences to other classical parameters for evaluation of systolic function such as LVEF, or diastolic as the ratio E/e'. The STI technique allows to determine subtle changes in the systolic and diastolic function of the LV suggestive of an adaptive process, specific to the increase of the hemodynamic forces according to the type of sport.

Variable	ES	SS	HC	Significance
BMI (Kg/m2)	22.7$\pm$1,8	33,6$\pm$3,8	26,7$\pm$2,8	p$\leq$ 0,001
LV Mass (g)	212.5$\pm$49	230$\pm$32	170$\pm$40	p$\leq$ 0,001
LV Mass index (g/m2)	112$\pm$23	97$\pm$12	71$\pm$31	p$\leq$ 0,001
LVEF (%)	66.2$\pm$7.6	64.3$\pm$6.4	62$\pm$7.2	N.S.
e'septal DTI (cm/s)	12.7$\pm$2.1	10.8$\pm$2.4	11.9$\pm$1.2	p$\leq$ 0,05
a' septal DTI (cm/s)	8.5$\pm$1.8	8.4$\pm$1.7	8.9$\pm$1.3	N.S.
s'septal DTI (cm/s)	9$\pm$1.2	9.2$\pm$1.3	9.3$\pm$1	N.S.
Ratio E/e'	7.2$\pm$1.5	7.9$\pm$1.8	7$\pm$1.6	N.S.

Table1. Echocardiographic characteristics of runners (DR), fighters (DF) and controls (CS).

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Comparison of clinical and echocardiographic features between heart failure patients with mid-range and reduced ejection fraction: determinants of two-year survival

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Background: The clinical and echocardiographic features of heart failure (HF) patients with mid-range ejection fraction (HFmrEF, LVEF 40 to 49%) remains elusive.

Purpose: We compared the clinical and echocardiographic e features between HFmrEF and HFrEF (LVEF<40%) patients and explored the related prognostic determinants of these patients.

Methods: A total of 804 HF patients with LVEF<50% (mean age 67$\pm$12 years, 74.8% male), referred to the echocardiographic laboratory in our hospital between June 2009 and December 2014, were enrolled in this study. Patients were divided into HFmrEF (n=389) and HFrEF (n=415) groups. Demographic data, medical history, laboratory data and echocardiographic parameters were analysed. Patients were clinically followed for 24 months (mean 23.0$\pm$3.1 months) by means of a clinical visit or telephone interview. The endpoint was all-cause death or heart transplantation.

Results: The prevalence of dyslipidaemia, anaemia, and coronary artery disease were significantly lower whereas the prevalence of lung disease and ICD/pacemaker implantation were significantly higher in HFrEF patients than in HFmrEF patients. NT-proBNP level was significantly higher in the HFrEF than HFmrEF group [median 1760 (667-3669) vs. 940 (432-2794), P=0.002].

Echocardiographic data showed that percent of left ventricular dilatation (41.4% vs.10.0%, P<0.001), significant diastolic dysfunction (57.4% vs. 40.6%, P<0.001), significant mitral regurgitation (MR, 17.4% vs. 9.0%, P<0.001), tricuspid regurgitation (TR, 9.4% vs. 6.4%, P=0.006), and elevated systolic pulmonary artery pressure (SPAP, 41.3% vs. 32.2%, P=0.025) were significantly higher in the HFrEF group than in the HFmrEF group.

68 patients died and 4 patients underwent heart transplantation over 2-year follow up. Overall survival was significantly lower in the HFrEF than in the HFmrEF group (88.6% vs. 93.6%, P=0.014). Multivariable Cox regression analysis showed that NYHA class [HR 2.04 95% CI 1.13-3.70], anaemia [HR 1.88 (1.04-3.42)], eGFR [HR 0.98 (0.97-0.99)], NT-proBNP [HR 2.28 (1.61-3.24)], moderate to severe TR [HR 2.40 (1.20-4.80)] were independent determinants of survival in patients with HFrEF after adjusting for age, gender, and body mass index. Meanwhile, NT-proBNP [HR 2.31, 95% CI 1.30-4.09] and eGFR [HR 0.98 (0.97-1.00)] remained as independent determinant of survival in patients with HFmrEF.

Conclusions: Present study demonstrates LVEF, NYHA class, anaemia, kidney dysfunction, NT-proBNP, and moderate to severe TR are independent determinants of survival in patients with HFrEF, while NT-proBNP and eGFR remain as independent determinants of survival in HFmrEF patients.

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Three-dimensional echocardiography left ventricular ejection fraction provides better patient selection for an implantable cardioverter defibrillator compared to two-dimensional echocardiography

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Background: Current ESC guidelines recommend ICD for primary prevention of sudden cardiac death in patients with symptomatic heart failure and left ventricular ejection fraction (LVEF) $\leq$ 35%. Conventionally, two-dimensional echocardiography (2DE) has been used to assess the LVEF, but the optimal method for patient selection remains to be clarified. Three-dimensional echocardiography (3DE) avoids the limitations of 2D algorithms for LVEF assessment and could provide better stratification of the arrhythmic risk.

Purpose: To compare the clinical impact of 3DE and 2DE LVEF to predict severe arrhythmic events in patients with left ventricular dysfunction

Methods: We prospectively recruited a cohort of patients with ischemic or non-ischemic cardiomyopathy and LV dysfunction, defined as LVEF$\leq$50%. Patients with myocardial infarction within 40 days of the enrollment were excluded. Medical therapy was optimized in all patients. 2D and 3D LVEF were measured using the disks' summation method and the semi-automated 3D software package (4D AutoLVQ) during the same study. The primary endpoint was the first occurrence of serious arrhythmic event defined as sudden cardiac death, ventricular tachycardia with hemodynamic compromise or appropriate device therapy.

Results: A total of 173 patients were enrolled, age 63$\pm$16 years, 83% male, 71% with ischemic heart disease, BMI was 26$\pm$ 4 kg/m2, NYHA Class 2.2$\pm$0.8, 2D LVEF 37$\pm$9%, 3D LVEF 35$\pm$10%. Data on arrhythmias was available for 140 patients who were included in the final analysis. After a median follow up of 56 months (18-65), 31 patients (22%) experienced severe arrhythmic events. Compared to 2D, the use of 3D to measure LVEF reallocated 22 (16%) of the 140 patients, 3 as having LVEF >35% and 19 as having LVEF $\leq$35%. Being reallocated by 3D LVEF to the group with LVEF $\leq$ 35%, increased the risk of severe arrhythmic events compared to those not reallocated HR = 3.35 (1.6-7), p=0.004. Patients with arrhythmic events had worse NYHA functional class (p=0.004), were more likely to receive antiarrhythmic therapy (p=0.019), had larger 2D and 3D left ventricular volumes (p<0.001) and lower 2D and 3D LVEF (p<0.001) In multivariable Cox regression analysis, only age and 3D LVEF resulted independent predictors of severe arrhythmic events, while 2DLVEF was not. 3DLVEF was a particularly strong predictor with a 41% decrease in the risk of severe arrhythmic events per each 5% increase(HR=0.59 (0.69-0.9), p=0.01. Moreover, 3D LVEF had a higher AUC compared to 2D LVEF to predict arrhythmic events. (0.82 vs. 0.74, p<0.001).

Conclusion: 3D LVEF is a strong independent predictor of arrhythmic events among patients with ischemic and non-ischemic cardiomyopathy and provides superior prognostic stratification than 2D LVEF. This findings support the use of 3D LVEF as the echocardiographic method to select patient for primary prevention of sudden cardiac death with ICD implantation.

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Unidimensional longitudinal strain: a new software independent approach for the assessment of longitudinal myocardial deformation by echocardiography

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Background: Impaired LV-LF is a known predictor of cardiac events in heart failure patients but two-dimensional strain imaging, the reference method to measure myocardial deformation, is not always available. Therefore, reliable and reproducible alternatives are needed.

Purpose: The aim of the present study was to evaluate Unidimensional Longitudinal Strain (ULS), a new echocardiographic parameter for the assessment of left ventricular longitudinal function (LV-LF).

Methods: Patients with dilated cardiomyopathy (DCM) who had their first presentation in our cardiology department, as well as an age and gender matched control group were prospectively included into this study. ULS was compared to global longitudinal strain (GLS), the current gold standard for LV-LF assessment by echocardiography. Uni- and multivariate Cox regression analysis were conducted to evaluate the prognostic value of ULS.

Results: The study population included 202 patients and 202 control subjects. LV-LF was higher in the control group compared to patients: GLS -19.5$\pm$1.7 vs. -12.6$\pm$4.8% and ULS -16,3$\pm$1,5 vs. -10.2 $\pm$3.9% (p<0.001 each). Linear regression analysis showed excellent correlation for ULS and GLS (r = 0.94, figure 1 A) while Bland Altman plots revealed lower values for ULS (bias -2.76%, limits of agreement $\pm$3.31%, figure 1 B). During a mean follow-up time of 39 months, the combined endpoint of cardiovascular death or hospitalization due to acute cardiac decompensation was reached by 28 patients (13.9 %). GLS and ULS had comparable prognostic impact on patients outcome (hazard ratio (HR) 1.21, 95% confidence interval (CI) 1.10-1.34, p<0.001 and HR 1.24, CI 1.12-1.39, p<0.001, respectively).

Conclusion: ULS is as new echocardiographic method for the assessment of LV-LF with similar diagnostic and prognostic value compared to GLS.
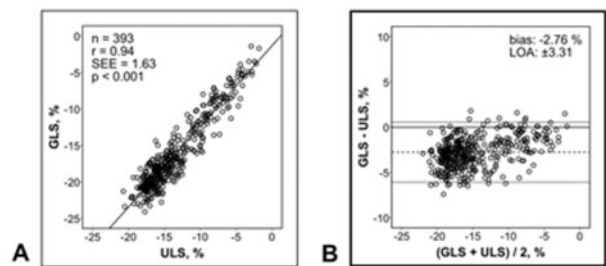
Abstract P237 Figure.

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Right ventricular function in open vs. closed pericardium following cardiac surgery: is pericardium the key?

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Introduction: The impairment of right ventricular function following cardiac surgery has been under notice but thus far lacks unambiguous explanation.

Purpose: The aim of this study is to examine the right ventricular systolic and diastolic function after cardiac surgery with pericardial closure

Methods: 24 patients (Mean age 65$\pm$8, 83% male), undergoing coronary artery bypass surgery (CABG) or aortic valve repair (AVR) (12 pericardium open (PO), 12 pericardium closed (PC)) were analysed. All patients Underwent pre- and post-surgery transthoracic echocardiography (TTE). Medical history and TTE-parameters (tricuspid annular plane systolic excursion (TAPSE), Tricuspid annular systolic velocity (TASV), Right ventricular fractional area change (RV-FAC), global longitudinal strain (GLS), global longitudinal strain rate (GLSR), tricuspid peak velocity of filling (TV E), tricuspid peak velocity of filling deceleration time (TV E dec),tricuspid peak velocity of late filling (A), early diastolic tricuspid annular velocity drived from tissue doppler (TV E), pulmonary venous systolic (S) and diastolic (D) flow, right ventricular free wall M-mode transversal movement (RFW) were assessed.

Results: In both groups we could detect a reduction of all the measured systolic parameters post-surgery (TAPSE, TASV, RV-FAC, RV-GLS). Pre-surgery TAPSE didnt differ between PC and PO groups but TAPSE was significantly higher in PC group post-surgery (12.9 cm vs. 9.08 cm, p=0.001). Nevertheless TASV did not show a significant divergence between pre- and post-surgery values in PC group. RFW demonstrated no distinct difference between groups neither pre- nor postoperatively. TV E/E' in the PO group was significantly higher post-surgery compared to PC group (5.7 vs. 10.04; p= 0.001). Between groups TV E dec did differ significantly and was lower in the PC group (open vs. closed: 233.7 vs. 127.12 p=0.003). Pulmonary venous flow did not differ significantly between groups post-surgery.

Conclusion: These results show significant higher longitudinal displacement (TAPSE) and trends towards higher deformation velocities (TASV) indication preservation and protection for the right ventricular systolic function through pericardial closure. The reduction of TV E dec on the other hand, although still above the cut off level of 120 ms., seems to indicate that pericardial closure might lead to a restrictive right ventricular diastolic pattern. Long-term follow-up data are required to determine whether the pericardial closure will preserve or worsen the right ventricular function.
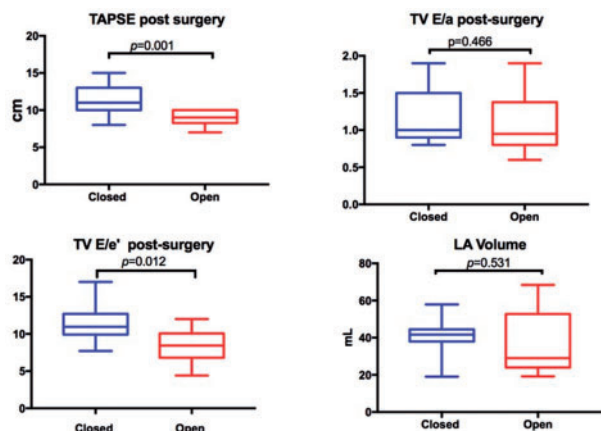
Abstract P238 Figure.

P239

Right ventricle systolic and diastolic function in gestational hypertension

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Introduction: Studies have been made to evaluate right ventricle function during pregnancy, but it is unknown if and how it changes during gestational hypertension.
Purpose: The purpose of this study was to determine right ventricle systolic and diastolic function changes in gestational hypertension (GH), and reversibility of the changes after delivery.
Methods: Study included 60 pregnant women. 35 with GH (defined as blood pressure $\geq$140/90 mmHg that appeared after 20th week of gestation and disappeared within six weeks postpartum) and 25 normotensives as control. Echocardiography was performed to evaluate systolic function (TAPSE, FAC, DTI-derived S′, IVCT, ET, GLS by 2D strain of the free wall,), RV index of myocardial performance (RIMP), and diastolic function (E/A, EDT, E/e′, RAVsI, IVRT) of the right ventricle. Echo was performed in the third trimester and 6 weeks after delivery.
Results: 1. Participants with GH during pregnancy had normal values of systolic function, and normal values of diastolic function except E/e', whose mean value was 6.354+-2.100.
2. Women with GH had worse systolic function than controls. GH women had lower s' (0.113±0.023 vs 0.146±0.026 p< 0.0005), higher RIMP (0.570±0.151 vs 0.435± 0.122 p<0.047), while other parameters remained without significant difference.
3.Parameters of diastolic function did differ: E/a was significantly lower in group with hypertension(1,1±0,26 vs 1,4±0,21 p <0,0005), EDT was longer (182,72±24 vs 160,1±18,6 p<0.0005) and prolonged IVRT in hypertensive patients(73,38±12,12 vs 59.73±12.402, p< 0.029) was found. Other parameters did not differ significantly from control group.
4. All changed echocardiographic parameters became improved six weeks after delivery, the difference persisted in women who had GH compared to control group only in s' (0.119+- 0.014 vs 1,45+-0,021 p< 0.003) which remained significantly lower.
Conclusion: Both systolic and diastolic function of right ventricle changed in gestational hypertension during pregnancy. After delivery, changes were reversible, but only s' remained lower as a suggestion of not fully recovered systolic function.

P240

Three-dimensional right ventricular ejection fraction predicts outcomes in ST elevation myocardial infarction with normal or mildly impaired left ventricular systolic function

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Background: Left ventricular ejection fraction (LVEF) is one of the most powerful predictors for cardiac mortality and morbidity after ST elevation myocardial infarction (STEMI) with lower values indicating worse prognosis. However, prediction of the long term prognosis in patients with normal or mildly impaired LVEF (>45%) is more difficult. Three dimensional echocardiography (3DE) allows for accurate and reproducible assessment of right ventricular ejection fraction (3D RVEF) which may be an important parameter for stratifying patients with LVEF>45% following STEMI.
Aims: To evaluate the relation between 3D RVEF at discharge and its temporal changes during the first year and major non-fatal cardiovascular adverse events (MACE) in STEMI patients treated by primary percutaneous intervention (PCI), irrespective of infarct location.
Methods: We have prospectively analyzed a cohort of 80 consecutive patients (mean age 61.17 years, 68.8% males) presenting with a first STEMI treated successfully by PCI. Patients with history of cardiac or pulmonary diseases were excluded. All patients underwent comprehensive 3DE including 3D RVEF and LVEF assessment at discharge, at 6 months and one year after the index event. The mean follow up duration was 8.2 ± 0.69 months.The combined endpoint of MACE was defined as reinfarction, need for repeat revascularization, hospitalization for heart failure or stroke.
Results: During the follow up period 30 patients (37.5 %) reached the combined endpoint. Thirty five (43.7%) of the patients had a discharge LVEF >45%. In this group the combined endpoint was reached by 14 patients (40 %). In patients with LVEF >45 % after PCI, the discharge 3D RVEF added incremental prognostic information for combined endpoint OR = 0.49, 95% CI 0.25 - 0.94, p = 0.033. Analyzing the predictive value of RVEF temporal changes from discharge to 12 months, using repeated measures t test, we found that in patients with normal or mildly reduced LVEF at discharge, the lack of recovery of 3DRVEF during follow up was associated with an increased risk of developing MACE. (p=0.01).
Conclusions: Right ventricular EF quantified by 3DE at discharge as well as its lack of improvement in the first year following STEMI improve prediction of nonfatal adverse events in patients with normal or mildly impaired LV systolic function, independent of infarct location.

P241

Functional shift in right ventricular mechanics following mitral valve repair/replacement: initial results of the PREPARE-MVR study

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Right ventricular (RV) dysfunction is a common and much-feared complication after mitral valve repair/replacement (MVR). The PREPARE-MVR study (PRediction of Early PostoperAtive Right vEntricular failure in Mitral Valve Replacement/Repair patients) aims to determine those parameters, which could be useful for perioperative risk stratification and prediction of RV failure.
In our current analysis, we sought to investigate the immediate postoperative functional alterations of the RV in patients underwent MVR.
Our preliminary data included 18 MVR patients (mean age 62±11 years, 9/9 f/m). Transthoracic echocardiography was performed before the operation and at intensive care unit discharge. Beyond conventional parameters, such as tricuspid annular plane systolic excursion (TAPSE), transthoracic 3D datasets from 4 or 6 cardiac cycles were acquired. 3D beutel model of the RV was created and end-diastolic volume (RVEDV) along with RV ejection fraction (RVEF) values were calculated using commercially available software. We have decomposed the motion of the RV using our custom software (ReVISION) to determine longitudinal (LEF) and radial ejection fraction (REF). The ratio of LEF or REF to RVEF quantifies the relative contribution of longitudinal or radial (bellows effect) wall motions to global function.
According to TAPSE, RV function was markedly reduced after the surgery (preoperative vs. postoperative: 26±5 vs. 12±4 mm; p<0.0001). However, by 3D echocardiography RVEDV and RVEF showed unaffected RV morphology and function (RVEDV: 104±36 vs. 98±28 mL; RVEF: 55±10 vs. 51±7%, both p=NS). By decomposing the motion of the RV 3D model, a functional shift can be revealed after the surgery. Before the operation, the longitudinal motion was dominant, however, it has significantly decreased after MVR (LEF/RVEF: 0.52±0.08 vs. 0.31±0.08, p<0.0001). Beyond this, a compensatory increase in the radial wall motion could be observed (REF/RVEF: 0.41±0.10 vs. 0.62±0.11, p<0.0001).
Radial motion of the RV free wall (bellows effect) can gain particular importance in certain conditions. Several factors such as opening of the pericardial sac and cardiopulmonary bypass hamper the normal RV mechanics, however, a compensatory increase in radial motion appears in MVR patients. The PREPARE-MVR study will investigate the clinical determinants of this phenomenon and its effect on patient outcomes.
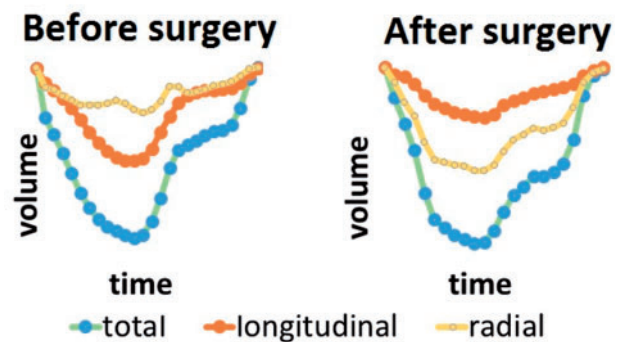
Abstract P241 Figure. Before vs. After Surgery

P242

Morphological and functional adaptation of the right ventricle according to the type of sport practiced

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Background and objectives: The possible morphological and functional adaptation that the right ventricle (RV) suffers according to the type of sport practiced has received less attention than that one of the left ventricle. Our goal is to determine them in a group of professional athletes and compare them to healthy subjects who do not practice sports at a professional level.
Method: We performed a transthoracic echocardiogram (TTE) on runners (R), canarian wrestlers (W) and healthy controls (H). We compared the morphological and functional findings related to RV.
Results: 68 subjects (25 R, 27 W and 16 H), mean age 29 ± 4 years, mean training R and W 13.2 ± 7.3 years. Body mass index (BMI) and echocardiographic variables, according to the type of sport practiced, are shown in Table 1. In both R and W, a significant TAPSE increase was observed in relation to H. In the medium and basal diameters of the RV, once indexed by body surface (BS), a statistically significant

increase in the R is observed from apical, four chambers at the end of the diastole and in the longitudinal diameter, both in relation to the W, and to the S.

Conclusions: our sample shows an increase in systolic function and RV diameters in R compared to W and in relation to H. All this seems to indicate that the adaptation of the RV varies according to the characteristics of the type of sport practiced, in relation to the controlsTable1

Variable	R	W	H
BMI (Kg/m2)	22.7±1.8●≠	33.6±3.8≠	26.7±2.8
TAPSE (mm)	27.68±6.67≠	28.23±4.30¥	24.67±3.05
RV long axis (mm)	21.61±4.92	24.26±4.62	21.28±3.19
RV long axis/BS (mm/m2)	11.35±2.62	10.40±1.54	10.41±1.54
RV basal (mm)	42.33±3.96≠	44.32±3.96¥	39.07±3.05
RV basal/BS (mm)	22.37±2.01●≠	19.18±1.72	19.28±1.82
RV medium (mm)	35.16±4.65	36.95±4.37	33±3.94
RV medium/BS (mm)	18.56±2.28●≠	16.04±2.16	16.24±1.74
RV long (mm)	73.20±5.73	75.04±5.32¥	69.21±3.94
RV long/BS (mm/m2)	38.74±3.55●≠	32.56±2.88	34.24±3.44

Table 1: Characteristics of the right ventricle: BMI: body mass index.
RV: right ventricle; Long RV: RV diameter from tip to base. * p < 0.05 between R and W; # p < 0.05 between R and H; ¥ p < 0.05 between W and H.

P243

Left atrial (LA) strain reflects LA compliance and pressures only in patients without significant LA remodelling

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Background: Left atrial (LA) strain (LA-GS), that has been postulated to represent a non-invasive surrogate of LA stiffness, is an emerging prognostic marker in heart failure (HF).

Aims: We hypothesized that the extent of LA remodelling might impact on the proposed association between LA-GS and LA stiffness.

Methods: 175 HF patients with preserved (n=101) or reduced (n=74) ejection fraction (EF) were enrolled prospectively. All patients underwent right heart catheterisation and simultaneous transthoracic echocardiographic examination. LA-GS was measured by 2D speckle tracking. LA stiffness was calculated as the ratio of maximal systolic LA pressure (LAP) to LA volume indexed to body surface area (LAVi).

Results: The patient cohort was dichotomized based on the degree of LA remodelling. LA-GS was significantly lower in patients with more pronounced LA remodelling (LAVi > 41 ml/m2; Group I, n=106) as compared to those with smaller LA volumes (LAVi ≤ 41 ml/m2; Group II, n=69) (10±6 vs. 17±10 %; p≤0.001).
In Group I, LA-GS was significantly associated with LA stiffness (r=-0.35; p=0.04) and LAP, as assessed by pulmonary artery wedge pressure (PAWP) (r=-0.49; p≤0.001). However in Group II LA-GS did not correlate with LA stiffness, and its correlation with PAWP was much weaker (r=-0.25; p=0,012).

Conclusion: LA-GS reflects the degree of LA stiffness and LA pressures in HF patients without significant LA remodelling.

P244

Diastolic function of the conccentric hypertrophied left ventricle in the aortic stenosis: evaluation with color M mode based intraventricular pressure difference

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Background: Although Aortic stenosis (AS) causes left ventricular (LV) conccentric hypertrophy with diastolic dysfunction, its mechanism is not clear. Color M-mode based intraventricular pressure difference (IVPD) was developed as a sensitive noninvasive evaluation method of ventricular sucking force during early diastole.

Purpose: The purpose of this study was to investigate the mechanisms of diastolic dysfunction in AS, hypertensive heart (HHD) and normal control (Cn) using IVPD.

Methods: The subjects were 28 moderate to severe AS cases, 14 hypertensive heart (HHD) cases and 14 normal controls (Cn). IVPD was calculated with 1D Euler equation using Color-M mode Doppler data during early diastole scanned on apical long-axis view. Total IVPD was divided into basal IVPD (B-IVPD), and mid to apical IVPG (MA-IVPD). The 2D strain was also measured in apical rotation (ARot) and its recoil velocity (AdeRot-r), in addition to global longitudinal (GLS) and circumferential (GCS) strains.

Results: Patients age showed a significant difference among AS, HHD and Cn groups (78.9±7.8 years old, 66.9±11.5 years old, 53.0±13.7 years old, [p <0.01]). Regarding the LV motion, ejection fraction (EF) and GCS had no significant difference among these three groups (EF: 65.9 ±14.5%, 62.9 ± 6.2%, 60.2 ± 3.6%, [p = ns], GCS: -20.3±4.6%, -20.5±2.4%, -20.6±4.0%, [p = ns], although GLS showed significantly difference between AS and Cn (-16.3±2.8%, -17.5±2.1%, -19.4±1.3 %, [p <0.01 AS vs Cn]). ARot was significantly higher in AS than in HHD (15.3±7.3°, 9.9±4.3°, 10.9±6.5°, [p <0.01 AS vs HHD]). Endo-systolic volume (ESV) was significantly lower in AS than the other two groups (24.8±11.0ml, 32.7±10.4ml, 36.6±5.3ml, [p <0.05 AS vs HHD, p <0.01 AS vs Cn]). T-IVPD, MA-IVPD were significantly higher in AS than in HHD and Cn (T-IVPD: 3.02 ±1.18 mmHg, 2.11 ± 0.86 mmHg, 2.08 ± 0.55 mmHg [p <0.05 AS vs HHD and Cn], MA- IVPD: 1.52±0.86 mmHg, 1.02 ± 0.50 mmHg, 0.82 ± 0.42 mm Hg [p <0.05 AS vs HHD, p <0.01 AS vs Cn]). E/e' increased significantly in AS than the other two groups (16.9±7.4, 9.6±3.5, 8.3±2.1 [p <0.001 AS vs HHD and Cn]). Among the parameters of LV geometry and deformations, ESV had the strongest correlation with MA-IVPD (r = 0.55, p = 0.010). In addition, GCS (r = 0.29, p = 0.029) and AdeRot (r = 0.35, p = 0.010) showed weaker correlation with MA-IVPD.

Conclusions: In AS cases, LV apical sucking force measured by MA-IVPD was reduced despite of the stiffened wall with elevated E/e'. The larger energy store represented by smaller ESV in AS cases, which is promptly released at early diastole to create LV suction, may cause larger MA-IVPD. This is the new insight into the mechanisms of diastolic dysfunction in AS.

P245

Associations between myocardial inflow pattern and the effectiveness of pulmonary vein isolation in patients with paroxysmal atrial fibrillation

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Background: Despite the technical improvement, the success rate of pulmonary vein isolation (PVI) in atrial fibrillation (AF) remains at suboptimal level. Due to that, the necessity to improve the patient selection process is widely recognized. Left ventricular (LV) diastolic dysfunction remains one of the most common causes of left atrial remodeling. However, few data is available about the interconnection between LV diastolic dysfunction and the effectiveness of PVI for the treatment of AF.

Purpose: The aim of the study was to assess the connection between mitral inflow pattern (MIP) and the effectiveness of radiofrequency catheter PVI in patients with paroxysmal AF.

Methods: The study involved 54 patients with paroxysmal AF selected for PVI. In all patients before the treatment start echocardiography was performed according to the standard protocol, including MIP assessment while on sinus rhythm. Based on this data the patients formed 4 groups: Group 1 with normal MIP (n=22); Group 2 with impaired LV relaxation (n=10); Group 3 with pseudonormal LV filling (n=15); and Group 4 with restrictive LV filling (n=7). There was no significant difference in sex, age and LV ejection fraction between the groups (p>0.05). Patient status was reassessed in 12 months after treatment start. The procedure was considered effective in case of absence of symptomatic and/or instrumentally supported (with ECG or 24-hour Holter ECG monitoring) AF paroxysms longer than 30 sec. The necessity to administer antiarrhythmic drugs after 3 or more months post PVI was considered as a criterion of ineffectiveness.

Results: Up to these criteria effective rhythm control was achieved in 20 patients (90,9+4,36%) from Group 1; 8 patients (80,0+6,67%) from Group 2; 3 patients (20+5,34%) in Group 3 and 1 patient (14,3+8,16%) in Group 4. Success rate was significantly higher (p<0,05) in Group 1 in comparison to all other Groups and in Group 2 in comparison to Groups 3 and 4. The difference between Groups 3 and 4 was insignificant.

Conclusions: In AF patients selected for PVI normal MIP is associated with higher probability of the successful postprocedural rhythm control in comparison to any type of abnormal MIP. Similarly, impaired LV relaxation is associated with the higher rate of PVI effectiveness than pseudonormal and restrictive LV filling. The presence of pseudonormal and restrictive LV filling, reflecting more advanced stages of LV diastolic dysfunction and higher LV filling pressures, is associated with reduced probability of effective PVI in patients with paroxysmal AF that might be considered during patient selection. Further investigation on a larger group is needed to verify this findings and assess their significance.

ISCHEMIC HEART DISEASE

P246

Correlation of brachial-ankle pulse wave velocity with Gensini score in patients undergoing percutaneous coronary intervention

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Background: The present study used brachial-ankle pulse wave velocity (baPWV) to evaluate the connection between arterial stiffness in patients with undergoning coronary angiogram (CAG) for suspected coronary artery disease (CAD) and the Gensini score as a index for extent of CAD.

Methods and Results: From January 2015 to April 2017, 3111 consecutive patients (mean age: 66 ± 11 years, M:F = 1380: 731) underwent baPWV and CAG for suspected CAD at our department.
When the extent of CAD was classified into nonsignificant or significant CAD (ie, 1-, 2- and 3-vessel disease), there was a significant difference in baPWV between the significant and nonsignificant CAD groups, but there was no difference in baPWV among the 3 significant CAD groups (Fig). Linear regression analyses showed that baPWV was significantly associated with the Gensini score (Gensini score = -1.695+0.1*BaPWV, R2 = 0.521, p<0.001).

Conclusions: Arterial stiffness as determined by baPWV is associated independently with significant CAD in patients with angina. Arterial stiffness is related to CAD

severity as assessed by the Genisi score. Therefore, increased arterial stiffness assessed by baPWV is associated with the severity of CAD in patients undergoing PCI.
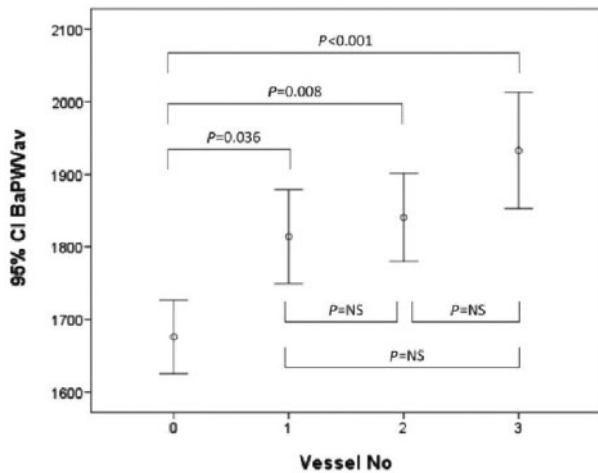
Abstract P246 Figure.

P247

"Crossed aorta" at transthoracic echo: an easy way to suspect circumflex origin from the right coronary sinus

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Introduction: Some previous case reports have nicely shown a finding at transthoracic echo examinations (TTE) that could lead to the suspicion of left circumflex coronary artery arising from the right coronary sinus.
Purpose: to investigate the prevalence of this echocardiographic sign in routine TTE performed in a single echo lab and its correlation with more advanced techniques to evaluate coronary anatomy.
Methods: All TTE performed by a single expert operator were prospectively assessed during a four year period, using standard equipments. The "crossed aorta" finding was described as a tubular, double-line shape structure in the modified five-chamber view, arising perpendicular to the long-axis of the aortic root (see figure). Coronary artery anatomy was finally assessed by means of MDCT-scan, MRI or invasive coronary angiography.
Results: During a four-year period with more than 4500 TTE performed, crossed aorta was found in 4 cases. Age was 57, 68, 78 and 85 years, all of them were male and two have bicuspid aortic valves with severe stenosis with moderately dilated aortic root. The latter complained about anginal chest pain. The crossed aorta was 3 to 4mm in thickness and in two cases showed diastolic flow after modifying colour Doppler settings. An anomalous left circumflex artery arising from the right coronary sinus was diagnosed in three of the cases and in the other case it arose from the right coronary artery itself.
Conclusion: Crossed aorta is an uncommon finding at TTE but extremely easy to see with common techhnology. This finding should lead the suspicion of anomalous origin of the left circumflex from the coronary sinus.
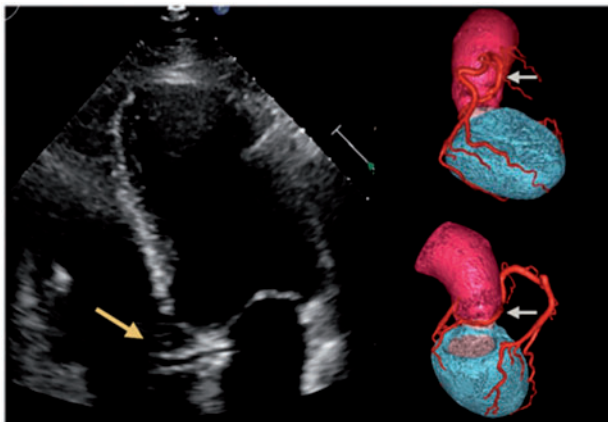
Abstract P247 Figure. Crossed aorta sign: TTE and CT findings

P248

Methotrexate carried in lipid core nanoparticles improved left ventricular function following acute myocardium infarction induced in rats

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Background: Acute myocardial infarction (AMI) is characterized by myocardial inflammation, fibrosis and cardiac remodeling that may lead to ventricular dysfunction and heart failure. Lipid nanoparticle (LDE) has previously shown to increase by several-fold the methotrexate (MTX) uptake by the cells.
Purpose: The aim of this study was to investigate the effects of MTX associated to LDE on rats with induced AMI.
Methods: Left coronary arteries of Wistar rats were ligated to induce AMI, and the rats were allocated to 3 groups: MI-controls, treated only with LDE; MI-MTX, treated with commercial MTX; MI-LDE-MTX, treated with LDE-MTX (MTX dose: 1 mg/kg, I.P., once/week). Echocardiography was performed at 24 hours and at 6 weeks after AMI induction. The animals were then euthanized for morphological and protein expression.
Results: Compared to MI-controls and MI-MTX, echocardiography showed that LDE-MTX treatment pronouncedly improved left ventricular (LV) systolic function, cardiac dilatation, wall thickness and LV mass. LDE-MTX significantly reduced AMI size, myocyte necrosis, inflammatory process, cardiac hypertrophy and myocardial fibrosis in the non-infarcted area of the LV. The protein expression of CD68 (macrophages) and pro-apoptotic factors caspase 3 and Bax was lower in MI-LDE-MTX experimental group, whereas the expression of anti-apoptotic factor Bcl2, anti-oxidant enzymes superoxide dismutase 1 and catalase and vascular endothelial growth factor (VEGF) was increased compared to both MI-controls and MI-MTX groups. VEGF correlated with AMI size (r2=-0.92; p<0.001) and LV systolic function (r2=0.48; p=0.003). Toxicity was not observed.
Conclusions: The marked improvements achieved by LDE-MTX without significant toxicity, makes this novel preparations a candidate for future clinical trials.

P249

Acute heart failure in STEMI patients after pPCI: insight into left ventricular mechanics by speckle tracking echocardiography

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Acute heart failure (HF) in pts with ST segment elevation myocardial infarction (STEMI) treated by primary percutaneous coronary intervention (pPCI) is important for prognosis. Speckle-tracking echocardiography offers comprehensive exploration of the left ventricular (LV) systolic function, beyond ejection fraction (EF), measuring myocardial deformation by strain and strain rate.
Aim: of this echocardiographic study was to analyze relation between LV myocardial mechanics and postprocedural HF (Killip class≥2) in STEMI pts treated with pPCI.
Methods: in 120 consecutive STEMI pts treated with pPCI early echocardiography was done including conventional echo parameters, longitudinal (L), radial (R) and circumferential (C) peak global strain (S;%) and peak systolic strain rate (SR;1/s) on endocardial (endo), medial (mid) and epicardial (epi) level. Post-systolic shortenings (PSS;%) were calculated for longitudinal and circumferential strains, for all three layers. Echo studies were done on VIVID 9-GE echo machine and EchoPack version 13 used for speckle tracking analysis.
Results: 16.7% of all pts had post pPCI HF. HF pts had significantly lower peak global LS on all three myocardial levels (LSendo: -11.51±4.15 vs -16.07±4.48; LSmid -9.82±3.47 vs -13.89±3.89; LSepi -8.46±2.95 vs -12.08±3.47, p<0.001, for all) as well systolic LSr (-0.59±0.22 vs -0.82±0.25, p<0.001). CS was also impaired in pts with HF on all three myocardial levels (CSendo: -16.57±5.92 vs -22.45±6.24, p<0.001; CSmid -11.78±4.29 vs 15.67±4.51, p=0.001; CSepi: -8.68±3.23 vs -11.33±3.58, p=0.003). Pts with HF had impaired RS (9.61±4.13 vs .13.03±5.93, p=0.016) and as expected lower EF (39.60±11.07 vs 50.89±10.00, <0.001) and higher WMSI (1.78±0.37 vs 1.38±0.29, p<0.001). PSS for LS was significantly higher in HF pts on all three levels (endo: 31.42±21.87 vs 12.51±12.09, mid: 32.50±21.61 vs 13.21±12.12 and epi: 35.84±23.65 vs. 14.14±1212 p<0.001, for all). Comparison of areas under a receiver operating characteristic (ROC) curves for investigated parameters reveals that PSS for LS on epicardial level had the largest area under the curve (0.812, CI 0.712-0.912, p<0.002), with 15.9% as optimal cut-off to identify HF patient (sensitivity 75% and specificity 70%).
Conclusion: STEMI pts with HF after pPCI have severely impaired myocardial longitudinal, circumferential and radial mechanics, as well as EF. However, the best discriminator to identify HF from non-HF pts was a degree of longitudinal post-systolic shortening, especially on epicardial level. Extensive asynchronous myocardial contraction on epicardial level after myocardial reperfusion, is closely linked to clinically overt HF.

P250

Predictors of in-hospital mortality in patients with successful primary coronary intervention for acute ST-elevation myocardial infarction

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Background: Predictors of in-hospital mortality in patients after successful primary coronary angioplasty for ST-elevation myocardial infarction (STEMI) determine the prognostic outcome of STEMI.

Objective: Our aim was to define different variables related to in-hospital mortality in patients with STEMI referred for primary percutaneous intervention (PCI).

Methods: The study sample included 298 patients admitted with STEMI & underwent primary PCI over two years. Demographic, clinical, laboratory and angiographic data were collected prospectively into a computerized registry. Patients were divided into two groups; 286 patients for survived group and 12 patients for in-hospital dead group. Both groups were compared for different variables. Both radial & femoral vascular accesses were used. Extend of coronary artery disease (CAD) was defined as significant lesions in single-vessel, two-vessel or multi-vessel disease. Different techniques of primary PCI were randomly used including direct stenting only, pre-dilatation then stenting, pre-dilatation then stenting and post-dilatation, direct stenting then post-dilatation, or balloon dilatation only. Echocardiography was done to all patient during hospital stay to estimate the left ventricular ejection fraction (LVEF). More than mild impairment of the left ventricular systolic function was defined as LVEF $\leq$ 40%.

Results: In-hospital mortality was associated more with older age (p=0.003), anterior STEMI (p=0.032), longer door to device time (p=0.0022), more than Killip class II on presentation (p<0.001), extend of CAD (p=0.032), in-hospital recurrent myocardial ischemia (p<0.001), and more than mild impairment of in-hospital LVEF (p<0.001). There were no significant correlations between in-hospital mortality and gender, history of DM, hypertension, dyslipidemia or smoking, Family history of premature CAD, technique of PCI, percutaneous access of PCI or use of aspiration device.

Conclusion: In-hospital mortality after primary PCI for STEMI could be predicted by older age, anterior STEMI, more than Killip class II on presentation, longer door to device time, extend of CAD, in-hospital recurrent myocardial ischemia and more than mild impairment of in-hospital LVEF.Comparison between the two groups regard

	In-hospital survived group	In-hospital dead group	P-value
LVEF >50 %	132 (46.2%)	4 (33.3%)	0.0001
LVEF = 41-50 %	99 (34.6%)	0 (0.0%)	
LVEF = 30-40 %	37 (12.9%)	4 (33.3%)	
LVEF <30	18 (6.3%)	4 (33.3%	
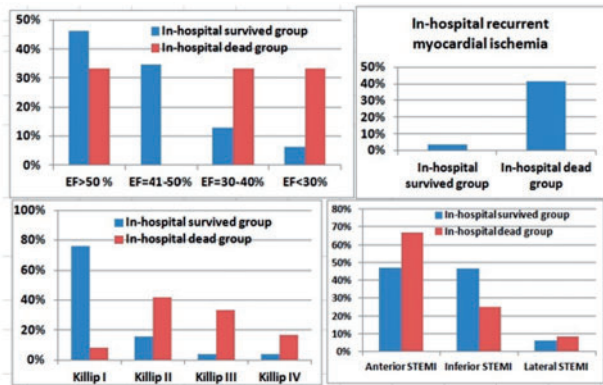
Abstract P250 Figure. Graphs

P251

Right ventricular involvement in acute myocardial infarction of different localization - detection by three-dimensional echocardiography

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Introduction: Right ventricular (RV) ischemia in the case of acute myocardial infarction (MI) causes reduction of the RV ejection fraction (EF). RV involvement in patients with MI determines higher morbidity and mortality. Currently three-dimensional echocardiography (3D echo) is the only non-invasive alternative to magnetic resonance imaging of the heart in estimation of volume and EF of the RV.

Our aim was to evaluate RV volumes and EF in patients with acute myocardial infarction of different localization using 3D echo.

Methods: A group of 73 patients with first-time acute MI with ST segment elevation was selected. All patients underwent coronary angiography, according to which the patients were divided into 3 subgroups depending on the acute lesion of a certain coronary artery: a subgroup with right coronary artery disease (RCA) - 34 patients, subgroup with lesion of left anterior descending artery (LAD) - 30 patients and a subgroup with lesion of the left circumflex artery (LCX) - 9 patients. 3D echo of the RV and volume measurements was performed between day 2 and day 4 after MI. A control group of 32 people was formed of healthy individuals. In statistical analysis for the Mann-Whitney U test the effect size r was also determined (0.1-small, 0.3- medium, 0.5-large).

Results: RV 3D EF below the recommended abnormality threshold (<45%) was found in 13 cases in the RCA group, in 3 cases in the LAD group and in 1 case the LCX group. Statistically significant difference (p<0.05) in end systolic volume (ESV) (r=0.49), stroke volume (SV) (r =0.32) and indexed SV (r=0.42) was revealed only between the control group and the RCA group. Indexed ESV was statistically significantly higher in the RCA group compared to both the control group (p=0.001; r=0.42) and the LAD group (p=0.013; r=0.34). There was no statistically significant difference in end diastolic volume (EDV) and indexed EDV between the groups, also the effect size was small. RV 3D EF was statistically significantly different between the controls and the RCA group (58% [11] vs 45.4% [13], p<0.001, r=0.66), between the controls and the LCX group (58% [11] vs 46.4% [10], p=0.004, r=0.46) and between the RCA and the LAD groups (45.4% [13] vs 55.1% [9], p=0.009, r=0.35). RV 3D EF less than 49% best predicted RV involvement in MI (AUC=0.88, 95% CI=0.79-0.96, p<0.001, sens 73% (95% CI=50-89), spec 78% (95% CI=67-87), PPV 50% (95% CI=38-62), NPV 91% (95% CI =83-95). RV indexed ESV was a good predictor as well with the cut-off value more than 28.8 ml/m^2 (AUC = 0.81 (95% CI=0.7-0.93), p<0.001, sens 77% (95 % CI=55-92), spec 77% (95% CI=66-86), PPV 50% (95% CI=38-62), NPV 92% (95% CI=84-96).

Conclusion: RV 3D EF and RV indexed ESV may be used for detection of RV involvement and evaluation of RV systolic dysfunction in early post-infarction period. Importantly, depressed RV 3D EF was seen in LCX infarction as well as in RCA MI, although this finding should be confirmed by larger group of LCX MI patients.

P252

Beta-blockers in ST elevation myocardial infarction with preserved left ventricular ejection fraction

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Introduction: The long term benefit of Beta-Blockers (BB) in patients (pts) with ST Elevation Myocardial Infarction (STEMI) was validated in studies done before the age of percutaneous reperfusion and the advent of new anti-platelet drugs. The benefit of such drugs in patients without left ventricular (LV) dysfunction is unknown.

Purpose: Understand the long term impact of BB therapy after a STEMI in pts without heart failure.

Methods: 493 pts consecutively admitted with STEMI between October 2009 and September 2015 with $\leq$ 75 years of age. Pts with background of heart failure, medicated with BB and pts with Killip $\geq$ 2 or death during admission were excluded. The patients were divided into 2 groups: A) pts medicated with BB upon release (n=217, 82.9% men) vs B) pts not medicated with BB upon release (n=121, 76.9% men). The groups were compared according to the composite primary endpoint (CPE) (re-infarction, stroke, cardiovascular death) and secondary endpoints at 1 year of follow-up (FU).

Results: No differences between groups regarding age (A=55.8±10.7 vs B=58.2±10.7), gender, history of angina (A=5.5% vs B=5.8%), myocardial infarction (A=5.5% vs B= 9.1%), hypertension (A=43.3% vs B=51.2%), diabetes (A=19.4% vs B=15.7%) or dyslipidemia (A=42.4% vs B=38.0%). No significant differences concerning previous medication. Pts from both groups presented similarly with chest pain (A=92.6% vs B =93.4%). Pts from group A had higher systolic (A=144.5±29.5 mmHg vs B=136.9±28.7 mmHg, p=0.023) and diastolic blood pressure (A=86.7±19.8 mmHg vs B=79.4±16.7 mmHg, p=0.001) and heart rate upon admission (A=78.9±16.7 bpm vs B=71.3±16.9 bpm, p<0.001). No differences regarding atrial fibrillation between groups (A=0.9% VS B=2.5%). Higher percentage of pts with STEMI complicated with complete heart block in group B (A=1.4% vs B=5.8%, p=0.028)

83.9% of pts from group A were treated with BB during hospital stay (A=83.9% vs B=10.7%, p<0.001). No other differences in the medical treatment were found. Pts from both groups were submitted to invasive stratification (A=99.1% vs B=98.3%) and angioplasty (A=92.6% vs B=88.4%) similarly. Multi-vessel disease was identical between groups (A=37.1% vs B=36.4%).

At 1 year of FU, no differences between groups regarding all-cause mortality (A=1.4% vs B=2.5%), re-infarction (A=1.4% vs B=0.8%), new angioplasty (A=4.1% vs B=2.5%), new hospital admission for cardiac ischemic disease (A=1.8% vs B=1.7%) was found. Pts from both groups exhibited Post-infarction angina similarly (A=10.1% vs B=11.5%). No differences were found in the CPE at 1 year of FU (A=2.8% vs B=3.3%).

Conclusion: There was no clear benefit in using BB after STEMI in pts under 75 years of age with no heart failure at 1 year of FU.

HEART VALVES

P253

Rate of progression of left ventricular dilatation in patients with chronic, asymptomatic aortic regurgitation evaluated by MRI, a six month follow-up study

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Background: Chronic aortic regurgitation (AR) creates a volume overload on the left ventricle. This leads to adaptive changes, including left ventricular dilatation. If left ventricular dilatation progresses, the probability of death and cardiac morbidity increases substantially unless corrective aortic valve surgery is performed. The patients therefore require repeated follow-up. However, the rate at which the left ventricle dilates is not established, and the optimal interval between visits remains unsettled.

Purpose: We aimed to investigate the rate of progression of left ventricular dilatation in patients with moderate to severe aortic regurgitation, without indication for aortic valve replacement (AVR). The average rate of progression can be used as an aid to schedule appointments in these patients, and to identify patients who warrant more frequent follow-up due to rapid ventricular dilation.

Methods: In this prospective cohort, 36 asymptomatic patients aged 46 ± 13 years, 89% males, who fulfilled at least two echocardiographic criteria for moderate or severe chronic aortic regurgitation and no indication for aortic valve replacement (AVR), were evaluated with cardiac MRI at baseline and at follow-up after six months. The primary endpoint was left ventricular end-diastolic volume (LVEDV). Paired samples t-tests were conducted to compare results at baseline and follow-up. Predictors of the change in LVEDV were assessed by linear regression.

Results: LVEDV increased from 246 ± 57 ml at baseline to 256 ± 51 ml at six months, t(35)=2,16, p=0,037 (Figure 1). The mean increase in LVEDV was 10 ml with a 95% confidence interval from 0,6 to 19 (Figure 2). Likewise, left ventricular end-systolic volume increased from 110 ± 33 to 117 ± 34 ml, t(35)=2,58, p=0,015, a mean increase of 7 ml (95% CI 1,5-13). On the other hand, there was no significant change in left ventricular ejection fraction, which was $56\pm8\%$ at baseline and $55\pm7\%$ at follow-up (p=0,41). There was no association between age, gender, NT-pro-BNP at baseline, aortic regurgitation fraction or aortic regurgitation volume and the rate of left ventricular dilation. These results must be interpreted with caution given the limited number of patients.

Conclusion: Our results indicate that in asymptomatic patients with moderate to severe AR, the average rate of progression in LVEDV is 10 ml per 6 months. Predictors of the rate of progression remain to be determined. To further elucidate these issues, we are currently performing long-term follow-up in a larger cohort of patients.
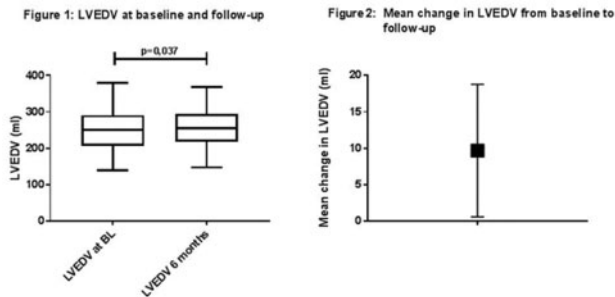
Abstract P253 Figure.

P254

Prognostic of the right ventricular strain in organic mitral regurgitation

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Purpose: Organic mitral regurgitation (MR) is a frequent disease which influences left (LV) and right (RV) ventricular functions. As previously demonstrated, around 30% of patients with severe organic MR have RV dysfunction (RV EF $\leq$ 35%). A biventricular dysfunction was associated with a substantial increase in cardio-vascular events after cardiac surgery. By its complex morphology, assessment of RV function is a challenge for echocardiographists. With respect of the good performance of RV longitudinal strain (RVLS) in predicting outcome in patients with different cardiovascular diseases we aimed to evaluate by RVLS 1) RV function, and 2) its impact on outcome in organic MR.

Methods and results: Two hundred fifty-eight patients (59 ± 15 years, 154 males) with mild to severe chronic organic MR were prospectively enrolled and underwent a complete echocardiography including RVLS assessment. Longitudinal strain impairment was defined as LV strain $\geq$ -20% and RV strain $\geq$ -21%. Patients with LV strain $\geq$ -20% have a mean LV ejection fraction of 60 ± 8 % vs 65 ± 7 % (P<0.0001) for those with LV strain is < -20%. Among these patients, 181 (70%) had moderate to severe MR. Out of moderate to severe MR patients, 101 had normal RV and LV function (NoDysf), 40 patients (22%) had an isolated LV dysfunction (LVdysf), 17 (9%) had an isolated RV dysfunction (RVdysf) and 23 (13%) had a biventricular dysfunction (BiVdysf). Biventricular dysfunction was strongly associated with both structural (tricuspid annulus diameter: $22,2\pm3,5$ vs $19,2\pm3,5$mm/m2, p=0,0003) and functional RV remodeling (RV fractional shortening: $27,6\pm9,6$ vs $38,3\pm11,4$ %, p<0,0001, TAPSE: $19,4\pm5,3$ vs $25\pm4,6$ mm p<0,0001, tricuspid annular S wave velocity:$12,6\pm2,9$ vs $15,5\pm3,1$ cm/s, p=0,0001) compared with NoDysf. They also show an increase in pulmonary pressure ($51,4\pm20,4$ vs $39,11\pm4$ mmHg, p=0,0002) and resistances (Abbas formula: $0,36\pm0,15$ vs $0,22\pm0,08$ p<0,0001). Forty-nine patients (19%)

presented a cardiovascular event during follow up (21.6 ± 14.4 months). Events comprised cardiovascular death (n=11 patients; 22%), cardiogenic shock (3; 6%), stroke (2; 4%), heart failure (25; 51%), new onset supra ventricular arrhythmia (4; 8%), ventricular arrhythmia (2; 4%) or another event (2; 4%). At 40 months follow-up, survival free of event was impaired in patients with BiVdysf compared with other groups (Nodysf: 73 ± 6 %, RVDysf: $70\pm13\%$, LVDysf: $66\pm10\%$ and BiVDysf: $41\pm19\%$, p=0.011).

Conclusions: In organic MR, RV and LV longitudinal strain assessment indentified a subgroup of patients with BiVDysf that portends a higher cardiovascular risk. The adjunction of RVLS assessment in the clinical work-up of patients with organic MR could improve the evaluation of cardiovascular risk in this population and may be helpful in the clinical-decision making process.

P255

Grading of mitral regurgitation in mitral valve prolapse using the average pixel intensity on continuous wave doppler

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Background and purpose: We recently reported the feasibility of the average pixel intensity (API) method on continuous wave Doppler for grading mitral regurgitation (MR) in a heterogeneous population of MR. Since mitral valve prolapse (MVP) is an important cause of primary MR, we more specifically investigated the feasibility of the API method and the MR flow dynamics in patients with MVP.

Methods: Transthoracic echocardiography (VIVID E9, GE) was performed by a single operator in consecutive patients with MVP (n=112). MR was assessed using the API method, color Doppler, vena contracta width (VCW) and proximal iso-velocity surface area (PISA) method to calculate the effective regurgitant orifice area (PISA-EROA) and regurgitant volume (PISA-RV).

Results: The API method was feasible in 89 % of all MVP patients (68% and 71% for VCW and PISA method, respectively; p<0.001). Inter- and intra-observer correlations for API in MVP with holo- and non-holosystolic MR were 0.989 and 0.995, respectively. For the overall MVP-MR population, API had good correlations with direct and indirect measures of MR severity. In holosystolic MVP-MR, which comprises most of the eccentric MR jets, API measures had superior correlations with indirect measures of MR severity compared to VCW and PISA-method.

API analysis of the proto-, mid- and telesystolic phases of MR in MVP showed different kinetics in non-holosystolic MVP compared to holosystolic MVP. A significant increase in pixel intensity towards telesystole was observed in non-holosystolic MVP-MR, whereas in holosystolic MVP-MR we found no significant differences in pixel intensities, suggesting a more steady state MR flow is present.

Based on ROC curves, an API cutoff value of 125 was suggested to identify severe MR in MVP. An MR duration/systolic time ratio <100% (i.e. non-holosystolic MVP-MR) identifies patients with non-severe MR in MVP (API<125), whereas the majority of holosystolic MVP had severe MR (API>125).

Conclusions: The API method is a valid, feasible and reproducible method for grading MVP-MR. As the API method takes into account the temporal MR flow changes during the entire systolic cycle, it may improve grading of MR in MVP-MR in daily clinical practice.
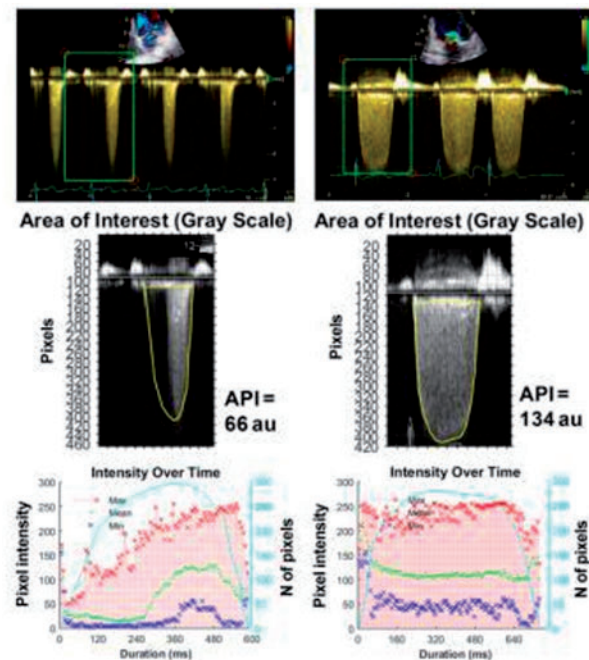
Abstract P255 Figure. API measurement in MVP-MR

P256

Evaluation of the integrative algorithm for mitral regurgitation severity by current ASE recommendations using cardiac magnetic resonance as reference method

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Purpose: The current ASE recommendations for native valvular regurgitation proposed an integrative algorithm for evaluation of mitral regurgitation (MR) severity. In the present study, we evaluated the algorithm in patients with chronic moderate or severe MR using cardiac magnetic resonance (CMR) as reference method.

Methods: Prospectively, patients with chronic MR due to valve prolapse (n=48) or valve perforation (n=1) were included. Echocardiography and CMR were performed within 4 hours. Severe MR was defined as regurgitation volume (RV) $\geq$ 60 ml or regurgitant fraction (RF) $\geq$ 50% by standard CMR method. Subsequently, 28 (57%) of the patients underwent surgery based on clinical and echocardiographic findings.

Results: The linear relationship between RV-CMR and individual echocardiographic parameters including vena contracta width, proximal isovelocity surface area (PISA) radius, effective regurgitant orifice area (EROA) and RV-Echo was moderate (R range: 0.62 for RV-Echo to 0.75 for EROA). In the first step of the algorithm containing 6 qualitative or semi-quantitative parameters (294 parameters in 49 patients) 267 (91%) were obtained. Thirteen (27%) patients had $\geq$ 4 criteria indicating severe MR. Twenty-one (43%) patients had 2-3 criteria and proceeded to step 2 evaluation by quantitative methods, which was possible in 12 patients but not in the remaining 9 patients, of whom all had severe MR according to CMR. Among 15 (31%) patients with < 2 criteria, 4 had severe MR according to CMR. Thus, 13 (27%) patients with severe MR remained indeterminate due to feasibility problems of quantitative Doppler parameters. The overall diagnostic performance of the algorithm was assessed in 40 patients using standard CMR thresholds as reference (95% CI): sensitivity 80% (61-91%), specificity 87% (62-96%), positive likelihood ratio 6.0 (1.6-22.1) and negative likelihood ratio 0.23 (0.1-0.5).

Conclusions: The proposed algorithm in ASE recommendations has acceptable diagnostic performance to discriminate between moderate and severe MR. The moderate relationship between individual parameters and RV-CMR underlines the importance of the integrative approach. However, the second step using quantitative methods is hampered by feasibility problems in a substantial group of patients with severe MR suggesting that CMR should be considered as complementary diagnostic modality in these patients.

P257

3D versus 2D doppler echocardiography-derived integrative approach to predict outcome in organic mitral regurgitation

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Background: Three dimensional echocardiography (3D-ECHO) emerged as a promising technique to quantify mitral regurgitation.

Purpose: To compare the effect on clinical outcome of quantifying organic mitral regurgitation (OMR) according to the 3D-ECHO versus the recommended 2D Doppler-echocardiography (2D-ECHO)-derived integrative approach.

Methods: The study population consisted of 226 asymptomatic patients (62$\pm$14 years, 60% males) with preserved left ventricular (LV) ejection fraction (> 60%) and chronic moderate-to-severe OMR (flail 28%, prolapse 57%, billowing 15%) defined by using the 2D-ECHO-derived integrative approach. Patients with other than sinus rhythm or poor 3D-ECHO image quality were excluded. Regurgitant volume (RV) of OMR was assessed using the PISA methods at 2D-ECHO, and using the vena contracta area normalized to jet duration and number of jets at 3D-ECHO. Severe OMR was defined as RV > 60ml.

Results: At baseline, significantly more patients had severe OMR at 2D-ECHO compared with 3D-ECHO (50% versus 36%, p <0.001). The majority of these differences in OMR classification were observed in patients with non holosystolic (n=101) or multiple (n=55) jets (both kappa < 0.2, both p<0.05). In contrast, a good agreement (kappa 0.8, p=0.2) was observed in holosystolic and single jets.

During median follow-up of 4.5 years (IQR 2.8-5.6 years), 36 (16%) patients died and 41 (18%) underwent mitral valve surgery. Patients with the 3D-ECHO-derived severe versus non severe OMR showed significantly higher all-cause mortality (38% vs 3%, log-rank p< 0.001) (Figure 1). In contrast, patients with the 2D-ECHO-derived severe versus non severe OMR did not show significantly higher mortality (19% vs 12%, log-rank p=0.18) (Figure 2). In addition, at baseline 3D-ECHO, a total of 16 (7%) showed reduced LV ejection fraction ($\leq$ 60%). Patients with the 3D-ECHO-derived reduced versus normal ejection fraction showed significantly higher combination of mortality and mitral valve surgery during follow-up (81% vs 28%, p<0.001).

Conclusions: The findings of the present study suggest that the 3D Doppler echocardiography-derived assessment of OMR is more clinically accurate than the recommended 2D approach. The accuracy of the 2D approach is limited mainly in patients with non holosystolic or multiple jets.
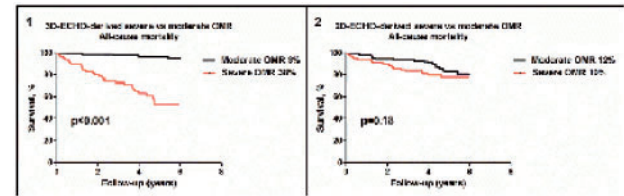
Abstract P257 Figure. and 2

P258

Usefulness of intraoperative three-dimensional transesophageal echocardiography to detect treatable residual mitral regurgitation immediately after mitral valve plasty

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Background: Residual mitral regurgitation (MR) immediately after mitral valve plasty (MVP) in the operating room is a well-known risk factor for late re-intervention. However, the usefulness of 3D intraoperative transesophageal echocardiography (IOTEE) is not fully elucidated.

Purpose: We sought to determine the feasibility of 3D IOTEE in clarifying the mechanism of residual MR and whether it has an impact on the conversion rate of mitral valve replacement (MVR).

Methods: We investigated consecutive 767 patients who were scheduled for MVP in our institute between January 2009 and December 2015. All patients underwent preoperative and intraoperative 3DTEE by experienced cardiologists trained in echocardiography. The preoperative etiologies of MR were prolapse (N=670), endocarditis (N=37), post MVP (N=14), functional (N=39) and others (N=7). Eighty-seven patients (11.3%) introduced immediate reinstitution of cardiopulmonary bypass (second pump run). The indication of second pump run was a residual MR with jet area more than 1.0cm2 or eccentric jet flow. The mechanism of residual MR were classified as following five groups and compared with conversion rates of MVR. Group1; inter-scallop malcoaptation (N=14), Group2; suture dehiscence (N=24), Group3; prolapse (N=37), Group4; Systolic anterior motion of the MV (N=9) and Group5; tethering (N=3).

Results: The total intraoperative success rate of MVP was 98% (n=753/767). Total of 87 patients received second pump run. Seventy-one percent underwent MVR in group 1, 0% in group2, 3% in group3, 22% in group4 and 33% in group5.

Conclusions: Almost all patients in group2 and 3 had a successful MVP on the second pump run with clarifying precise mechanism and origin of residual MR by 3D IOTEE. On the other hand, the rate of MVR conversion was relatively higher in group1 and 5 compared to group2 or 3. Repairing MR due to interscallop degenerative change and left ventricular dilatation may be a complicated procedure nevertheless the mechanism is clear.3D IOTEE is essential in the assessment of mitral regurgitation to determination the origin, lesion localization, and severity, which is required to select the suitable surgical techniques for mitral valve repair.MVR conversion rate on second pump run

	Re MVP (N = 73)	MVR (N = 14)	total (N = 87)
Group1, inter-scallop malcoaptation	4 (29%)	10 (71%)	14
Group2, suture dehiscence	24 (100%)	0 (0%)	24
Group3, prolapse	36 (97%)	1 (3%)	37
Group4, sytolic anterior motion of MV	7 (78%)	2 (22%)	9
Group5, tethering	2 (67%)	1 (33%)	3

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Impact of myocardial stiffness on short-term functional outcome in patients with organic mitral regurgitation: insights from novel measures of myocardial elasticity

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Chronic left ventricular (LV) volume overload in organic mitral regurgitation (MR) triggers LV dilation, eccentric hypertrophy and remodeling and ultimately LV dysfunction.

Purpose: We tested the hypotheses that 1) intrinsic velocity propagation of myocardial stretch (iVP), a validated measure of myocardial elasticity, may be abnormal in these patients, and 2) that LV stiffening may influence the response in LV function after mitral valve repair.

Methods: Patients with mitral valve prolapse and severe MR (n=51; mean age 59$\pm$12 yrs, 72% male; in sinus rhythm) were prospectively recruited. A control group (n=37, age 49$\pm$13 yrs) was selected from patients with normal cardiac function. After comprehensive TTE, ultra-high frame rate (250-350Hz) tissue Doppler scans were acquired in 3 apical views, one LV wall at a time. iVP was measured as the wave

speed of myocardial stretch propagating from base to apex in late diastole. Elastic modulus (Em) was derived from iVP and LV geometry. Global longitudinal strain (GLS) was measured by speckle tracking. Data on ejection fraction (EF) at 3 days pre hospital discharge after mitral valve repair was collected from the medical records.

Results: Patients with severe MR had an LV EF of 63±7%, LV end-diastolic diameter (LVIDD) 58±5 mm, end-systolic diameter (LVIDS) 36±5 mm, effective regurgitant orifice area (EROA) 0.6±.2 cm². Most patients were in NYHA class I and II (64% and 34%, respectively). iVP (2.0, IQR 1.45, 2.21m/s) and Em (26, IQR 14, 31 kPa) were higher in severe MR compared to controls (iVP: 1.6, IQR 1.45, 1.77m/s; Em: 13.8, IQR 12.2, 17.8; p<0.01 for both). Higher iVP was associated with larger LV diameter (LVIDD r=0.41; LVIDS r=0.36), LV mass (r=0.32), EROA (r=0.40); p<0.05 for all. No significant relationship was found with age, peak mitral A flow velocity, measures of LV filling pressures (pulmonary vein Ar-A duration, E/e') or LV systolic function (GLS, EF). By multivariate linear regression analysis where some variables were entered sequentially (age, gender, EROA, LVMI, LVESD, hypertension, coronary artery disease and history of myocardial infarction) the only variable that remained independently related to iVP was EROA (r² model=0.27; p<0.01). At follow-up, 30 patients underwent mitral valve repair. At pre hospital discharge, there was an inverse significant correlation between EF and preoperative iVP; the higher the baseline iVP, the lower the EF at pre discharge (r=0.38, p=0.02). Of note, no correlation was found for baseline GLS and EF at pre discharge.

Conclusions: Novel indices of myocardial elasticity indicate that patients with severe MR have stiffer LV myocardium compared to normal subjects. This likely reflects the maladaptation of the LV tissue to chronic volume overload burden. Increased myocardial stiffening was associated with lower LV EF immediately after mitral valve repair.

P260

Hypercholesterolemia associated with mitral valve regurgitation secondary to myxomatous mitral valve disease: bench to bedside mechanism

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Background: Data from pathological studies and animal experimental models suggest an association between the degree of degenerative mitral regurgitation (MR) and the LDL-receptor family. We sought to assess the effect of serum lipids on progression of MR in patients with defined myxomatous mitral valve, and determine the mechanism via an experimental animal model of disease.

Methods: From our 20-year (October 1988 – May 2010) echocardiography database we retrospectively identified all patients (age 18-70 years) at least 2 echocardiographic studies ≥6 month apart, in whom a degree of MR caused by myxomatous mitral valve (MMV). The MR was assessed as mild, moderate or severe. Exclusion criteria were: ischemic involvement, rheumatic heart disease, associated congenital defects, aortic regurgitation more than mild at first exam, the presence of aortic stenosis and valvular prosthesis, history of endocarditis and severe MR at first examination. 103 patients (45 males), were considered eligible for the study, worsening of MR (a progression of at least one degree) being noted in 57 patients. To confirm the mechanism rabbits were fed a 6 month cholesterol diet with and without atorvastatin to test this hypothesis in vivo.

Results: Patients with MR progression had a higher weight (70.5±12,8 vs 65.2±10.4, p=0.034), higher LDL-cholesterol levels (142±33 vs 125±38, p=0.019). This group had also a larger baseline left atrium, larger left ventricle diastolic diameter, a higher ejection fraction and a more severe initial MR on first examination. At univariate analysis, predictors of mitral regurgitation progression were the initial degree of MR, left atrium antero-posterior diameter, left ventricle diastolic diameter, ejection fraction, body weight and LDL-cholesterol value. At multivariate analysis, when the effect of the initial degree of mitral regurgitation was controlled for, LDL cholesterol remained the only independent predictor of MR worsening, the other parameters losing significance. Rabbits on the high cholesterol diet developed severe myxomatous mitral regurgitation as studied using color flow doppler, histology and RTPCR demonstrating increase in chondrogenic markers, and improvement in all parameters after treatment with Atorvastatin.

Conclusions: Our study showed that LDL cholesterol levels and the initial degree of MR are the mains determinants of MR time progression in patients with MMV. This finding, as confirmed using an in vivo rabbit model, could have an important impact in MMV patients clinical management.

P261

Left ventricular consequences of mitral annular disjunction in myxomatous valve disease

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Background: Mitral annular disjunction (MAD) is characterized by systolic detachment of mitral annulus from ventricular myocardium, noted with myxomatous mitral valve disease (MMVD) and diagnosed by echocardiography.

Purpose: We aimed to evaluate potential left ventricular (LV) abnormalities in MAD and to investigate if these abnormalities may have consequences in MMVD evaluation.

Methods: We analyzed by 2D echocardiography 61 patients with MMVD and severe mitral regurgitation (62±11 years; 25% women) pre and post valve repair. LV diameters, posterior wall (PW) and interventricular septum (IVS) thickness at basal and medium level in systole and diastole, were compared between patients with and without MAD.

Results: MAD was diagnosed in 27 (44%) patients (7.9±3.4 mm). At diagnosis, there was no difference in regurgitant volume in MAD vs. no MAD (83±31 vs. 90±57 mL/beat, p=0.57) or in left atrial volume index (60±17 vs. 60±17 mL/m2, p=0.91). Diastolic measures of basal and mid-LV diameters and wall thickness were no different in MAD vs. no MAD (all p>0.20). In systole, basal PW was markedly increased in MAD vs. no MAD (19.1±2.2 vs. 15.2±2.2 mm, p<0.001) whereas no significant difference was noted in IVS thickness. Hence, in systole wall thickening was higher in MAD for basal PW (74±27 vs. 50±28%, p<0.001) and the ratio of basal (PW+IVS wall thickness)/diameter was also higher in MAD (1.06±0.24 vs. 0.91±0.21, p=0.01). The systolic ratio wall thickness/diameter was higher in basal segment than in mid-LV in MAD vs. no MAD (both p<0.001) but the cavity deformation was larger in patients with MAD (p=0.004). In contrast, difference in EF in MAD vs. no MAD (65±5 vs 62±8%, p=0.13) did not reach significance. After mitral repair with suture annuloplasty, LV diameters and wall thickness showed no difference in MAD vs. no MAD. Wall thickening declined in all segments and were similar in MAD vs. no MAD (all p>0.50).

Conclusions: Mitral annular disjunction is frequent with DMVD and associated with differences in LV patterns. In MAD, there is an excessive wall thickening specifically located at the basal PW. This appearance maybe misleading for higher LV function while post-operative imaging shows normalization post annular suture. Hence, in MAD care should be taken to avoid under-estimating LV consequences of MR due to DMVD.

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Quantification of mitral regurgitation by transthoracic echocardiography and cardiac magnetic resonance in patients affected by mitral valve prolapse

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Introduction: Recent changes in valvular heart disease guidelines support surgical repair in patients with asymptomatic severe primary MR making crucial the assessment of MR severity. Cardiovascular Magnetic Resonance (CMR) can accurately quantify mitral regurgitation and is increasingly used in this context. There are few comparative studies between transthoracic echocardiography (TTE) and CMR. All these studies include patients with primary and secondary MR combined and most of them have shown a modest concordance in the qualitative or quantitative evaluation of MR.

Purpose: Our study aims at analysing the differences in the qualitative and quantitative evaluation of MR between TTE and CMR in patients affected by Mitral Valve Prolapse (MVP).

Methods: 34 patients with MVP (age 56±14, male 59%) were studied by TTE and CMR in a single centre. The maximum time interval between TTE and CMR was 98 days (median 41). Experienced echocardiographers graded qualitatively MR by integrating multiparametric data as indicated by guidelines; EROA and regurgitant volume (RV) were assessed by the PISA method. RV was derived by CMR from left ventricular volumes and phase contrast technique and categorized qualitatively according to the guidelines. The degree of regurgitation evaluated was compared by the two techniques using a 4-grade scale (mild, moderate, moderately severe and severe) in all patients.

Results: Exact concordance in MR grade with CMR is observed in 47% of patients and it increases up to 91% when considering concordance within one grade of severity (κ=0.51).

The quantitative comparison between RV with both methods is moderate (r=0.58 with a mean difference CMR-TTE of -8 ±16 ml). In only 4 of the patients a difference between the volumes greater than 30% is observed, all characterized by eccentric regurgitation.

CMR has the best interobserver reproducibility for RV (CMR CCC 0.95, 0.86-0.98; TTE CCC 0.92, 0.71-98).

Conclusion: The findings suggest that in patients with MVP and severe MR by TTE evaluation CMR may help identifying proper patients for early asymptomatic surgery.Comparison of MR Severity

TTE MR	CMR MR				Total
	Mild	Moderate	Moderately Severe	Severe	
Mild	10	0	0	0	10
Moderate	9	2	1	0	12
Moderately Severe	1	2	2	1	6
Severe	0	1	3	2	6
Total	20	5	6	3	34

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Infective endocarditis in the absence of microbiological diagnosis: clinical profile and outcome

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On behalf of: Endocarditis team

Background: Infective endocarditis with negative blood cultures represents 3-31% in different series and is a challenging diagnosis; furthermore,it has been associated with increased mortality due to delayed diagnosis and the difficulty to establish an appropriate treatment.

Objectives: Our aim was to study clinical features and prognosis of patients with infective endocarditis in absence of microbiological diagnosis.

Methods: We analyzed 434 consecutive cases of infective endocarditis of our hospital from 2003 to 2017. Diagnosis was established by ESC guidelines criteria for infective endocarditis

Results: A total of 50 patients (11%) had negative blood cultures and lack of microbiological diagnosis (group A), which were compared to those patients with positive microbiological result (group B, n = 384 patients). There were no differences regarding clinical basal characteristics between the two groups. Patients in group A had a higher percentage of valvular regurgitation (91 vs. 78%, p = 0,04), heart failure (67 vs. 44%, p = 0.007),echocardiographic local complications (67 vs 44%; P = 0.003) and required earlier surgery (30 vs. 182 days, p = 0.005). Highest mortality occurred in group A (38 vs. 28%) but it didn't reach statistical significance (P = 0.114).

Conclusion: 11% of patients with infective endocarditis in our serie,had no microbiological diagnosis. These patients have more local echocardiographic complications, valvular regurgitation and heart failure, without significant differences in terms of mortality.

P264

Clinical characteristics and diagnosis of non-bacterial thrombotic endocarditis

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Nonbacterial thrombotic endocarditis (NBTE) is a rare condition that refers to a spectrum of noninfectious lesions of the heart valves (especially aortic valve, or mitral valve) that is most commonly seen in advanced malignancy. The aim of our study was to evaluate the clinical presentation, imaging characteristics, and diagnosis of NBTE.

We retrospectively reviewed the medical records of 39 patients with infective NBTE between January 2003 and May 2016. The NBTE was diagnosed with a form of non-infectious endocarditis, that was characterized by the deposition of sterile platelet thrombi on heart valves.

The age of patients with NBTE was median 56 (interquartile range: 44-68 [years]), male gender was 16 patients (41.0%). NBTE is associated with a number of underlying conditions, of which advanced malignancy (hematologic malignancy [n=7, 17.9%] or solid cancer [n=24, 61.5%]) was the most common in this study. Other less common etiologies was included to antiphospholipid syndrome, or antithrombin III deficiency, or other inflammatory disease (ulcerative colitis, Crohn's disease, Churg Strauss syndrome). The major clinical manifestations of NBTE result from systemic emboli, especially cerebral infarction (n=17, 43.6%), rather than myocardial infarction (n=1, 2.6%) or venous thrombosis (n=4, 10.3%). Treatment of NBTE usually consisted of systemic anticoagulation (warfarin [n=13, 33.3%] or enoxaparin [n=10, 25.6%])) and therapy directed at treating the underlying malignancy or associated condition (steroid [n=1, 2.6%] or chemotherapy [n=4, 10.3%]). Surgery with valve debridement or excision was performed (n=2, 5.1%). Transesophageal echocardiography (TEE) is more sensitive than transthoracic echocardiography for the detection of vegetations, particularly for small lesions (<5 mm), so as the 28 patients (71.8%) were performed to TEE. The most site of NBTE was mitral valve (n=24, 61.5%) and aortic valve (n=12, 30.8%). Among all these patients, 18 patients were accompanied with the significant regurgitation of involved valve (over mild grade).

Because of the difficulty of differential diagnosis, we should pay attention to accurate diagnosis and proper management of NBTE, especially for the special echocardiographic findings accompanied with regurgitation or round shaped vegetation, underlying conditions, or initial clinical manifestation. The selection of patients suitable for TEE should be individualized according to performance status and life expectancy if the patient is known to have underlying conditions.

P265

Clinical characteristics and outcomes of infective endocarditis on native valves in adults depend on specific hospital settings

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Background: Since 2009, the ESC guidelines have introduced the restriction of antibiotic prophylaxis for infectious endocarditis (IE) to the highest risk patients, and are currently promoting the collaborative approach for its management which relies on health care conditions in each European country.

Purpose: To study the clinical characteristics and outcome of IE on native valves (NV) in adults, in different hospital settings, since 2009.

Methods: Records from 2009 to 2016 of adult patients with primary discharge diagnosis of IE were compared between 2 hospitals: an emergency hospital (EH) with cardiology and neurology departments, and a referential infectious disease hospital (IDH). IE was diagnosed by transthoracic or transesophageal echocardiographical criteria. Patients with prosthetic valves or intracardiac devices were excluded.

Results: 483 patients with a discharge diagnosis of IEVN were evaluated: 131 in EH (92 in the cardiology and 39 in the neurology departments), and 366 in IDH. Valve lesions were predominantly on the mitral (52%) and aortic (54%) valves, by comparison with the tricuspid (11%) and pulmonary (2%) valves (p<0.00001). Annual distribution of hospitalized IEVN patients did not change significantly over the study period in EH (p for trend=0.88), whereas it decreased in IDH (p for trend=0.01). Patients hospitalized with IENV in EH were older than in IDH (66±x vs 62±y years; p=0.04), with no significant differences for gender (males 61% vs 69%). Less cases of IE were identified with positive blood cultures in EH than in IDH (41% vs 53%; p=0.025) or had a specified potential portal of entry (7% vs 22%; p<0.00001). Among those with identified pathogens, staphylococcus species were recorded in 43% and streptococcus species in 35% of the cases. 46% of patients diagnosed with active IENV in EH and having a stable clinical condition were transferred in an infectious disease department, in order to complete their antimicrobial therapy. Patients managed in EH had a more severe outcome than those hospitalized in IDH, consisting in neurological complications (33% vs 13%; p<0.00001) and in-hospital mortality (28% vs 4%; p<0.00001). Transfer in a cardiac surgery unit during hospitalization was recorded only for 7% of the patients with IENV in EH and for 23% of those in IDH (p<0.00001).

Conclusions: Since the restriction of indications for antibiotic prophylaxis, the incidence of IENV did not increase, confirming the validity of the current recommendations of the ESC guidelines. The main localization of IENV remained the mitral and aortic valves, while the most frequently encountered pathogens were staphylococcus and streptococcus species. However, many improvements must be done in the microbiologic expertise and reference of patients with severe IE managed in emergency hospitals to cardiac surgery, in order to accomplish a real collaborative approach to this disease.

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Native versus prosthetic valve infective endocarditis: what are the differences in clinical practice?

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Background: Infective endocarditis (IE) still have a high morbi-mortality, being well known the severity associated with prosthetic valve IE.

Purpose: To characterize IE patients (pts) and analyze the differences between native and prosthetic valve IE.

Methods: Retrospective study with IE pts admitted to our centre during a 10 year-period (2006-2015). Data on past medical history, clinical presentation, microorganisms, echocardiography and hospitalization outcomes were evaluated. Significant differences between native and prosthetic valve IE were analyzed.

Results: Were included 130 pts, 96(74%) males, mean age 61±16 years, 96(72%) pts with native valve IE. Pts with prosthetic valve IE had more previous arterial hypertension (65%vs 45%;p=0.046) and heart failure (HF) (38%vs 21%;p=0.045).

At admission, 77(59%) pts had constitutional symptoms or cardiac murmur.

The aortic valve was the most often involved (n=77;60%), more often in prosthetic valve IE (82%vs 51%;p=0.001). The right-side valves were more affected in native valve IE (18%vs 3%;p=0.04).

Infection was considered to be healthcare-associated in 29(22%) pts. Staphylococcus aureus was the most frequent isolated microorganism (29;22%), without significant differences in microbiological agents between native and prosthetic IE. 28(22%) pts had negative blood cultures.

Vegetations were the main echocardiographic findings observed (n=102;78%). Native valve IE pts had more often vegetations (83%vs 65%; p=0.002) and valve regurgitation (59%vs 35%;p=0.004) in echocardiography. Prosthetic valve IE pts had more valve obstruction (15%vs 3%;p=0.03), abscess (35%vs 6%;p<0.001) and pseudoaneurysm (12%vs 1%;p=0.02) observed in echocardiography.

The mean length of hospital stay was 41±23 days, with adverse outcomes occurring in 108(83%) pts, mainly HF (n=64;49%), with prosthetic valve IE pts having more locally uncontrolled infection (68%vs 33%;p=0.001).

Cardiac surgery was performed in 42(32%) pts. Pts with native valve IE were more referred to surgery due to HF (87%vs 25%;p<0.001) and pts with prosthetic valve IE due to locally uncontrolled infection (58%vs 10%;p=0.002).

The in-hospital death rate was 32%, without significant differences between the two groups. Of these, 31(74%) hadnt been proposed for surgery (in 50% justified with a high risk surgery). Septic shock was the main cause of dead (n=14;33%).

Conclusion: Prosthesic valve IE pts had more past history of arterial hypertension and heart failure, less vegetations and more valve obstruction, abscess and pseudoaneurysm in the echocardiography, and were more referred to cardiac surgery due to locally uncontrolled infection.

Native valve IE pts had more vegetations and valve regurgitation in echocardiography, and were more referred to cardiac surgery due to heart failure.

We also highlight the absent of significant differences in clinical presentation, microbiological agents and in-hospital death rate between the two groups.

P267

Septal bulge and risk of paravalvular leak after transcatheter aortic valve implantation

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Background: The septal bulge (SB) is a subaortic protuberance of the septum toward the left ventricular outflow tract (LVOT). SB is related to hypertension and aging, and thus it is frequently observed in patients that undergo transcatheter aortic valve implantation (TAVI).

Purpose: To evaluate the impact of SB on the incidence of paravalvular leak (PVL) post TAVI implantation.
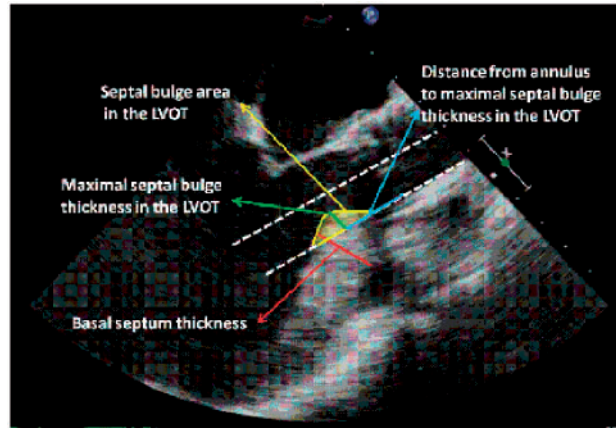
Methods: Consecutive TAVI (2013-2016) with pure annular (Edward Sapiens, Lotus) or supra-annular (Evolute, Corevalve) leaflet implantation were included; excluding devices in the early learning curve. All patients with the required transesophageal echocardiography (TOE) images during the TAVI implantation were included. Nonstandard measurements were obtained (Figure). Presence of PVL was evaluated in TOE after implantation. Results were compared with Anova and Bonferroni statistical tests.

Results: 147 patients (mean age 78±12 years, 59% females) were included (56 Corevalve, 41 Lotus, 33 Evolute, 17 Edward Sapiens). No significant differences in SB parameters among the different devices were observed. Table shows SB measurements among the different grades of PVL. Only maximal thickness of the SB in LVOT was related with PVL, especially for supra-annular prosthesis. Only one moderate-severe PVL was observed in the annular group and the differences in the other groups of annular prosthesis were not statistically significant.

Conclusions: The presence of a prominent SB in the LVOT may be related to higher risk of PVL regardless of maximal basal septum thickness, especially in the longer devices with supra-annular leaflets position.Septal bulge measurements

Abstract P267 Figure. Septal bulge measurements in LVOT view

P268

Comparison of modification of aortoventricular angle after transcatheter aortic valve implantation between self-expandable valve and balloon-expandable valve

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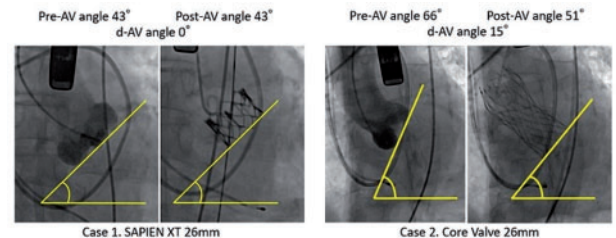
Background: Transcatheter aortic valve implantation (TAVI) with balloon-expandable or self-expandable valve has been widely used for treatment of high-risk patients with severe aortic stenosis (AS). In some AS patients who underwent transfemoral-TAVI with self-expandable valve, the aortoventricular (AV) angle, which is an angle between ascending aorta and left ventricle, changes after valve implantation.

Objectives: This study aimed to compare the change of AV angle after transfemoral-TAVI between balloon-expandable and self-expandable valve.

Methods: A total of 55 patients who underwent transfemoral-TAVI in our hospital between April 2014 and March 2017 were enrolled in this retrospective study. In 52 patients excluding 3 patients (2 valve-in-valve implantation, 1 acute deterioration), we measured the angle between the horizontal plane and the angiographic projections perpendicular to the native valve plane before valve implantation as the pre-AV angle, and the angle between the horizontal plane and the proximal edge plane of implanted valve after valve implantation as the post-AV angle (Figure 1). Then, we calculated the difference between pre- and post- AV angle: d-AV angle= (post-AV angle) – (pre-AV angle).

Results: The balloon-expandable valve was implanted in 42 patients (32 SAPIEN XT, 10 SAPIEN 3; Edwards Lifesciences, Irvine) and the self-expandable valve was implanted in 10 patients (9 CoreValve, 1 Evolut R; Medtronic, Minneapolis). There were no significant differences between balloon-expandable and self-expandable valve both in pre- and post- angle. However, d-AV angle in patients treated with the self-expandable valve was significantly larger than those with the balloon-expandable valve (6.4±5.2 vs -0.3±2.5, p<0.0001).

Conclusions: Our findings suggest that the self-expandable valve is involved in morphological relationship between aortic root and left ventricle compared to the balloon-expandable valve. Therefore, in TAVI with the self-expandable valve for treatment of high-risk AS patients, we may need to care to modification of aortoventricular angle accompanying valve implantation.

Abstract P268 Figure..

	Paravalvular leak	None (n=49)	Trace (n=51)	Mild (n=35)	Moderate-severe (n=12)	P value
All prostheses (n=147)	Basal septum thickness (mm)	17.4±3.8	17.9±3.0	17.9±3.1	17.8±2.6	0.899
	SB thickness in the LVOT (mm)	3.6±1.2*	3.2±1.3	3.7±1.3&	5.2±1.6*&	<0.001
	SB area in the LVOT (cm2)	0.47±0.29	0.44±0.30	0.47±0.27	0.70±0.32	0.056
	Distance from annulus to SB maximal thickness in the LVOT (mm)	10.1±3.7	10.5±4.1	9.5±3.3	12.4±2.7	0.126
Supra-annular prostheses (N=89)	Basal septum thickness (mm)	17.2±4.6	18.0±2.8	17.8±2.8	18±2.7	0.848
	SB thickness in the LVOT (mm)	3.5±0.7*	3.1±1.4	3.8±1.3	5.2±1.6*	0.001
	SB area in the LVOT (cm2)	0.47±0.25	0.42±0.23	0.48±0.25	0.64±0.27	0.092
	Distance from annulus to SB maximal thickness in the LVOT (mm)	10.2±3.0	10.4±3.5	9.6±3.1	12.1±2.6	0.175
Annular prostheses (N=58)	Basal septum thickness (mm)	17.6±3.4	17.7±3.3	18.6±5.0	16	0.902
	SB thickness in the LVOT (mm)	3.6±1.3	3.3±1.3	3.3±1.6	7.4	0.043
	SB area in the LVOT (cm2)	0.47±0.31	0.47±0.39	0.40±0.36	1.3	0.132
	Distance from annulus to SB maximal thickness in the LVOT (mm)	10.1±4.1	10.6±4.8	9±4.8	16	0.538

*& statistically significant differences in the post-hoc Bonferroni analysis

P269

Bacteriemia, infective and prosthesis valve endocarditis after transcatheter aortic valve implantations

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In this study we try to assess influence of clinically relavant baceriemia for development of infective endocarditis at patients after transcatheter aortic valve implantations (TAVI).

We analyze series of 200 patients after TAVI procedures performed between 03/2010 and 06/2016 in our Department.

At 52% of patients Medtronic Corevalve was implanted, 30% - Edwards Sapien XT/3, 1% - Medtronic Engager and 20% - Medtronic Evolut R, Boston Scientific Lotus 5%. In 77% cases transfemoral access was used, in 12% direct aorta, in 6% subclavian, 3% transcarotid and 2% apical. 42% of patients have implanted 29 mm bioprosthesis, 35% - 26 mm, 12% -23 mm, 7% - 31 mm and 2% - 27 mm, 1% - 25 mm, 1%- 27 mm. Eight patients of this group develop clinically relevant bacteriemia due to urological (50%) or pulmonary infections (50%). From this group the infections was limited to non-heart sides in 2 pts (25%). In 2 pts (25%) the infective endocarditis of mitral valve occurred (1-AML, 1-PML). And 4 (50%) pts developed prosthetic valve endocarditis in TAVI prothesis – 3 (37%) of them died and 1 (13%) survived.

Clinically relevant bacteraemia at TAVI patients is rather non-frequent complication (4%), and not always lead to TAVI PVE. However in cases of TAVI valve's PVE we found 75% of mortality.

P270

Left ventricular remodelling post transcatheter aortic valve implantation (TAVI) is dependent on baseline mean gradient and ejection fraction: an echocardiographic study

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Background: The left ventricular response to aortic stenosis (AS) is complex. Although transcatheter aortic valve implantation (TAVI) decreases the left ventricular afterload by reducing the transvalvular pressure gradient, data regarding its impact on left ventricular geometry is limited.
Purpose: This study sought to assess left ventricular reverse remodeling following transcatheter aortic valve implantation (TAVI).
Methods: Data from patients with severe aortic stenosis (AVA $< 1cm^2$) undergoing TAVI at our institution was analysed. Patients without both an in-house pre-and post procedure echocardiogram available for analysis were excluded, as were patients with suboptimal echocardiographic windows. Comprehensive echocardiography was performed prior to and following intervention. Patients were classified into 4 subtypes according to mean gradient and LVEF:

HGNEF: High gradient (MG>40mmHg) and normal ejection fraction (LVEF>55%)
HGREF: High gradient (MG>40mmHg) and reduced ejection fraction (LVEF<55%)
LGNEF: Low gradient (MG<40mmHg) and normal ejection fraction LVEF>55%
LGREF: Low gradient (MG<40mmHg) and reduced ejection fraction (LVEF<55%)
Results: 67 patients were included in the final analysis. The mean age was 80.8 ± 7.5 years and 37 patients (55.2%) were female. The median follow up time for echocardiography was 11.1 weeks (IQR 7.6-15.7 weeks). The number of patients were subdivided into: 1. HGNEF 38 (56.7%), 2. HGREF: 13 (19.4%), 3. LGNEF: 4 (6%) and 4. LGREF: 12 (17.9%).

Overall, there was a significant reduction in septal thickness and left ventricular mass on the follow up echocardiogram. The decrease in relative wall thickness was not significant:
Interventricular septum (mm): Pre-TAVI 12.3± 2.7 vs Post TAVI 11.7 ± 2.6, p= 0.027
Posterior wall (mm): 10.8 ±2.3 vs 10.4 ± 2 p= 0.166
LVEDD (mm): 46.3 ±7.6 vs 45.6 ±9.4, p=0.867
RWT: 0.49±0.15 v's 0.46 ±0.14, p= 0.159
LV mass: 199 ±59 vs 186 ± 51, p= 0.016

Patients with high gradient aortic stenosis and preserved left ventricular ejection fraction showed greater decreases in relative wall thickness and left ventricular mass than those with high gradients and reduced ejection fraction and those with low gradient aortic stenosis.
Group 1, HGNEF. Pre TAVI RWT 0.53 ±0.15 vs Post TAVI RWT 0.47 ±0.13, Pre TAVI LV mass 188 ±51 vs 174 ±48, p= 0.028
Group 2, HGREF. RWT 0.42 ± 0.17 vs 0.44 ± 0.15, LVM 223 ± 70 vs 211 ± 60, p= 0.345
Group 3, LGNEF. RWT 0.47 ± 0.1 vs 0.52 ± 0.23, LVM 178 ± 28 vs187 ± 60, p= 0.854
Group 4, LGREF RWT 0.42 ±0.09 vs 0.43 ± 0.13, LVM 215 ± 68 vs 93 ± 39, p= 0.308

Conclusions: Our data demonstrates a significant improvement in left ventricular mass following TAVI, which appears to be driven by a reduction in wall thickness. Sub-group analysis suggests that the improvements in left ventricular geometry are more pronounced in patients with high gradient aortic stenosis and preserved ejection fraction.

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Improved cognitive performance following transcatheter aortic valve implantation despite the presence of lacunar cerebral lesions - a RETORIC substudy

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On behalf of: RETORIC

Background: Data regarding the cognitive trajectory of patients undergoing transcatheter aortic valve implantation (TAVI) are scarce and contradictory. With the indication area of TAVI expanding towards younger generations, understanding the effects of TAVI on cognitive function is attaining crucial importance.
Purpose: The primary aim of the present study was
1) to assess the evolution of global cognitive function and specific cognitive domains after TAVI
2) to identify any correlation between periprocedural lacunar brain lesions and potential cognitive changes
Methods: – Patients were included from the prospective arm of the Rule out Transcatheter Aortic Valve Thrombosis with Post-implantation Computed Tomography (RETORIC, NCT02826200. Global cognitive function was assessed using the Mini Mental State Examination (MMSE); specific cognitive domains were investigated using the Addenbrooke's cognitive examination (ACE). Tests were performed before (within 2 days) and after (within 3 days) the procedure. Following intervention, all patients underwent brain MRI including diffusion tensor imaging (DTI) before hospital discharge to identify potential new ischemic lesions.
Results: – As of May 2017, 34 patients with full datasets of pre- and postoperative cognitive tests and brain MRI examinations have been included in the study (mean age: 79 years; range: 63-92). Global cognitive performance of the patients was similar pre- and post-operatively (mean MMSE score 24.7 vs 25.6 p=0,13). However, when the analysis was confined to those patients whose baseline score was under the study population's average (n=8), a significant improvement was observed (20.7 vs 23.0 p=0.019).

Regarding specific cognitive domains, the short term memory of the patients improved significantly following intervention (1,03 ±0,97 vs 0,63±0,81, p=0,001). No statistically significant change was observed in case of the other domains.

Novel lacunar cerebral lesions were detected in 63% of the subjects. When classifying the patients according to the presence or absence of cerebral lesions, similar perioperative cognitive trajectory was observed in the two groups (MMSE: 23.8±3.8 vs 26±3 with and 24.4±3.1 vs 27.0±2.5, without lesions, respectively; p>0.05 in all cases).

Conclusion: – The initial results of this RETORIC substudy indicate no short term cognitive decline following TAVI, despite the presence of peri-operatively developed novel lacunar cerebral lesions. Furthermore, patients with slightly reduced intellectual capacities at baseline showed improvement in global cognitive function after valve replacement.

CARDIOMYOPATHIES

P272

Dynamic changes of lung ultrasound B-lines in acute heart failure

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Purpose: Lung ultrasound B-lines are the sonographic sign of extravascular lung water. Our aim was to assess the dynamic changes of B-lines during hospitalization for acute heart failure (AHF), and compare them with non-invasive echo-derived hemodynamic data.
Methods: Seventy-eight patients (age 74±12 years) admitted with a diagnosis of AHF were enrolled. A quick integrated cardio-pulmonary ultrasound exam including B-lines, pulmonary artery systolic pressure (PASP, obtained by maximum tricuspid velocity, and inferior vena cana dimension and collapsibility) and E/e' assessment was performed by a portable device with a cardiac probe at admission (T0), between 24 and 48 hours (T1), and at discharge (T2). A B-line score was calculated by dividing the sum of all B-lines found in each scanning site by the number of available scanning sites.
Results: Mean B-line score was 3.6±2.0 at T0 with a significant reduction already at T1 (2.7±1.7, p<0.0001) and at T3 (1.3±1.3, p<0.0001). PASP and E/e' showed a significant decrease at T3 (PASP: 42±11 vs 38±13 mmHg, p=0.02; E/e': 17.4±9.1 vs 13.5±5.7, p=0.05), but not at T1 (PASP: 39±11, p=0.11; E/e': 14.3±5.6, p=0.87).

Conclusions: In patients hospitalized with AHF, changes in B-lines are more dynamic than changes in PASP and E/e'. Lung ultrasound evaluation of B-lines can be helpful in the management of AHF, monitoring day-by-day changes of extravascular lung water.
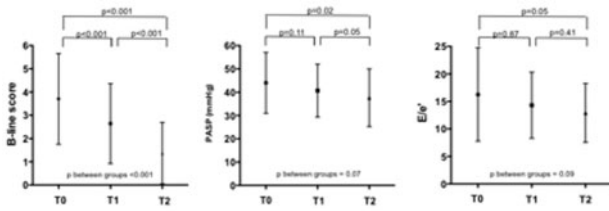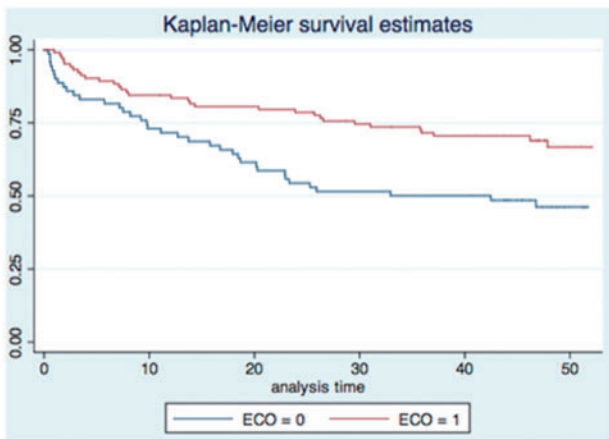

Abstract P272 Figure.

P273

The contribution of echocardiography to the prognosis of heart failure from the first episode

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1- Introduction: Heart failure (HF) is one of the most frequent causes of hospitalization and it has an ominous prognosis after discharge. Transthoracic echocardiogram (TTE) plays a very important role in the diagnostic process of this pathology and in fact the clinical practise guidelines recommend the accomplishment of a TTE during the admission. However, the influence of TTE on prognosis after discharge is unclear.
2- Purpose: Our objective was to analyse the use of TTE in patients hospitalized for a first episode of heart failure. As well as study how this complementary test may influence on patients' outcomes.
3- Methods: During the year 2013 we reviewed the patients that were hospitalized for a first episode of heart failure in a second level general hospital. After a median follow-up period of 29,6 months, survival data were studied based on Kaplan-Meier method. We analysed survival differences depending on the performance of TTE or not during the hospitalization using the log rank test.
4- Results: A total number of 176 patients were enrolled, with a mean age of 79,1 ± 10,9 years and a gender distribution of 43,3% male. Among all patients, TTE was conducted in 103 patients, which represents 59% of the sample. Systolic dysfunction was diagnosed on 29,05% of whom TTE was done. After analysing survival data, we identified that 25% of patients had died at 16,7 months, 48,2% of them because of cardiovascular death. Patients who underwent a TTE during their admission had better survival results than those who did not have that test done, as we show on the attached image (Image 1), being these results statistically significant (p=0.003).
5- Conclusions: **According to our results:** 1.-TTE is being underused in patients with a first HF episode despite the recommendations of the clinical practise guidelines.
2.- Failure to perform this diagnostic technique is associated with a worse prognosis. This exam may help us to understand better of the disease and select the most proper management.

Abstract P273 Figure. Survival depending on TTE performance

P274

Comparison of interatrial conduction time in heart failure patients and controls

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Background: Interatrial conduction time (IACT) is prolonged in a subset of HFpEF patients (pts), as demonstrated in a small number of studies, while its distribution appears heterogenous in HFrEF. Normal values of IACT in non-HF pts are still largely unknown. We aimed to compare IACT between HF pts and normals and to assess IACT among HF pts.
Methods: A total of 71 HF pts (mean age 65±14 years, 45% male) were retrospectively assessed and compared to 27 age- and sex-matched controls. IACT was measured from echo Doppler traces as the difference between the time of transmitral and transtricuspid A wave onset.
Results: Mean IACT in the controls was 2.2±22.3 ms and 14.9±46.1 ms in HF pts (p=0.07). The 95th percentile (40ms) of IACT in the controls was used as the cut-off point to define abnormal IACT, i.e. interatrial dyssynchrony (IAD).
IACT>40 ms was present in 22 (31%) of HF pts: 15 pts (48%) with HFpEF, 3 pts (30%) with HFmrEF and 4 pts (13%) with HFrEF, p <0.001. Along with a higher proportion of HFpEF pts in the IACT>40ms group, higher IAD was related to lower heart rate, female gender, higher LVEF and smaller LVIDd (Table). There was no difference in age, SBP, NYHA class, eGFR, E/e' or atrial volumes.
Conclusion: This pilot study suggests a possible cutoff value of IACT measured by Doppler echocardiography, which might lead to better recognition of the subset of HF pts with significant IAD, however it requires confirmation on a larger cohort.IACT in heart failure patients

	IACT≤40 ms (n=49)	IACT > 40 ms (n=22)	P value
Age (± SD)	63±15	68±13	0.18
Gender			
Male (%)	27 (55.1)	5 (22.7)	0.02
SBP (mmHg)	126±23	132±21	0.31
HR/min	76±14	67±14	0.03
eGFR-MDRD (mL/min/1.73m^2)	60.5±23.9	59.3±20.0	0.96
History of AFib. (%)	17 (34.7)	10 (45.5)	0.43
NYHA II (%)	29 (59.2)	13 (59.1)	0.56
NT-proBNP (pg/mL)	3234±5556	1322±1703	0.09
LVIDd (mm)	6.0±1.1	5.4±0.9	0.01
LAVI (mL/m^3)	41.8±16.0	44.5±18.5	0.84
RAVI (mL/m^3)	28.2±16.4	23.5±15.1	0.15
E/E'	15.0±7.9	15.9±5.6	0.31
LVEF (%)	39±16	52±15	0.003

P275

Correlation between echocardiographic and cardiac magnetic resonance findings and arrhythmic events in patients with left-ventricle non-compaction cardiomyopathy

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On behalf of: Sunshine

Introduction: Left Ventricular Non-Compaction (LVNC) is a genetic cardiomyopathy where the walls of the ventricle are non-compacted, leading to the formation of trabeculations within the ventricular wall, giving it a spongy texture. It has an estimated prevalence of 0,014 to 1,3%. One of its documented complications are arrhythmias, such as atrial fibrillation and ventricular tachycardia. Doppler Echocardiography and Cardiac Magnetic Resonance Imaging (CMR) remain the two main diagnostic tools, but whether there is a correlation between their findings and arrhythmic complications in LVNC remains to be determined.
Purpose: To determine if there is a correlation between echocardiographic and CMR findings and arrhythmic events in patients with LVNC.
Methods: We created a data base of patients with a diagnosis LVNC that are being followed as outpatients in 11 public Hospitals, spanning from January 2007 to

December 2016. An univariate analysis of echocardiographic and CMR findings and arrhythmic complications was performed.

Results: A total of 104 patients was included in the study, and 60 (57,7%) were male and the average age was 45,82 ± 19,29 years. Echocardiography was the diagnostic method in 84 patients (80,8%), while the other 20 (19,2%) were diagnosed by CMR, but a total of 80 patients (76,9%) underwent both diagnostic methods. A total of 17 (16,3%) patients had an arrhythmic event, either as a presentation, or as a finding on ECG or 24h Holter (1 had Atrial Flutter, 6 had Atrial Fibrillation, 1 had Supraventricular Tachycardia, 3 had Ventricular Tachycardia, and 1 had both Atrial Fibrillation and Ventricular Tachycardia).

On a univariate analysis, arrhythmic events had a correlation with older age (p=0,016) segmental wall-motion abnormalities on echocardiography (p=0,04) and tricuspid valve disease (p=0,038). There was no correlation found between findings on CMR and arrhythmic events.

Conclusion: LVNC remains a poorly understood form of cardiomyopathy, for which there is no specific treatment thus far. Finding predictors of future arrhythmic events may provide a way of reducing the burden of the disease. On our study, we were able to find a correlation between arrhythmic events on follow-up and older age, segmental wall-motion abnormalities on echocardiography and tricuspid valve disease.

Larger studies with bigger cohorts may provide new information useful for better understanding and managing these patients.

P276

Predictors of limited exercise capacity in different types of heart failure

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Background and Aim: Six-minute walking test (6-MWT) is introduced as a reproducible test for assessing exercise capacity in heart failure (HF) patients. Based on the left ventricular ejection fraction (LV EF), the HF recently was classified as HF preserved EF (HFpEF), HF with reduced EF (HFrEF) and HF with mid-range EF (HFmrEF). We aimed in this study to assess the best predictors of exercise capacity in patients with these different types of HF.

Methods: This study included 206 consecutive patients (63 ± 11 years) with stable chronic HF. A complete 2 dimensional, M-mode and Tissue-Doppler echocardiographic study was performed. LAD was measured by transthoracic echocardiography (parasternal view). A 6-MWT distance was performed on the same day of the echocardiographic examination. According to the LVEF, patients were divided into three group: group I - HFpEF (EF >50%, n=57), group II - HFmrEF (EF=45-50%, n=45) and group III - HFrEF (EF <45%, n=98).

Results: Patients with preserved EF had higher NTproBNP (p=0.006), had higher NYHA functional class and diastolic blood pressure(p=0.01 for both), larger left atrium - LA (p=0.003), reduced septal e' (p=0.01) and TAPSE (p=0.03) compared patients with reduced EF, but not differ compared with mid-range EF. However, LV end-systolic volume (LV-ESV) and non-sinus rhythm was different between three type of HF. LV end-systolic volume (ESV) was higher in HFpEF vs. HFmrEF (p=0.009), in HFpEF vs. HFrEF (p<0.001) and in HFmrEF vs. HFrEF (p=0.02). Te presence of atrial fiblrillation was more present in HFpEF vs, HFmrEF (p=0.03), in HFpEF vs. HFrEF (p<0.001) and in HFmrEF vs. HFrEF (p=0.01).

In multi-variate analysis in all HF study patients, LA diameter - LAD [3.272 (1.561-6.858) p=0.002], age [1.087(1.023-1.141) p=0.005], NYHA class [4.209 (1.860-9.523) p=0.001], and the presence of atrial fibrillation [3.402 (1.022-11.326) p=0.04] independently predicted exercise capacity. In HFpEF patients, NYHA class [14.816 (1.514-146.000) p=0.02] and weight [0.974 (0.771-0.990) p=0.03], in HFrEF, age [1.141(1.483-1.243) p=0.002], LAD [5.966 (1.847-19.267) p=0.003], and LV end-diastolic volume - LV-EDV [1.037(0.005-1.068), p=0.02], whereas in HFmrEF only NYHA class [8.654 (1.058-70.805), p=0.02] independently predict exercise capacity.

Conclusion: In HF patients, predictors of exercise capacity differ according to the severity of overall systolic function, with age, left atrial diameter and end-diastolic volume in HFrEF, only NYHA class in HFmrEF, and with NYHA class and obesity in HFpEF.

P277

Clinical and prognostic value of temporal progression of the cardiac magnetic resonance imaging findings in acute myocarditis

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Introduction: The natural history of acute myocarditis remains variable and predictors of adverse outcome are unknown. European guidelines recommend the following of these patients (pts) with both electrocardiogram (EKG) and echocardiogram. Cardiac magnetic resonance imaging (CMR) has proven diagnostic value, not being well established its prognostic and predictive value, particularly, the presence and extension of late gadolinium enhancement (LGE).

Purpose: To assess the clinical course and CMR findings progression in pts with acute myocarditis diagnosis and to identify adverse outcomes predictors.

Methods: Prospective study with pts admitted in our centre with acute myocarditis diagnosed according clinical findings, troponin T values elevation and CMR criteria (Lake Louise), since 1/2013. Selection of those pts who were clinically assessed and performed CMR in two moments: acute episode and at least 6 months later (FUP).

Results: Of all 41 admitted pts with acute myocarditis, 25 fulfilled our included criteria: 19 males (76%), mean age 34 ± 18 years, 3 pts (12%) with previous episode of myocarditis. At presentation 24 pts (96%) had chest pain; 22 (88%) mentioned prodromal symptoms. Only 1 patient evolved with atrial fibrillation and acute heart failure (HF) and 1 presented non-sustained ventricular tachycardia. All pts were in sinus rhythm in the initial EKG with ST segment elevation present in 18 pts (72%). The mean maximal troponin T value was 709 ± 393.5 ng/L. Coronariography was performed at 10 pts (40%), which excluded significant coronary lesions. In the initial CMR, 24 pts (96%) had LGE: 22 (88%) with subepicardial location, 2 (8%) with intramyocardial location. FUP CMR was performed at a median of 8 months. There wasn't significant differences between the means of the left ventricular (LV) ejection fraction (56 ± 6% vs 56 ± 5%, p = 0.89), LV mass (59 vs 57 g/m2, p=0.79), LV end-diastolic volume (83 vs 81 mL/m2, p = 0.52), LV end-systolic (39 vs 36 ml/m2, p=0.12) or LV systolic volume (52 vs 48 ml/m2; p=0.61). Twenty pts (80%) maintained areas of LGE; as expected, there was a reduction in the number of segments with LGE in 14 pts (56%) and this number was significantly lower in FUP CMR (4±2.2 vs 2.4±2.1; p=0.002). In a mean follow-up of 466 ± 244 days, 4 adverse events were registered: 1 patient had very frequent symptomatic premature ventricular complexes and 3 pts evolved with new HF (NYHA class II). There wasn't significant association between adverse events occurrence and maximal troponin T value, presence of ST segment elevation and the analyzed CMR parameters, namely, the presence and extension of LGE.

Conclusions: In this population of pts with acute myocarditis, medium-term adverse event rate was very low and no independent predictor was identified. It is important to note that in the majority of pts, FUP CMR showed persistence of LGE areas, being able to constitute a pathophysiological mechanism for future adverse outcomes.

P278

Echocardiographic evaluation of safety of radiotherapy of cardiac sarcomas

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Background: Primary cardiac sarcomas (PCS) have a dismal prognosis, with a low level of evidence regarding the optimal management due to disease rarity. Complete surgical resection is the mainstay of treatment, but the resection may be incomplete or impossible because of the local extension. Multimodal treatment (MMT) with chemotherapy and radiotherapy (RT) is widely used in soft tissue sarcomas of the extremities, improving survival. New RT techniques, as Intensity Modulated Radiotherapy (IMRT-TOMO) focus the radiation burden to the target neoplasm and limit the involvement of the cardiac structures. Nevertheless, RT is rarely used in PCS, because the target lesion is inside the heart, and the heart's movement make difficult to avoid the irradiation of the surrounding structures.

Purpose: Our aim was to report the short and long term echocardiographic changes in patients (pts) with cardiac sarcomas treated with TOMO or IMRT.

Methods: Amongst a group of 22 pts treated with MMT for PCS, we analyzed 8 pts (6 males) with PCS (5 angiosarcomas) treated with local RT. All patients underwent surgical resection and 7 pts had received previous chemotherapy. For every patient, we reviewed the echocardiograms performed (as for protocol) at baseline (before starting RT), weekly during RT and at the last follow-up (FU), the FU was performed every 3 months for 2 years, every 6 months for 3 more years, then yearly). The mean age was 47.75 years (range 23-72). The mean duration of FU was 3.4 years (range 1.2-6.5). Mean tumor size at diagnosis was 6.6 cm (range 2.5-14cm). The tumor affected the left ventricle (LV) in 2 pts, interventricular septum in 1 pt, right atrium in 4 pts and left atrium in 1 pt.

Results: Before RT, the mean LV ejection fraction (EF), global longitudinal LV strain (GLS), S' (peak systolic velocity of basal interventricular septum), MAPSE (mitral annular plane systolic movement) and Tei index were 65±4%, -16±3%, 6.5±0.7 cm/s, 10.7±1 mm, 0.48±0.18, respectively. Also, TAPSE (tricuspid annular plane systolic movement) and RV FAC (fractional area change) were 15.7±4mm and 49±13%, respectively. After RT, there was a trend to a slightly lower mean EF (63%), S' (6 cm/s), MAPSE (9.8mm), TAPSE (13mm) and RV FAC (48%) and higher GLS value (-15%) and Tei index (0.55) (p=NS). Three patients died in the follow-up (2 pts of distant metastases, 1 pt of pulmonary embolism) and 5 are currently alive, free of disease. At the last follow-up, the mean LV EF was 65% and mean GLS was -17%, and there were no cases of constrictive pericarditis.

Conclusion: In our experience RT for heart sarcomas seems to be relatively safe using modern RT techniques. We found a trend to a slight (not statistically significant neither clinically relevant) worsening of cardiac function at short term FU, with at least partial recovery during long term FU. Larger studies are necessary to further evaluate the safety of RT in the multimodal treatment of cardiac sarcomas.

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Left ventricular non-compaction: application of imaging diagnostic criteria in real life

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On behalf of: SUNSHINE

Introduction: Left ventricular non-compaction (LVNC) is characterized by the presence of an extensive non-compacted myocardial layer lining the cavity of the left ventricle (LV) and potentially leads to cardiac failure, thromboembolism, and malignant arrhythmias. Diagnostic imaging criteria were first described for echocardiography and after by cardiac magnetic resonance (CMR). Some authors assume CMR as the gold standard for LVNC diagnosis but there are few studies comparing CMR with echocardiographic criteria in LVNC.

Aim: The purpose of this study was to evaluate the concordance between CMR and echocardiographic LVNC diagnostic criteria.

Methods: We performed a prospective, multicenter study, involving 11 hospital centers that include all patients with LVNC who underwent an CMR and an echocardiogram. The number of patients fulfilling each one of the three echocardiographic published definitions (Chin, Jenni and Stollberger) were correlated with CMR criteria (diastolic noncompacted/compacted (NC/C) length in the long-axis > 2,3).

Results: We included 59 patients with LVNC, 34 male (58%) with a mean age of 45,8 ± 19,3 years.

CMR criteria for LVNC were met in 79,7% of patients. The remaining patients have echocardiographic criteria without CMR diagnostic criteria for LVNC.

Assuming CMR as the gold standard the following results for echocardiographic criteria were found: 1. Jenni criteria have a positive predictive value of 55,3% and a negative predictive value of 33,3%;

2. Chin criteria have a positive predictive value of 66,7% and a negative predictive value of 83,3%;

3. Stollberger criteria have a positive predictive value of 42,6% and a negative predictive value of 58,3%.

A lack of correlation between CMR and Echocardiographic criteria for LVNC was observed.

Conclusion: The findings in this study addresses important questions concerning the diagnosis of LVNC. In fact, the lack of correlation between CMR and echocardiographic criteria for LVNC, raise the need to optimize both the echocardiographic and CMR criteria for LVNC.

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The role of 2D strain echocardiography to ascertain true LV function recovery in PPCM patients

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Background: Peripartum cardiomyopathy (PPCM) is a relatively uncommon disease. Its outcome is associated with either the possibility of complete recovery or with lasting morbidity which contributes to increased mortality. Previous studies defined the recovery of left ventricle (LV) function cut-off point of LV ejection fraction (LVEF) of ≥ 50%, but women who was proclaimed recovered still have potential risk of worsening LV function during subsequent pregnancy. This might suggested that some patients do not reach complete LV recovery and remain with residual LV myocardial dysfunction.

Purpose: This study sought to evaluate the role of comprehensive echo techniques of 2D Systolic Strain (2DS) imaging as an additional examination to confirm LV systolic function in recovered PPCM patients.

Methods: This study was part of PPCM prospective cohort registry at our centre. We evaluated 23 recovered PPCM patients who were proclaimed to have complete recovery based on echo Biplane Simpson's method from April 2015 to April 2017. The assessment of 2D strain echo consisted of global longitudinal strain (GLS), global radial strain (GRS), and global circumferential strain (GCS), all were measured using speckle tracking echocardiography. The left ventricular function were measured with biplane Simpson's LVEF. The role of 2D strain echo as an additional examination to confirm LV systolic function was analyzed with multivariate regression analysis.

Results: A total of 56 PPCM patients were registered in ongoing prospective cohort registry from September 2014. Of the 35 patients with complete recovery based on Simpson's biplane method, 23 of them were enrolled in this study (mean age 32 ± 5 years), 3 patients were excluded due to sub-optimal echo image, and the others were loss to follow-up. There were 11 subjects who still have low GLS (mean -17.8 ± 3.5 %), low GRS (mean 32.6 ± 13.9 %), and low GCS (mean -14.1 ± 3.6 %) despite recovered of the LV systolic function. We found a strong correlation in bivariate analysis between GLS and LVEF (r=0.640, p<0.05), GRS and LVEF (r=0.639, p<0.05), and moderate correlation between GCS and LVEF (r=0.563, p<0.05). Multivariate linear regression analysis showed GLS and GRS have a significant role to confirm LV

systolic function (β 0.625; p < 0.001), (β 0.636; p < 0.001), after adjusted with BMI, hypertension, and parity.

Conclusion(s): This study demonstrated comprehensive echo techniques imaging of GLS and GRS should be used as an additional examination to confirm LV systolic function in recovered PPCM patients. Therefore 2D strain echo might identify residual myocardial injury in recovered PPCM women with apparent recovery of LV systolic function.
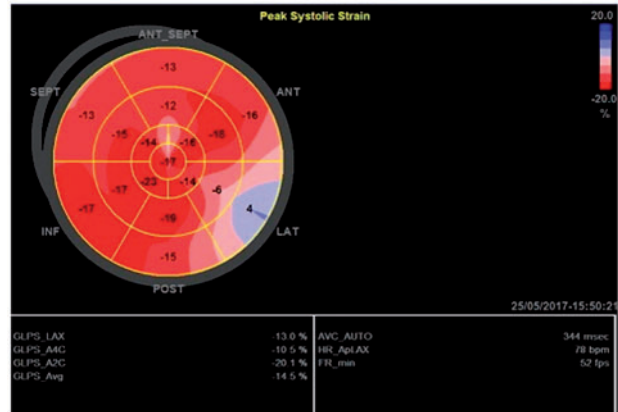
Abstract P280 Figure. Bull's eye GLS of recovered PPCM patient

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Alcohol abuse causes impairment of diastolic function and influences left ventricular deformation parameters

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Introduction: Alcohol abuse can cause heart dysfunction. Data about correlation between total or daily dose (TD- total dose/AUD-alcohol unit per day) and heart function (ECHO and laboratory) are rare so we compared erlier obtained data between patients with heavy and light pattern (HP vs LP) of alcohol consumption.

Methods: A group of 37 subjects without history of heart diseases but abusing alcohol were included. We divided our patients into 2 groups: drinking ≥5 alcohol units per day (heavy pattern, HP; 9 pt., mean age 55±11) and <5 units (but systematically >1 unit) per day (light pattern LP, 28 pt., mean age 51±10) and choose 2 parameters describing severity of alcoholism: TD and AUD. - See table 1.

Results: Both group presented low-range normal values for left ventricular EF and GLS (global longitudinal strain), right ventricular function were fully preserved, see table 1. Indices of left ventricular diastolic function (E/A and E/E' ratio) were significantly worsened and left atrial volume showed a tendency to larger values in HP group: 1.4±0.8 vs 1,0±0.35, p=0.01 for E/A, 11.9±8.9 vs 7.74±3.1, p=0.02 for E/E' and 52,4±36 ml vs 36,7±17 ml, p=0.08 for LA volume. Moreover, significant correlations were observed between TD and E/A (r=0,66, p=<0001), E/E' (r=0.54, p=0.0006), left atrial vol. (r=0.56, p=0.0004) and strain (negative correlation for absolute strain values) GLS (r=-0.4, p=0.016).

Conclusions: Excessive alcohol abuse caused impairment of diastolic LV function corresponding with moderate (pseudonormal) stage of diastolic dysfunction. Strain showed trend to be lower in heavy drinkers group (especially measured in 2 chamber view). Despite small number of examined subjects diastolic function deterioration and longitudinal strain impairment showed dose-dependent pattern.Table 1

Parameters	HP mean	HP SD	LP mean	LP SD	P value
EF	51,78	20,21	53,46	13,08	0,77
E/A	1,48	0,85	1,01	0,35	0,018
E/E'	11,95	8,97	7,39	3,11	0,027
LA vol	52,45	36,42	36,7	17,43	0,08
TAPSE	21,45	5,22	22,85	6,76	0,57
GLS	-16,63	6,351	-18,64	4,13	0,29
AFI 3c gs	-15	9,67	-17,87	5,22	0,43
AFI 4c gs	-14,94	8,47	-17,31	5,28	0,33
AFI 2c gs	-13,82	10,18	-18,48	5,04	0,07
NTpro BNP	980,19	1546,77	691,82	1395,1	0,69

HP, LP- low, heavy drinkers
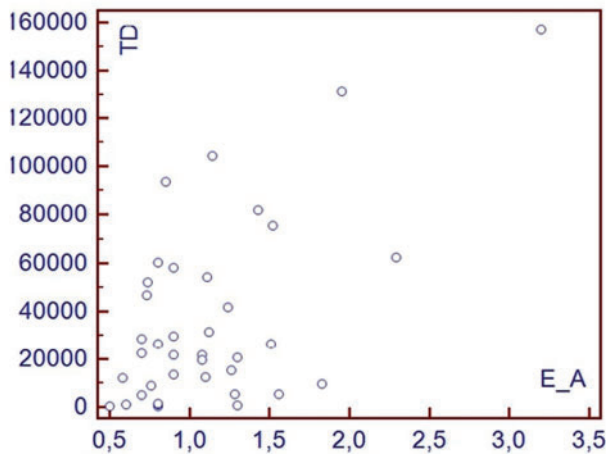
Abstract P281 Figure. 1

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Thoracic aortic aneurysm and left ventricular systolic function

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Introduction: The primary impairment of left ventricular (LV) systolic function have been reported in some inherited syndromic thoracic aortic aneurysms (TAA), such as Marfan and Ehlers–Danlos syndromes.

The aim was to evaluate the LV function in non-syndromic TAA without significant coronary artery disease.

Methods: 50 consecutive patients (mean age: 57.9 ± 14.9 years) with TAA were enrolled in our study in 2013. Computed tomography with three-dimensional reconstruction used to measure aortic diameters. Histopathological analysis of resected aortic tissue specimens after surgery of the ascending aorta, preoperative coronary angiogram, and preoperative transthoracic echocardiography was performed.

Results: The LV was dilated in male (end-diastolic volume: 157.9 ± 79.0 ml) and female (end-diastolic volume: 110.0 ± 34.3 ml) TAA patients. Global systolic LV function was depressed in both males and females (EFsimpson: 54.2 ± 10.2 and $58.7 \pm 8.6\%$, respectively). There was a moderate negative correlation between ascending aortic diameter and LV ejection fraction (r=–0.42; p=0.002).Patients with medial degeneration in tissue samples (elastic fibre fragmentation, cystic medial change, smooth muscle cell necrosis) had worse LV systolic function than patients without histological features of medial degeneration (EFsimpson: 54.0 ± 7.8 vs. $59.6 \pm 3.6\%$; p=0.012)Bicuspid aortic valve was identified in 18 patients (37.5%), tricuspid – in 32 patients (62.5%). BAV patients were younger than TAV (47.2 ± 12.2 vs. 60.0 ± 10.8 years; p<0.0001). The global systolic LV function (EFsimpson: 57.4 ± 8.7 vs. $56.1 \pm 13.5\%$; p=0.71) and maximal aortic diameter (52.6 ± 8.4 vs. 53.2 ± 9.1 mm; p=0.82) did not vary between BAV and TAV patients.In the multiple regression analyses aortic root diameter, but not LVEF, was affected by β-blockers preoperative treatment (p=0.03). There was no effect on aortic diameter or LVEF by ACEI, ARB treatment (p>0.05).

Conclusions: We found LV systolic dysfunction in non-syndromic TAA patients without significant coronary artery disease. This may affect their postoperative survival and can be explained by damage to the intramyocardial extracellular matrix in aortic medial degeneration.

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Myocardial mechanics in patients with liver cirrhosis: augmented circumferential strain in response to circulatory dysfunction

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Background: It is believed that cirrhosis is associated with impaired systolic contractile reserve and diastolic dysfunction. Lately, the connection between cirrhotic circulatory dysfunction (CCD) and decrease in cardiac performance has been suggested, however, the mechanism of this effect remains unclear.

Objective: To determine the impact of CCD in myocardial mechanics.

Methods: We enrolled 45 patients with compensated and decompensated cirrhosis. A complete echocardiogram with speckle-tracking myocardial mechanics analysis was performed at the same time of determination of plasma renin activity (PRA), a surrogate marker of CCD (cutoff value: >4 ng/mL/hour).

Results: The characteristics of study population are shown in the Table. GLS values did not differ between patients with and without CCD. In subjects with higher levels of PRA, GCS was significantly increased. Diastolic dysfunction is uncommon when the new criteria are applied.

Conclusions: Circumferential deformation is increased in CCD. GCS could represent a parameter for monitoring cardiac function. Follow-up data will establish the prognostic implications of GCS.Patient baseline characteristics

	Total (n:45)	Circulatory Dysfunction (n: 10)	No Circulatory Dysfunction (n: 32)	p value
Age (years)	57.5 ± 7.8	52.1 ± 7.5	59.4 ± 7.3	< 0.05
Male gender, n (%)	35 (77.8%)	8 (80%)	24 (75%)	0.74
MELD score	13.4 ± 0.5	17.3 ± 4.9	11.9 ± 5.2	0.01
Creatinine (mg/dL)	0.8 ± 0.3	1 ± 0.2	0.8 ± 0.3	0.36
Bilirubin (mg/dL)	2.1 ± 1.9	3.4 ± 2.3	1.6 ± 1.7	0.01
Sodium (mEq/L)	139.5 ± 3.9	136.1 ± 5.6	140.7 ± 2.5	< 0.05
INR	1.5 ± 0.5	1.7 ± 0.4	1.3 ± 0.5	0.04
QTc interval (ms)	415.9 ± 35.6	422.4 ± 37	412.7 ± 35.4	0.52
Diastolic dysfunction, n (%)	7 (15.6%)	2 (20%)	4 (12.5%)	0.76
LVEF (%)	65.1 ± 4	65.2 ± 2.9	65.1 ± 4.4	0.94
E/ė ratio	11.1 ± 3.2	12.3 ± 3.8	10.5 ± 2.9	0.13
TR velocity (m/s)	2.2 ± 0.6	2.5 ± 0.5	2.1 ± 0.6	0.10
Cardiac Index (L/min/m2)	3.8 ± 0.9	3.9 ± 1	3.7 ± 1	0.72
GLS (%)	-22 ± 2.2	-22.7 ± 1.6	-22.8 ± 2.4	0.23
GCS (%)	-29 ± 4.2	-32 ± 2.8	-28 ± 4.2	0.02

GCS: Global circumferential strain; GLS: Global longitudinal strain; INR: International normalized ratio; LVEF: Left ventricular ejection fraction; MELD: Model for End-stage Liver Disease; QTc: Corrected QT interval; TR: Tricuspid regurgitation.

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Prevalence of pulmonary hypertension in chronic kidney disease patients undergoing hemodialysis

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Background: Pulmonary hypertension (PH) which rarely is severe occurs frequently in patients with chronic kidney disease (CKD) but possible etiologic factors has not been completely elucidated.

Purpose: This study wants to evaluate the prevalence of PH among CKD patients on maintenance hemodialysis (HD) and compare clinical and echocardiographic variables among patients with and without PH.

Methods: Clinical data of 40 HD patients referred to our center were recorded and detailed echocardiography performed in the day after HD on each case.PH was defined as systolic pulmonary artery pressure (SPAP) more than 35 mmHg at rest.Variables of patients with and without PH were compared.

Results: PH was detected in 12 HD patients with prevalence of 30%.Patients with PH had higher dialysis vintage (41 ± 35.9 versus 23.3 ± 8.6 months, P value =0.04), larger left atrial (LA) and right ventricle (RV) size, higher left ventricle end-diastolic dimension (LVEDD) and lower ejection fraction (EF), higher LV mass compared with Non PH patients (P value < 0.05).

LV diastolic dysfunction and pericardial effusion were significantly associated with PH (P value< 0.05).Crude mortality was relatively similar in both groups.

Conclusion: PH is common in HD patients and is mostly multifactorial. Elevated pulmonary capillary wedge pressure (PCWP) may be the most important factor in evolution of PH. Chronic volume overload,LV systolic and diastolic dysfunction are the most common contributing factors in PCWP elevation in this population.comparison of variable according to PH

Variable	PH group	Non-PH group	P value
SPAP(mmHg)	50.1 ± 13.8	29.7 ± 3	
EF (%)	42.2 ± 13.5	49.6 ± 8.5	0.04
LVEDD (cm)	5.8 ± 0.6	5.2 ± 0.8	0.05
LV mass(gr)	258.7 ± 67.8	185.6 ± 78.6	0.01
LA area(cm2)	23.3 ± 4.9	19.2 ± 6.3	0.05
Diastolic dysfunction≥grade 2 n(%)	9 (75%)	7 (25%)	0.03
Moderate/Severe MR n (%)	4 (33%)	2 (7%)	0.03
E/E` ratio	20.8 ± 5.2	10.8 ± 4.3	0.00
RV size (cm)	3.5 ± 0.6	2.9 ± 0.4	0.03
TAPSE (mm)	21.8 ± 5.6	21.3 ± 3.3	NS
TASV (cm/sec)	11.6 ± 3.2	13.3 ± 3.6	NS
Pericardial effusion n(%)	5 (41%)	1 (3%)	0.02
Dialysis vintage (months)	41 ± 35.9	23.3 ± 18.6	0.04

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The effect of education, telephone monitoring on self-efficacy and shock anxiety of implantable cardioverter defibrillator patients

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Background: Although ICD implantation has life-saving benefits, it causes widespread anxiety, depression and fear in the patients and has physical, social and psychological negative effects.
Purpose: The purpose was to investigate the effects of education, telephone monitoring on self-efficacy and shock anxiety of implantable cardioverter defibrillator patients.
Methods: Between February and September 2016, 65 patients who were hospitalized for ICD admission and who were waiting to be discharged after ICD were assigned to randomized intervention (n=33) and control (n=32) groups at the Cardiology Clinic of Education and Research Hospital. The investigation was approved by the ethics committee. Both groups were informed about the research and written approval was obtained. A training booklet about ICD prepared by individual training was given to intervention group. Telephone monitoring was done once in two weeks for three months then once a month. No attempt was made to the control group. In the third and sixth month controls of both groups, Self-efficacy and Expectation Outcomes After the ICD Implantation Scales, Florida Shock Anxiety Scale were administered. For the evaluation of the study data, descriptive statistical methods (Mean, Standard Deviation, Median, Frequency, Ratio, Minimum, Maximum) were used; moreover, for comparison of quantitative data, Student t Test was used for comparisons of two groups' parameters which showed normal distribution and Mann Whitney U Test was used for comparisons of two groups' parameters which did not show normal distribution. Pearson's Chi-square test was used to compare qualitative data. Spearman's Correlation Analysis was used to evaluate inter-variable relationships. Significance was evaluated at p <0,05 level.
Results: 76.9% of the patients were male, aged between 18 and 79 years and mean age was 55,80 ± 15,55. The difference between 3rd month self-efficacy scores of the groups were not statistically significant (p=0,321); whereas, the 6th month self-efficacy scores were statistically higher at significant level in the intervention group than the control group (p= 0,034). The increase in the 6th month scores was statistically significant in both groups compared to 3rd month scores (p=0,001). 3rd month and 6th month shock anxiety scores did not differ between the groups (p>0,05). In both groups, as the number of shocks increased, an increase in shock anxiety was detected. (Intervention group, r:0,441, p=0,01) (Control group, r:0,472, p=0,006). It was found that those who were younger than 60 years had higher levels of shock anxiety and lower levels of self-efficacy.
Conclusions: According to the results, it was seen that the attempt increased the self-efficacy and expectation outcomes and did not affect the shock anxiety. The fact that shock anxiety in shocked patients is higher than in the ones who are not shocked suggests that different attempts for shock anxiety should be planned.

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Facing up heart disease in elderly people diagnosed with cancer; is echo enough?

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On behalf of: CARTIER (CARdioToxicity In the Elderly pRogramme) Project

Background: There is a lack of significant data regarding how the baseline cardiac condition of elderly patients (pts.) is before starting any cancer treatment (c-tt°).
Although, cardiac magnetic resonance (cMR) is considered the gold standard for the measurement of cardiac structure and function, transthoracic echocardiography (TTE) is the imaging technique recommended to monitor the ventricular systolic function in patients with cancer.
Our aim was to compare the prevalence of underlying cardiac disease (CD) in this population (> 65 yo) before receiving c-tt° using both TEE and cMRI.
Methods: Between March 2015 and September 2016, 95 pts. with cancer underwent a comprehensive diagnostic work-up, including TTE and cMRI. Analyses of all images were performed and interpreted by expert cardiologists following the last guidelines recommendations.
Results: Out of the 95 pts. included (mean age 73yo, 58% males, 75% solid tumor), before cardiac assessment, only 11.6% had no CVRF and 43% had previous CD. There were not inconsiderable differences in LV volume and mass between TTE and MRI findings. Moreover cMR detects a significant higher number of patients with depressed left ventricle ejection fraction and allows us to assess more accurately the right ventricle. (Table 1)
Conclusions: cMR identifies a significant higher number of patients with unknown CD comparing to TTE in elderly patients with cancer. Diagnosis, treatment and follow-up of these pts. in a specific Cardio-Oncology Unit might reduce the significant risk of cardiac toxicity related to c-tt°Cardiac Imaging Findings

	TTE	cMR	p
No performed		5 (5.3%)	
LV end-diastolic volume index (ml)	92±33	131±37	< 0.05
LV dilated (%)	5 (5.2%)	15 (16%)	< 0.05
LVEF (%)	63 ±8.4	63± 10	0.72
Depressed LVEF (%)	10 (10.5%)	25 (25%)	< 0.05
Mild/moderate/severe LV dysfunction (%)	8.4/1/0	22/3.1/1.0	<0.05
RV end-diastolic volume index (ml/m2)		72 ±19	
RV dilated (%)	2 (2.1%)	11 (12%)	< 0.05
RVEF (%)		59.1 ± 9.4	
RV systolic dysfunction	0%	34 (38%)	< 0.05
Late gadolinium enhancement (ischemic etiology)		3 (3%)	

cMR: cardiac magnetic resonance; TTE: transthoracic echocardiography; LV: left ventricular; LVEF: left ventricular ejection fraction; RV: right ventricular.

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Association between echocardiographic and inflammatory markers in patients with atrial fibrillation

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Background: There is extensive evidence that inflammation contributes to the pathophysiology and recurrence of atrial fibrillation (AF). Our aim was to evaluate the association of specific echocardiographic markers with inflammatory biomarkers in patients with AF.
Methods: We prospectively enrolled 26 patients who were submitted to electrical cardioversion (ECV) due to AF and/ or atrial flutter. All patients had data collected regarding clinical characteristics, biochemical markers before ECV as well as ECG before and after ECV. Both transthoracic (TTE) and transoesophageal (TOE) echocardiograms were performed prior to ECV in all patients. Homocysteine and interleukin-6 were measured before TOE. TTE parameters included end systolic (TSd) and end diastolic (TDd) left ventricle (LV) diameters, LV volumes, transmitral flow evaluation, lateral e', septal e', average E/e' ratio, left atrium volume index (LAVI). Additionally, we searched for the presence of F waves in transmitral flow; if present, F wave VTI was calculated. Left atrial appendage (LAA) peak flow velocity, maximum tissue velocity and strain rate were recorded during TOE. Linear regression was performed to assess the association of echocardiographic markers with inflammatory biomarkers.
Results: A total of 22 patients were included for final analysis with a mean age of 68.7±11.4 years (40.9% males). At univariate analysis, higher TSd (p=0.026), TDd (p=0.015) and LV end diastolic volume (p=0.032) predicted increased homocysteine values (figure). Similarly, higher VTI of transmitral E wave (p=0.009), average E/e' (p=0.010), LAVI (p=0.036), F wave VTI (p<0.001) were identified as predictors of elevated interleukin-6 values. F wave VTI was an independent predictor of increased interleukin-6 values (p=0.005, R=0.977).
Conclusion: The present study suggests that echocardiographic markers such as end diastolic LV dimension and F wave TDI are surrogate markers of inflammation in patients with AF.
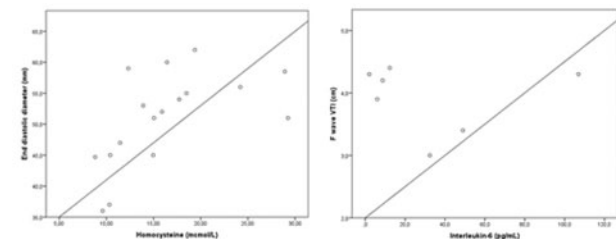
Abstract P287 Figure. Univariate analysis

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The effect of psoriasis on diastolic (Dys)function: a pilot echocardiographic study

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Purpose: Recent studies have established psoriasis as an independent risk factor for the development of cardiovascular disease. The aim of this study was to evaluate, with clinical, analytical and imaging methods, the effects of the systemic proinflammatory state induced by psoriasis on cardiac remodelling and evaluate Diastolic Dysfunction (DD) as an early marker of cardiovascular involvement.

Methods: This study enrolled 38 consecutive psoriasis patients (47,5 years, 68,4% males). Clinical information and evaluation of inflammatory markers were collected. Diastolic function was assessed by two-dimensional transthoracic echocardiography (TTE) and speckle-tracking (STE).

Results: This description of statistically relevant data, and its variation according to the widely accepted DD markers, found that in patients with higher values of Psoriasis Area and Severity Index (PASI), as well as higher values of High-Sensitive C-Reactive Protein (hsCRP) values, both left atrial (LA) volume index > 34 mL/m2 and Left Ventricle Global Longitudinal Strain (LV GLS) > -20% are more frequently seen. We found that 60% of patients presented a LA volume above 34 mL/m2 and 51,4% presented LV GLS > -20%. E/A ratio below 0,75 was found in 10,8%, 8,1% had values above 1,5 and 44,4% had deceleration time greater than 220 ms.

Conclusion: TTE analysis, particularly with STE shows promising prospects in early identification of DD in psoriatic patients. Also, hsCRP may have a role in detecting low grade inflammatory states and predict long-term repercussions of chronic inflammatory states.

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Early morphological changes in preadolescent athletes assessed by three-dimensional echocardiography

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Background: Athlete's heart is a term used to describe the morphological and functional changes in the hearts of athletes competing in endurance sports. Recent studies suggest that these changes may occur even in preadolescent athletes.

Purpose: This study aims to further describe the morphological and functional changes in the left ventricle (LV) of preadolescent endurance athletes using three-dimensional (3D) echocardiography.

Methods: Seventy-six cross-country skiers aged 12.1±0.2 years were compared to a control group of 25 non-competing individuals aged 12.1±0.30 years. Echocardiography was performed in all subjects, including 3D acquisitions and 3D LV volumes, ejection fraction (EF), stroke volume, cardiac output and LV mass were assessed.

Results: The cross-country skiers engaged in on average 7.0±2.4 hours of endurance training per week, while the non-competing individuals self-reported on average 1.8±2.4 hours of physical exercise per week. There were no differences between the two groups with regards to 3D LV volumes, EF and stroke volume (Table). However, 3D LV mass and 3D LV mass corrected for BSA yielded significant differences.

Conclusion: The results of this study support the notion that changes related to athlete's heart can be seen as early as in preadolescence and is the first study to describe these early morphological changes using 3D echocardiography.

Table

	Athletes (n=76)	Controls (n=25)	p-value
Resting heart rate, bpm	72±12	80±20	0.01
LV end-diastolic volume, ml	100±14	96±14	0.23
LV end-systolic volume, ml	44±7	41±7	0.11
Ejection fraction, %	56±3	57±3	0.19
Stroke volume, ml	56±8	55±8	0.52
Cardiac output, l/min	3.9±0.9	4.4±0.9	0.03
LV Mass, g	92±10	87±8	0.03
LV Mass/BSA, g/m^2	69±6	64±7	0.001

Data expressed as mean±SD. Right column shows P-values for Student's t-test.

P290

Atrial function after running and swimming races: different impact on atrial performance of two endurance disciplines

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Background: Endurance training within sports involving the lower part of the body (cycling or running) has been associated with atrial remodelling and an increased risk of atrial fibrillation. However, no data is available on upper-body-involved disciplines (swimming).

Purpose: The aim of our study was to compare acute changes in atrial performance after an open-water race with those shown after a trail-running race.

Methods: Standard and speckle tracking echocardiographic assessment of right atria (RA) and left atria (LA) was performed at baseline and immediately after a 9.5 km open-water swimming race in 26 healthy men. The same protocol was performed in 21 male runners before and after a 35 km-trail-running race.

Results: Training load (METS/hours/min/week) was similar in both groups (swimmers: 4720±292, runners: 4591±292;p=0.87). Table 1 shows the results of the echocardiographic parameters. Lower baseline values of atrial deformation with slightly smaller volumes were observed in swimmers. This group showed an increase of atrial performance with significant increases in atrial deformation and no reduction in atrial volumes. Runners showed a decrease in atrial volumes an deformation.

Conclusions: The observed transient impairment in atrial performance after leg-involved endurance events was not evident after an endurance swimming race. Swimmers seem to have larger functional reserve of both atria, particularly the RA, as compared to runners. The underlying mechanisms explaining these differences need further investigation

P291

Left ventricle remodelling in teenager athletes: is it different from that observed in adults?

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Background: Left ventricle remodelling (LVre) is a common finding in adult athletes. Recently, teenager athletes (TA) training load has increased progressively achieving that of adult athletes. However, little data is available regarding LVre in teenagers.

Purpose: Our aim was to analyze and characterize LVre in TA, and compare it to that observed in young adult athletes (YA).

Methods: 1686 competitive athletes from 20 different sport disciplines were included. Conventional 2D echocardiography was performed and LVre was defined according to current recommendations. Results were analyzed based on the dynamic and static components in concordance with Mitchell's classification. Training load and years of training were also determined.

Results: We compare two groups: >18 years old (YA, n= 646) and <18 years old (TA, n= 1040). Table 1 shows the echocardiographic characteristics in each group. TA showed smaller LV dimensions and less frequently LVre as compared to YA. We observed a weak correlation, though statistically significant, between the years of training and LVre (LV mass index and Relative Wall thickness (RWT), r=+0.265 and r=+0.137 respectively, p< 0.01). Sports with higher dynamic component were associated with higher LVre (LV mass index 91.59 g/m2 vs 82.45 g/m2 and RWT 0.364 vs 0.351, p<0.01)

Conclusions: Young athletes develop larger LV remodeling than teenagers, potentially due to larger number of years of training. Athletes from sports with high dynamic component show greater LV remodelling.Table 1.Echocardiographic characteristic

Abstract P290 Table 1

| Parameter | Swimmers | | | | Runners | | | | | |
	Baseline	Post-race	Δ%	p	Baseline	Post-race	Δ%	p	p*	p**
LA Sa	-14.9±2.7	-16.7±4.9	+8.6±31.2	=0.30	-17.0±4.1	-17.4±4.0	+4.7±18.2	=0.40	=0.06	=0.63
LA St	33.2±6.8	37.5±7.2	+10.2±21.2	<0.05	42.0±7.2	40.1±7.6	-3.7±15.2	=0.17	<0.05	<0.05
LA SRa	-2.0±0.5	-2.2±0.5	+6.3±25.9	=0.55	-2.1±0.5	-2.1±0.5	+3.9±16.6	=0.37	=0.31	=0.76
LA SRs	1.7±0.4	1.9±0.3	+15.2±24.5	<0.05	1.9±0.4	1.7±0.3	-4.1±14.1	=0.09	=0.12	<0.05
RA Sa	-14.8±1.9	-18.4±4.8	+27.5±33.2	<0.05	-19.0±4.1	-18.3±2.7	-0.9±17.5	=0.39	<0.05	<0.05
RA St	34.0±5.7	34.0±10.9	+4.1±36.7	=0.36	47.1±7.3	39.6±5.3	-15.0±10.6	<0.05	<0.05	<0.05
RA SRa	-1.8±0.4	-2.2±0.6	+28.7±30.9	<0.05	-2.2±0.5	-2.2±0.4	+0.7±17.0	=0.59	<0.05	<0.05
RASRs	1.8±0.3	1.8±1.0	+5.3±57.9	=0.09	2.1±0.4	1.8±0.2	-12.5±13.5	<0.05	<0.05	<0.05
LA volume (ml/m2)	29.6±6.5	30.2±6.8	+2.6±12.8	=0.57	34.8±6.3	32.0±8.5	-8.7±12.5	<0.05	<0.05	<0.05
RA volume (ml/m2)	29.5±4.4	31.0±4.1	+6.0±12.0	=0.06	30.9±7.1	29.6±4.4	-4.59±8.5	<0.05	=0.47	<0.05

p*: swimmers vs runners for the basal comparation; p**: comparation for the % change after the race; Sa and SRa: strain and strain rate during contractile atrial fase; St and SRs: strain and strain rate during reservoir atrial fase.

Parameters	Teenager Athletes (<18 years)	Adult Athletes (>18 years)	P
N	1040	646	
Indexed LVDD, mm/m^2	28.46 ± 2.60	27.79 ± 2.31	<0.01
Indexed LVSD, mm/m^2	17.66 ± 2.22	17.34 ± 1.99	<0.01
Indexed Septum mm/m^2	5.21 ± 0.71	5.33 ± 0.67	0.330
Indexed PWT mm/m^2	5.09 ± 0.7	5.18 ± 0.62	<0.01
Indexed LV mass, g/m^2	78.26 ± 15.28	94.82 ± 19	<0.01
Cardiac hypertrophy, N, %	154 (14.8)	191 (29.6)	<0.01
RWT	0.35 ± 0.049	0.37 ± 0.055	<0.01
RWT > 0.42, N, %	139 (13.4)	126 (19.5)	<0.01
LV normal geometry, N, %	777 (74.7)	370 (57.3)	<0.01
Concentric remodelling, N, %	109 (10.5)	85 (13.1)	<0.01
Eccentric hypertrophy, N, %	123 (11.8)	151 (23.4)	<0.01
Concentric hypertrophy, N,%	31 (3.0)	40 (6.2)	<0.01

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Effects of recreational marathon training on myocardial structure and function: a speckle tracking echocardiography study

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Introduction: Recreational running is supposed to be favorable in reducing cardiovascular risk. But in some studies elite marathon running has been linked to sustained myocardial injury. Few data exists about effects of recreational marathon running on myocardial function.

Purpose: In this study we assessed the effect of recreational marathon running upon left and right ventricular function.

Methods: Echocardiograms were evaluated in 36 recreational marathon runners who performed at least 1 marathon within a year. Measurements included duration on marathon training, marathon races, time of last marathon, km per month or per week, time of last 10 km. We also assesed traditional indices of LV and RV systolic and diastolic function such as ventricle volumes, EF, FAC and transmitral flow measurements and indices of speckle tracking echocardiography (STE) such as longitudinal and circumferential strain, torsion and twisting rate.

Results: Data from 36 runners (mean age 49±10 years, 28 males, mean duration of running 14±14 years, mean marathon time marathon 235±88 min, mean km/month 165±94, mean km / last week of examination 38±28) were analysed. LV end-systolic (ESV/BSA) and end-diastolic (EDV/BSA) were positively correlated with marathon races (r=0,39, p=0,008 and r=0,38, p=0,025 respectively) along with mean km/month (r=0,43, p=0,009 and r=0,37, p=0,03 respectively) and mean km/last week (r=0,46, p=0,007 and r=0,37, p=0,03 respectively). Diastolic indices of transmitral E was positively correlated to mean km/week (r=0,36, p=0,04) while transmitral A was negatively correlated to mean km/week (r=-0,38, p=0,03) and DT was negatively correlated to km/month (r=-0,37, p=0,03). In STE circumferential strain of midwall and epicardial was positively correlated to marathon races (r=0,35, p=0,045 and r=0,35, p=0,043 respectively). Additionally peak LV twist and twisting rate were correlated negatively to years of marathon racing (r=-0,41, p=0,022 and r=-0,41, p=0,023 respectively) while peak LV untwisting rate was positively correlated to duration, number of races and negatively with the marathon time(r=0,54, p=0,002, r=0,37, p=0,041 and r=-0,515, p=0,004 respectively)and torsion of LV was negatively correlated to duration of running training in years (r=-0,46, p=0,009). Finally RV function assessed by FAC was correlated negatively with marathon races (r=-0,351, p=0,039). We found no correlation among marathon races, years of training, marathon time or km in the last week and the LV or RV global longitudinal strain.

Conclusions: These data suggest that marathon recreational training dilates LV, affects the diastolic function and has neutral effects on myocardial contractility regarding longitudinal strain but adverse effects when assessed by circumferential strain, twist and torsion which can be attributed to different effects of running to cardiac mechanics. Interestingly running burden had no effect on RV function in recreational marathon runners.

STRESS ECHO

P293

The prognostic value of triple imaging vasodilator stress echocardiography in diabetic patients: integration of wall motion, coronary flow velocity and left ventricular contractile reserve in a single

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On behalf of: Stress Echo 2020 study group

Background: Diabetic patients with negative vasodilator stress echocardiography (SE) by wall motion criteria may still suffer intermediate risk. Reduced coronary flow velocity reserve (CFVR) and/or blunted left ventricular contractile reserve (LVCR) may identify patients at higher risk missed by consideration of regional wall motion abnormalities alone.

Purpose: To assess the added prognostic value of CFVR and LVCR in diabetic patients with vasodilator SE negative for ischemia.

Methods: A total of 375 diabetic patients (age 68±9 years, 217males, ejection fraction 57±9%) underwent dipyridamole SE (0.84 mg/kg over 6 min) with triple imaging in a multicenter, prospective, longitudinal study. In all patients we assessed: 1) regional wall motion (negative in all, by selection); 2) CFVR of the left anterior descending coronary artery (abnormal value <2.0); 3) LVCR (stress/rest ratio) with left ventricular force (systolic blood pressure by cuff sphygmomanometer/end-systolic volume from 2D by Simpson rule).

Results: With a receiver operating characteristic analysis, LVCR <1.1 was the best prognostic predictor (area under the curve 0.67 [95% CI 0.62-0.72]; sensitivity 59%, specificity 66%) and was taken as abnormal value accordingly. CFVR was abnormal in 139 (37%), LVCR in 156 (42%); neither one in 157 (42%), and both in 77 (21%) patients. At individual patient analysis, a weak, albeit significant correlation (r=0.20; p=0.0001) was detected between CFVR and LVCR.During a median follow-up of 16 months (1st quartile 6, 3rd quartile 29 months), 86 major adverse cardiac events (MACE) occurred: 16 deaths, 13 myocardial infarctions, and 57 revascularizations (9 surgery, 48 angioplasty). Multivariable prognostic indicators were CFVR <2 (HR 4.91, 95% CI 2.93-8.22; p<0.0001), age (HR1.03, 95% CI 1.00-1.06; p=0.03), and LVCR<1.1(HR 1.60, 95% CI 1.01-2.53; p=0.04).The 3-year MACE-rate was 63% in patients with both abnormal CFVR and LVCR, 42% in patients with abnormal CFVR only, 19% in patients with abnormal LVCR only, and 10% in patients with both normal CFVR and LVCR (see figure). Hard event rate at 3 years was 3% in patients with both normal CFVR and LVCR, fivefold higher in patients with abnormal CFVR or LVCR only, and nine-fold higher in patients with both abnormal CFVR and LVCR.

Conclusions: Diabetic patients with negative SE by regional wall motion criteria during vasodilator stress may still have a significant risk in presence of an abnormal CFVR and/or LVCR, which assess the underlying, largely unrelated, microvascular and myocardial component of coronary circulation.
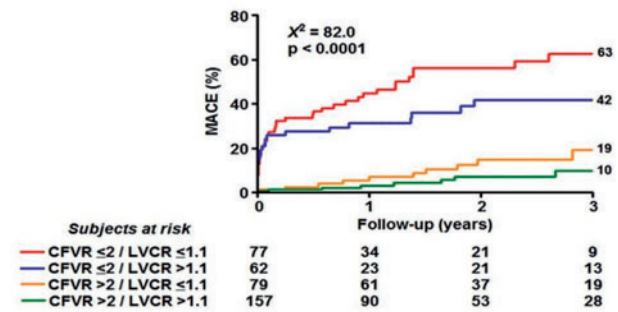
Abstract P293 Figure.

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Stress Echo 2020:ad-interim report

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**On behalf of:** Stressecho 2020 study group

Background: The curiosity-driven effectiveness trial "Stress echo (SE) 2020" (ClinicalTrials.gov ID: NCT03049995) started in late 2016 to provide prospective, international, large scale evidences on SE utilization in the real world within and beyond coronary artery disease. The target (by the end of 2020) is to have 100 centers recruiting 10,000 patients on 10 different subprojects.

Purpose: to assess the progress of SE2020 study at 9 months after study kick-off

Methods: The project was approved by the ethical committee of the principal investigator center in July 20, 2016; launched at European society Cardiology meeting on August 29, 2016; and started recruitment (first patient-in in the leading center) on September 1, 2016. All candidate readers had to pass quality control upstream to recruitment, completed as per May 20th, 2015 by 70 readers for regional wall motion (RWM); of them, a subset of 41 also completed B-lines reading. Overall, 31 different laboratories from 12 countries completed the quality control procedures (Argentina, Brazil, Bulgaria, Costa Rica, Hungary, Italy, Lithuania, Poland, Russia, Serbia, UK, US); of them, 23 started recruiting following local ethical committee clearance. The chosen stress (left to physician choice and tailored on specific diagnostic question)

was exercise in 779, dipyridamole in 568, and dobutamine in 108 patients. The optimal core protocol was quadruple imaging: RWM (mandatory in all); left ventricular contractile reserve (LVCR, force, stress/rest); B-lines (4-regions scan); left anterior descending coronary artery flow velocity reserve (CFVR).

Results: 1460 patients were recruited by 23 certified laboratories as per May 20th, 2017. Overall, the 1460 patients were distributed as follows: candidates to cardiac resynchronization therapy (n=8, target by the end of 2020=250); heart failure with reduced ejection fraction (124 patients, target 2500); hypertrophic cardiomyopathy (n=57, target 250); heart failure with normal ejection fraction (23, target 250); valvular heart disease (28, target 250); known or suspected coronary artery disease (1016 patients, target 2500); extreme physiology (n=190, target 240); congenital heart disease (5, target 250); borderline, early or at risk pulmonary hypertension (n=15, target 250); genetic stress echo in offspring of familial primary hypertension, dilated cardiomyopathy or hypertrophic cardiomyopathy (n=0, target 250). By imaging modality,1126 patients had dual, 757 triple, and 511 quadruple imaging (see Figure).

Conclusions: The effectiveness, curiosity-driven, observational SE2020 study is feasible in a large international network and is reshaping of SE practice with dissemination of novel parameters (progressively converging into quadruple imaging as the core protocol) and new applications (mainly outside coronary artery disease)
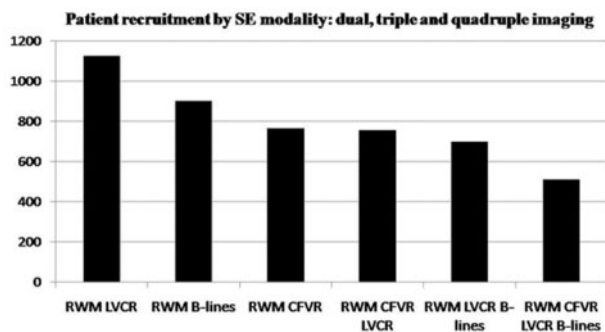
Abstract P294 Figure. Figure

P295

Correlation between coronary flow reserve and left ventricular diastolic function in patients without obstructive coronary artery stenosis treated with ivabradine

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Background: Transthoracic Doppler-derived coronary flow reserve (CFR) is an index of coronary arterial reactivity and can be impaired in both obstructive coronary artery disease (CAD) and coronary microvascular disease (CMD). Otherwise, CMD has been regarded as an important cause of left ventricular (LV) diastolic dysfunction. In different trials, ivabradine showed to improve CFR and diastolic function, but these effects were never correlated. The aim of our study was to assess the combined effect of ivabradine on CFR and LV diastolic function and the correlation between these two parameters.

Methods: 86 patients (52 M, 34 F; mean age 64±7 years) without obstructive CAD were enrolled in the study. After baseline data were collected, all patients underwent Doppler-derived CFR. Coronary flow was assessed in the left anterior descending coronary artery (LAD), and was identified as the color signal directed from the base to the apex of the left ventricle, containing the characteristic biphasic pulsed-Doppler flow signals. CFR were determined as the ratio of hyperemic, induced by intravenous dypiridamole administration, to baseline diastolic coronary flow velocity.

Doppler echocardiography included pulsed tissue Doppler of the mitral annulus. The ratio of mitral velocity to early diastolic velocity of the mitral annulus (E/e′) was used as a surrogate marker of diastolic function.

Patients were randomly assigned to ivabradine or placebo for one month (after uptitration phase). Doppler echocardiography and CFR assessment were performed again at the end of treatment period.

Results: There were no significant differences in baseline characteristics between ivabradine and placebo group. CFR was successfully performed in all patients. Baseline CFR was not significantly different in both groups. After treatment, in ivabradine group CFR significantly increased (3.34 ± 0.41 vs. 2.24 ± 0.36 - p < 0.01) and E/e′ significantly decreased (8.3 ± 1.8 vs. 10.4 ± 2.1 - p < 0.01). At baseline, a significant inverse association between CFR and E/e′ was observed. After treatment, a weaker correlation was observed.

Conclusions: CFR is associated with LV filling pressure in patients without obstructive CAD, and ivabradine is able to improve both CFR and diastolic function. A weaker correlation after treatment shows that the effect of ivabradine on coronary function is more complex than heart rate reduction and diastolic function improvement alone.
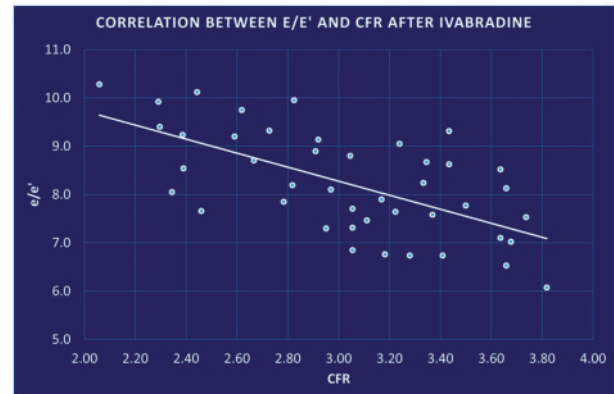
Abstract P295 Figure. Correlation between E/e' and CFR

P296

Stress echocardiography in patients with known or suspected coronary artery disease: prognostic value of a risk score

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Introduction: Pharmacological stress echocardiography (SEcho) is useful for the evaluation of cardiovascular prognosis of patients with coronary artery disease (CAD), however the physician should also consider clinical and resting echocardiographic parameters. A risk score would allow to integrate all these parameters for the stratification of cardiovascular prognosis.

Purpose: To evaluate the ability of SEcho to predict cardiovascular prognosis in patients with known or suspected CAD and to develop a cardiovascular risk score, integrating clinical, resting and stress echocardiographic parameters.

Methods: Retrospective study including 789 patients with known or suspected CAD, who performed Dobutamine SEcho (DobSEcho) or Dipyridamole SEcho (DipSEcho) between 2010 and 2015. A Cox regression analysis was used to identify the clinical, resting and stress echocardiographic variables that predict cardiovascular events (cardiac death, acute myocardial infarction (AMI) and myocardial revascularization). Using these variables, two cardiovascular risk scores were developed, one for DobSEcho and the other for DipSEcho. It was determined, using ROC curves, the cut-off point of each score that allowed the stratification of cardiovascular prognosis.

Results: During follow-up (Mdn=28 months, IQR=31), 13.7% of the patients had cardiovascular events. A positive SEcho showed to be an important predictor of cardiovascular prognosis (DobSEcho: HR=3.585, 95% CI 2.003-6.417, p<.001; DipSEcho: HR=6.496, 95% CI 1.510-27.946, p=.012). Other predictors were history of AMI, active smoking or percutaneous coronary intervention (PCI); decreased left ventricular function (LVF); rest wall motion score index (rWMSI); and symptoms during SEcho. Risk Score (DobSEcho): Risk=2,523* AMI+2,786* LVF+2,532* Symptoms SEcho+3,585* SEcho Result. Risk score (DipSEcho): Risk=3,710* Smoker+5,530* PCI+4,072* rWMSI+6.496* SEcho Result. Scores cut-off points: 3.1855 (J=0.504) (DobSEcho) and 5.8008 (J=0.587) (DipSEcho).

Conclusion: This study shows the value of SEcho parameters for the stratification of cardiovascular prognosis of patients with known or suspected CAD, either individually or as part of a cardiovascular risk score, in combination with clinical and resting echocardiographic parameters.

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Stress echocardiography as a prognostic tool in patients with previous myocardial infarct

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On behalf of: EchoLab Guimarães

Introduction: The evaluation of post-myocardial infarct (MI) prognosis constitutes a challenge in the clinical practice. Stress echocardiogram (SE) allows the evaluation of ischemia and prognostic stratification of patients with coronary heart disease (CHD). However, the presence of left ventricular (LV) dysfunction and baseline wall motion abnormalities may limit the prognostic value of SE.

Aim: To evaluate the prognostic value of SE in patients with previous MI

Methods: Retrospective study including 333 patients with previous MI submitted to pharmacological SE with dobutamine or dipyridamole (2010-2015). WE collected demographic, clinical, electrocardiographic and echocardiographic data. We defined a combined endpoint of cardiovascular (CV) events composed by the occurrence of non-fatal MI, revascularization or cardiac death.

Results: Patients were predominantly males (79.3%), with mean age 64.5±11 years. Major CV risk factors were very prevalent and 86.5% of patients presented 2 or more CV risk factors. The majority of patients (83.6%) had CHD previously documented on angiography and 2-vessel CHD was present in 37.7% and 3 vessel CHD in 21.6% of cases. History of percutaneous and surgical revascularization was present in 34.8% and 16.5 of cases, respectively. LV dysfunction was present in 47.5% and mean wall motion score index (WMSI) was 1.91±0.3.

Most SE were performed with dobutamine (74.2%) and 20.1% of the SE were positive for ischemia. Mean follow-up was 33.2±20.5 months. SE presented a sensitivity of 49.3%, a specificity of 84.5%, a positive predictive value (PPV) of 44.6% and a negative predictive value (NPV) of 86.8% for the occurrence of CV events, although these values may be underestimated by the long follow-up. Patients with positive SE presented a significantly lower event free survival than patients with negative SE (56±5.1 vs. 75±3.4 months; p=0.001). Univariate regression analysis identified the following predictors of CV events: SE result, female gender, renal failure, history of chest pain previous to SE, history of surgical revascularization, heart failure, LV dysfunction and nitrates use. Multivariate regression analysis identified as independent predictors of CV events the presence of renal failure (p=0.034), a positive SE (p<0.001) and LV dysfunction (p=0.012).

In the subgroup of patients with more wall motion abnormalities (WSMI>1.5;n=140), SE presented a PPV of 43.1% and a NPV of 86.3%. In multivariate regression analysis, a positive SE was an independent predictor of CV events (OR:9.8;P<0.001), but not LV dysfunction (p=0.062).

Conclusion: SE presents a high specificity and NPV in patients with previous MI. In this population, the SE result, LV dysfunction and renal failure were independent predictors of CV events. In patients with more accentuated wall motion abnormalities, the prognostic value of SE is maintained.

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Pharmacological stress echocardiography as a predictor of cardiovascular events in diabetic patients

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Introduction: Patients with diabetes mellitus (DM) have a high risk of cardiovascular (CV) events, such as myocardial infarction, revascularization or cardiac mortality. Coronary artery disease installs silently in this subgroup of patients, so pharmacological stress echocardiography (PSE) stands out as the method of choice in the diagnosis of coronary artery disease and prediction of CV events in diabetic population.

Aim: Evaluate the value of PSE in the stratification of prognosis in diabetic patients with suspected or diagnosed coronary heart disease.

Methods: Retrospective study including 297 patients with DM, who performed PES (dipyridamole or dobutamine) between 2010 and 2015. Demographic data, clinical, electrocardiographic, baseline and stress echocardiographic findings were collected to identify predictors of prognosis. We defined a combined endpoint of CV events, composed by cardiac death non-fatal, myocardial infarction non fatal and percutaneous or surgical revascularization.

Results: 194 patients (65.3%) were male and the mean age was 66±9 years. Cardiovascular risk factors were identified such as dyslipidemia (85.2%), arterial hypertension (89.9%), obesity (36.7%) and smoking (7.7%). We found history of myocardial infarction in 42.8%, angioplasty in 22.5% and bypass surgery in 12.8%. Left ventricular systolic dysfunction was detected on basal echocardiogram in 27.3% of cases. PES was performed in 55.9% of patients due to suspected coronary artery disease and in 44.1% due to diagnosed coronary heart disease. PES was performed with dobutamine in 68% and dipyridamole in 32% of patients. PES was positive in 15.2%, negative in 74.1% and inconclusive in 10.8% of patients. Mean follow-up was 2.6 years (±1.53). CV events occurred in 15.1% of patients. Using a multivariate regression analysis we identified as independent predictors of CV events the positivity of PES (p<0.001, OR 6.9, 95% 2,4-20,1), the chronic renal failure (p=0.005, OR 4.7, 95% CI 1,61-13,73) and the occurrence chest pain after PES (p=0.007, OR 3.6, 95% 1,4-9,3).

Conclusion: In this study, PES was an important independent predictor of CV events in patients with DM.

P299

Myocardial wall motion assessment in stress echocardiography by quantification of principal strain bulls eye maps

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Introduction: Analysis of wall motion abnormality is an established method for detecting myocardial ischemia and has the advantage of being less invasive and cost-effective compared to pulmonary artery catheterisation. However, its accuracy is largely dependent on the experience of the clinician since the interpretation of echocardiograms is highly subjective. Therefore, there is a need for an automated analysis of myocardial wall motion for transition from qualitative to quantitative assessment.

Purpose: We attempt to automate wall motion assessment using echocardiographic image analysis and machine learning techniques to indicate wall motion abnormality among dobutamine stress echo patients.

Methods: 3D echocardiography datasets were acquired (Philips iE33) from 120 clinical patients who underwent Dobutamine Stress Echo. 61 patients who met the inclusion criteria for image and video quality were included in the studies. Left ventricular functionality was quantified using TomTec® 4D-LVAnalysis software and analysed by a dedicated MATLAB® software to find its principal strain. We extracted useful features from the bull's eye map generated based on principal strain to classify wall motion abnormality using a Random Forest algorithm with the accuracy being evaluated using a leave-one-out cross-validation formulation.

Results: 3D echocardiography datasets from 61 patients who went through dobutamine stress test were analysed clinically for classification as either positive or negative myocardial wall motion abnormality, serving as the ground truth. 14 out of the 61 patients were classified positive (abnormal wall motion) while 47 were classified as negative SE (normal wall motion) by the attending clinician. Classification results using a Random Forest algorithm yielded a 72.13% accuracy with a correct classification of 43 out of 61 patients. The sensitivity and specificity is 35.71% and 82.97% respectively.

Conclusions: We have developed a novel machine learning approach to assess wall motion, by implementing it as a classification problem. This technique has the potential for a simplified and automated quantitative analysis in stress echocardiography. In future, we would also attempt to extend to the recent advances in the field of deep learning to analyse further enhancements in the classification accuracies by leveraging the image-level features in the bull's eye maps using deep Convolutional Neural Networks.
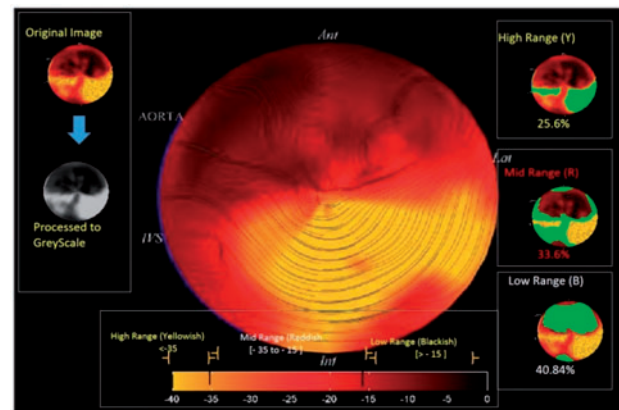
Abstract P299 Figure. Bull's eye map of 3DE principal strain

P300

The incremental value of 2D longitudinal strain analysis to dobutamine stress echocardiography in patients with moderate pretest probability for coronary artery disease

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Background: Detection of significant coronary artery disease (CAD) in patients with moderate pretest probability is a major challenge. The standard dobutamine stress echocardiography (DSE) has a moderate sensitivity even with expert eyes. 2D speckle tracking echocardiography (STE) provides an objective semi-automated analysis of myocardial deformation.

Aim: Studying the diagnostic accuracy of global longitudinal: systolic strain (LS), systolic strain rate (LSRs),early diastolic strain rate (LSRd) and post systolic index (PSI) both at rest and at peak dobutamine stress in detecting significant CAD as compared to conventional wall motion abnormality (WMA) assessment.

Methodology: We prospectively studied 101 symptomatic patients with moderate pretest probability of CAD and no significant structural heart disease. DSE was performed for all patients with offline STE analysis. Coronary angiography was followed within 1 month (significant CAD if luminal diameter stenosis ≥ 70%). Receiver Operating Characteristic (ROC) analysis was used to obtain cutoff values of significant sensitivity and specificity.

Results: Mean age was 53±8 years, 44% were males. 49 had significant CAD (group 1) and 52 had normal or mild CAD (group 2). More males had significant CAD (P: 0.002), no other significant differences between 2 groups in baseline characteristics. The sensitivity and specificity of WMA assessment for CAD were 79.5% & 92.3%

respectively, with positive predictive value (PPV) of 90.6%, negative predictive value (NPV) of 82.7% and diagnostic accuracy of 86%

At rest, GLSRd was the only strain parameter that was significantly different between the 2 groups (P: 0.04). In ROC analysis, GLSRd =1.41 had 77.6% sensitivity and 50% specificity to detect significant CAD [Area under curve (AUC): 0.64, P: 0.01).

At peak stress, all strain parameters were significantly different between the 2 groups, however the GLS had the highest AUC (0.876, P:<0.001). A cut off value of ≤ -20 had 89.8% sensitivity, 84.6% specificity, 84.6% PPV, 89.8% NPV and 87% diagnostic accuracy.

Combining WMA assessment & GLS≤ -20 at peak stress had a larger AUC (0.9, P: <0.001). In comparison to conventional WMA assessment; the combined parameter had significantly more sensitivity (95.9% vs 79.5%, P: 0.008) and similar specificity (84.6% vs 92.3%, P: 0.125). PPV, NPV & diagnostic accuracy were 85.4%, 95.6% and 90% respectively.

Conclusion: GLSRd may offer a potential sensitive tool to detect significant CAD at rest. Combination of WMA assessment & GLS ≤ -20 at peak stress had higher sensitivity and NPV for significant CAD in patients with moderate pretest probability.

P301

Absence of contractile reserve associated with a higher risk of further progression of chemotherapy-induced left ventricular dysfunction

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Background: Chemotherapy-induced cardiotoxicity has become a significant problem in oncology patients. Rest left ventricular ejection fraction and rest global longitudinal strain (GLS) is routinely used to monitor cardiotoxicity. Assessment of contractile reserve (CR) induced with pharmacologic stressors may be useful in patients with left ventricular dysfunction.

The aim of this study was to determine whether the absence of contractile reserve assessed by low-dose dobutamine stress echocardiography (DSE) was associated with the further progression of chemotherapy-induced left ventricular dysfunction (LVD).

Methods: We studied 27 patients with chemotherapy-induced left ventricular dysfunction (left ventricle injection fraction < 50% by 3D echocardiography) in prospective study. All patients were underwent a low-dose dobutamine stress echocardiography study using speckle tracking imaging. Patients were followed up for the worsening LVD (decrease in left ventricle injection fraction >10% by 3D echocardiography) over a period of 1 years.

Results: Among 27 patients, 18 (66%) showed evidence of CR. During 12-month follow-up, the further reduction of left ventricle injection fraction was found in three among 18 patients with contractile reserve and in eight among nine patients without contractile reserve. Absence of contractile reserve increased the risk of further reduction of left ventricle injection fraction (OR: 5.333; 95% CI: 1.850–15.371). Compared with patients without progression of LVD, patients with worsening LVD (n = 11) had a smaller increase of global longitudinal strain (GLS) and strain rate after DSE (1.4 ± 0.5 vs. -3.9 ± 1.4% and -0.1 ± 0.1 vs. -0.4 ± 0.2 1/s, p < 0.5), and a lack of change in the circumferential deformation (1.5 ± 0.79 vs. -4.0 ± 1.6%).

Conclusion: Patients with chemotherapy-induced left ventricular dysfunction and absence of contractile reserve detected by DSE had a higher risk of further reductions in left ventricle ejection fraction.

P302

Left atrial deformation parameters for the assessment of hemodynamically significant coronary artery stenosis in patients with intermmediate pretest probability of coronary artery disease

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Introduction: The role of left ventricle (LV) longitudinal deformation parameters in detecting hemodynamically significant coronary artery disease (CAD) have been shown in previuos studies. However, still little is known about the diagnostic value of longitudinal left atrial (LA) strain/strain rate parameters at rest and at peak dobutamine dose in the assessment of CAD, while their role can be substantial.

Purpose: To determine the diagnostic value of left atrial (LA) longitudinal deformation parameters at rest and at peak dose of dobutamine stress echocardiography (DSE) to predict significant coronary artery stenosis in patients with intermmediate pretest probability of CAD.

Methods: DSE and adenosine stress magnetic resonance imaging (AMRI) were perfomed to 61 patients with intermmediate pretest probability of CAD. CAD was defined as >70% diameter coronary artery stenosis on invasive coronary angiography or in the presence of intermediate stenosis (50-70%) validated as hemodynamically significant by AMRI. Both conventional and LA miocardial deformation parameters, such as LA peak systolic strain (LA S), peak systolic SR (LAs SR), early diastolic SR (LAe SR), late diastolic SR (LAa SR) were analysed using 2D speckle tracking echocardiography (STE) at rest and at peak dobutamine dose. Patients were divided into two groups: non-obstructive CAD (-) n=22 (36%) vs obstructive CAD (+) n=39 (64%).

Results: There were no significant differences of clinical characteristics, conventional echocardiography LV and LA parameters and longitudinal LA deformation parameters between the two groups at rest. LAe SR and LAs SR were significantly lower in

patients with obstructive CAD at peak dobutamine dose (LAe SR 2,07 ± 0,76 s⁻¹ vs 1,68 ± 0,63 s⁻¹, p=0.04; LAs SR 2,68 ± 1,51 s⁻¹ vs 2,05 ± 0,98 s⁻¹, p=0.05). There were no significant differences between other LA deformation parameters at peak dobutamine dose. According to ROC analysis the strongest predictive value had early diastolic SR (LAe SR) (cut off value: -2,05 s⁻¹, sensitivity 71%, specificity 75%; AUC 0,76, p=0,02) and systolic SR (LAs SR) at peak dobutamine dose (cut off value: -2,31 s⁻¹, sensitivity 65%, specificity 68%; AUC 0,71, p=0,045).

Conclusions: Early diastolic SR and systolic SR at peak dobutamine dose are important markers in detecting hemodynamically significant coronary artery stenosis in patients with intermmediate probability of CAD.

P303

Cut-off value of coronary flow velocity reserve obtained by transthoracic Doppler echocardiography during intravenous infusion of dobutamine for diagnosis of functional significant myocardial bridging

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Background: Previous studies showed that coronary flow velocity reserve (CFVR) measurement by transthoracic Doppler echocardiography (TTDE) during inotropic stimulation with dobutamine, in comparison to vasodilation with adenosine, provides more reliable functional evaluation of myocardial bridging (MB). However, the cut-off value of CFVR for diagnosing functional significant MB has not been evaluated.

Purpose: The purpose of the study was to evaluate the adequate cut-off value of TTDE-CFVR after iv. infusion of dobutamine (DOB) for diagnosis of functional significant MB.

Methods: This prospective study included 45 patients (30 males, mean age 56±9 years) with angiographic evidence of isolated MB of the LAD and systolic compression ≥50% diameter stenosis. Exercise stress-echocardiography test (SE) for detection of myocardial ischemia and TTDE-CFVR in the distal segment of LAD during iv. infusion of dobutamine (DOB:10-40μg/kg/min) were performed in all patients.

Results: Exercise-SE was positive for myocardial ischemia in 9/45 (20%) of patients. CFVR during peak DOB was significantly lower in SE-positive group in comparison to SE-negative group (2.03 ± 0.16 vs. 2.54 ± 0.47, p=0.005). Using exercise-SE test as a gold standard for detection of myocardial ischemia, a receiver-operating curve identifies the optimal CFVR DOB cut-off value <2.2 (AUC 0.85, 95% CI: 0.71-0.95, p=0.004) with a sensitivity of 100% and specificity of 71%.for the presence of functional significant MB. The overall diagnostic accuracy of TTDE-CFVR measurements during dobutamine infusion was 80%.

Conclusion: A cut-off value of <2.2 of CFVR obtained by TTDE may discriminate functional significant MB that induce myocardial ischemia.

P304

Benjamin of the family - the first Polish Stress Echocardiography Registry

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On behalf of: Polish Working Group on ECHOCARDIOGRAPHY

Introduction: We present the results of the first Polish Stress Echo (Pol-STRESS) registry which included 17 large university and regional hospitals. Untill now, no collective data have been available on the use of SE in Poland until now.

Aim: To evaluate the number, settings, results and complications of Stress Echo (SE) investigations performed in Poland.

Methods: In this survey we report the results of a one-year registry of SE examinations.

Results: The study included data from 17 university hospitals and county public hospital which performed 4611 SE examinations, including 4408 tests in patients investigated for coronary artery disease (CAD) and 203 tests to evaluate valvular heart disease (VHD). All centers performed dobutamine SE (100%), 10 centers performed pacing SE (58.8%), while cycle ergometer SE and treadmill SE were performed by 6 (35.3%) and 5 (29.4%) centers, respectively. Dipyridamole SE was performed only in one center. The mean number of examinations per year was 271 per center. In comparison, during the same period 20,637 invasive coronary angiographies and 9,118 electrocardiographic exercise tests were performed in the study centers.

Overall, 224 complications of SE examination (4.9% of all tests) were reported by the surveyed centers.we did not record any cardiac death (0%) during SE examination in any of the centers. Three cases of SE-related myocardial infarction were reported in 2 (11.7%) centers. The rates of minor complications were low.

SE to evaluate CAD was more commonly performed in hospital settings using cycle ergometer (72.6%), treadmill (87.6%), and low-dose dobutamine (68.0%), while a dipyridamole test was more frequently employed in ambulatory patients (77.6%). No significant differences between the rates of examinations performed in ambulatory and hospital settings were found for high-dose dobutamine and pacing SE. Examinations to evaluate VHD were significantly more frequently performed in hospital settings.

SE examinations amounted to more than one third of all stress tests performed in the surveyed centers over the study period.

Conclusions: SE was a safe diagnostic method, and major complications are very rare.

Despite European recommendations, SE examinations to evaluate CAD are performed less frequently than electrocardiographic exercise tests, although they already comprise a significant proportion of all stress tests.

More than half of exercise SE examinations were performed in the hospital setting, while pharmacological stress testing was more commonly performed on an outpatient basis.

P305

12-years temporal trend in referral pattern and test results of stress echocardiography in a tertiary care referral center with moderate volume activities and cath-lab facility

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Background: Data on stress echocardiography (SE) time-related changes in referral patterns and diagnostic yield for detection of inducible ischemia could enhance Echo-Lab quality benchmarks and performance measures.

Purpose: Evaluating temporal trends in SE test results among ambulatory patients with suspected or known coronary artery disease (CAD) in a tertiary care referral center with moderate (>100/year) volume SE activities and Cath-Lab facility.

Methods: From January 2004 and December 2015, 1954 patients (mean age 62 ± 12 years, 42% women, 27% with known CAD) underwent SE (1673 exercise SE, 86%, 245 pharmacological SE, 12%, 34 pacing SE, 2%). Time was grouped into three 4-year periods, where clinical data and test results were evaluated.

Results: A progressive decline over time in the rate of pharmacological SE instead of a dramatic increment of exercise SE (79% to 96%, p<0.0001) was noted. Classical risk factors and the proportion of patients with known CAD did not change significantly over the study period, except for a progressive decrease of arterial hypertension prevalence (from 72% to 63%, p=0.003). A gradual increase of women (from 39% to 45%, p=0.02) and decrease in inducible myocardial ischemia rate (from 12% to 3%, p<0.0001) was noted.

Conclusion: Invasive strategies are widely employed nowadays for CAD management. We observed, over a 12-year period, a progressive decrease in the frequency of inducible myocardial ischaemia among patients with known or suspected CAD e referred to our EchoLab for SE with Cath-Lab facility, and this trend was parallel to changes in SE referral practice. These findings are particularly relevant if we consider the practical implications on diagnostic SE accuracy and risk assessment.
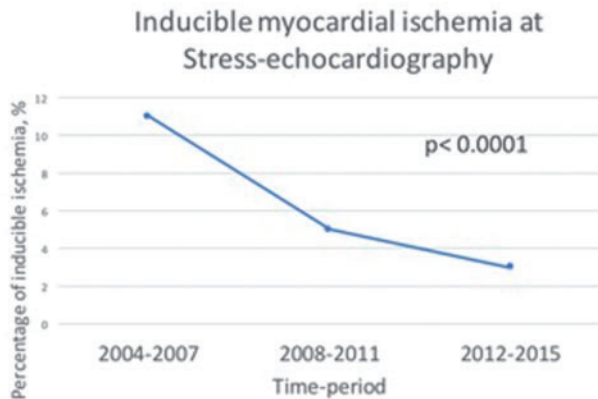
Abstract P305 Figure. Inducible myocardial ischeamia at SE

P306

Prognostic predictors of exercise echocardiography in asymptomatic severe aortic stenosis

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Introduction: The management and clinical decision making in asymptomatic patients with severe aortic stenosis (AS) remains a challenge. Improved life expectancy has led to an increasing number of elderly patients with this condition, in whom the symptoms are harder to evaluate, not only because of their comorbidities but also because they may reduce their level of physical activity and be unaware of subtle changes in effort tolerance. Exercise stress echocardiography may further unmask a subset of asymptomatic patients who are at high risk of cardiac events and would benefit from an earlier intervention.

Purpose: We sought to assess incremental prognostic utility of exercise echocardiography, with special emphasis on functional capacity and its impact in mortality.

Methods: We performed a retrospective analysis of the patients with asymptomatic severe aortic stenosis undergoing exercise echocardiography between 2011 and 2017 at our institution. Exercise protocols used included the Bruce protocol and its modified version.

Results: A total of 50 patients with asymptomatic severe aortic stenosis were included in this analysis (mean age 70 +/- 8.8 years; 52% female gender; 27.5 mean body-mass index; 12% smokers or ex-smokers; 74% hypertension; 44% diabetes; 76% dyslipidemia; 24% coronary artery disease; 6% ischemic stroke; 14% atrial fibrillation). The average time of the test was 7min +/-2.9 and the mean maximal metabolic equivalents (METs) achieved was 3.6 +/- 2.7. 46% of this cohort were symptomatic and did not achieve 85% of the maximum expected cardiac frequency - two patients due to chest pain with signs of ischemia, one patient due to a second degree AV block, and the remaining due to dyspnea and weariness. The mean-gradient at rest was 32mmHg, the peak exercise mean-gradient was 50mmHg and 61% increased the mean gradient above 18mmHg (51% above 20mmHg). No major complications were recorded. 26% were submitted to aortic valve replacement. The overall mortality was 16%, with a mean follow-up of 895 +/-687 days. The functional capacity was related with the mortality – the patients that didn't achieve at least 7 METs had higher mortality rates (29% vs 3.2%, p=0.015). Predictors of lower functional capacity were age, female gender and body mass index. The increased gradient > 18mmHg or 20mmHg did not correlate with higher mortality rates.

Conclusions: These findings highlight additional parameters that could assist in identifying a high risk group of asymptomatic patients with severe AS. The presence of lower functional capacity might be an additional parameter to identify those patients who could benefit the most from aggressive monitoring and early intervention.

P307

Exercise-induced myocardial ischemia in patients with isolated myocardial bridging

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Background: It has been postulated that altered coronary blood flow in the artery with myocardial bridging (MB) predisposes development of myocardial ischemia (MI) and acute coronary syndrome (ACS).

Purpose: To evaluate relation between exercise-induced MI, clinical presentation and angiographic correlates of isolated MB.

Methods: Forty-five patients (30 males, mean age 56 ± 9 years) with angiographic evidence of isolated MB on left anterior descending artery and systolic compression $\geq 50\%$ diameter stenosis were investigated for exercise-induced MI with stress-echocardiography (SE) test. Twenty MB-patients presented with stable angina, 12 with ACS, and 13 were asymptomatic. At MB-site, minimal luminal diameter (MLD) and percent diameter stenosis were obtained by quantitative coronary angiography.

Results: There was a significant correlation between SE-induced MI (positive in 9/45, 20%) and stable angina (r=0.398, p=0.007), a borderline correlation with the asymptomatic group (r=-0.289, p=0.057), and no correlation with the ACS group (r=-0.156, p=0.311). Exercise-SE was positive almost exclusively in MB-patients with stable angina (7/20, p=0.015), and negative among MB-patients with ACS (11/12, p=0.413). Among angiographic parameters, only MLD at end-diastole was significantly lower in patients with both stable angina and ACS compared with the asymptomatic group (1.77+0.27 vs. 1.80 + 0.33 vs. 2.10 + 0.36, p=0.019). There were no significant differences between any of angiographic parameters and exercise-induced MI.

Conclusions: In patients with MB, exercise-induced MI is related to clinical presentation of stable angina, but not ACS. However, clinical presentation of MB and MI cannot be fully explained by angiographic parameters of MB.

P308

Discordance between exercise electrocardiography and exercise echocardiography for detecting myocardial ischemia

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Introduction: Exercise treadmill test (exTT) is widely used for detecting myocardial ischemia. However, its accuracy is limited compared to imaging modality as exercise echocardiography (execho). We aimed to determine predictors of false positive (FP) exTT in patients referred to an execho.

Methods: Single-center, observational, retrospective study of patients referred to execho between January 2013 and August 2015. A positive exTT was defined as a horizontal or down-sloping ST-segment depression ≥ 0.1mV, persisting for at least 0.06–0.08s after the J-point. A positive execho was defined as the induction of a transient change in regional contractility in at least two continuous segments during exercise. Predictors of false positive exTT were determined by logistic regression analysis. Variables with p<0.1 in univariate analysis were included in multivariate model. Functional capacity (expressed in METs) was defined as maximal exercise capacity.

Results: A total of 564 patients were analysed. A positive exTT was reported in 150 patients. Of those, a positive execho was present in 74 patients and was negative in 76 patients (FP group). Patients with a FP exTT were younger (61.5 ± 8.1 vs 65.5 ± 8.3 years p=0.003), less likely to have diabetes (21.1% vs 40.5% p=0.009), dyslipidemia (65.8% vs 78.4% p=0.010) and known coronary artery disease (31.6% vs 67.6%

p<0.001). Atypical chest pain was more prevalent in these patients (26.7% vs 13.7% p=0.04). FP group had also a better functional capacity (10.0 ± 1.9 vs 8.5 ± 2.0 METs p<0.001). Age, absence of diabetes, absence of hypertension, atypical chest pain, better functional capacity and exTT positive only in electrocardiographic inferior leads were associated with a FP test in univariate analysis. In the adjusted analysis, only functional capacity (OR: 0.33; 95% CI 0.12-0.54; p=0.002) and exTT positive only in inferior leads (OR: 1.18; 95% CI 0.31-2.06; p=0.008) predicted false-positives.
Conclusion: In our study, 50% of patients with a positive exercise electrocardiography had a negative exercise echocardiography regarding ischemia. Better functional capacity and the positivity of electrocardiographic testing only in inferior leads independently predicted FP exTT.

P309

accuracy of exercise echocardiography for detecting significant epicardial coronary artery stenosis

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Introduction: Exercise echocardiography (execho) is an extensively used imaging stress tool to assess patients with suspected coronary artery disease. We aimed to determine the diagnostic accuracy of execho for detecting significant epicardial coronary artery stenosis (EpCS).
Methods: Single-center, observational, retrospective study of patients referred for treadmill execho who subsequently underwent invasive coronary angiography. Significant EpCS was defined as the presence of a coronary artery stenosis > 50%. Predictors of a positive execho without significant EpCS were determined by logistic regression analysis. Variables with p<0.1 in univariate analysis were included in multivariate model.
Results: We studied 142 patients, 76.2% were male, overall mean age of 64 ± 9 years. Regarding cardiovascular risk factors: 79.7% of patients had dyslipidemia, 72.2% hypertension, 39.5%, smoke exposure and 31.5% diabetes. A history of coronary artery disease (CAD) was reported in 54.6%. A positive execho (n=104) without significant EpCS was observed in 35 patients: these patients were more frequently women (40.0% vs 14.5% p=0.003), had less prevalence of dyslipidemia (65.7% vs 87.0% p=0.010), smoke exposure (20.0% vs 46.4% p=0.016) and less history of CAD (17.1% vs 72.5% p<0.001) compared to true positive execho. They also had a lower wall motion score index (WMSI) at baseline (1.2 ± 0.3 vs 1.4 ± 0.4 p=0.006) and a reduced WMSI variation after exercise test (Δ WMSI 0.34 ± 0.26 vs 0.51 ± 0.34 p=0.014). There was no significant differences on functional capacity (8.2 ± 1.9 vs 7.8 ± 2.2 METs p=0.35). Overall, execho sensitivity was 87.3% and specificity 48.3%. In patients with history of CAD, there was a higher specificity 72.2% with a similar sensitivity rate (86.4%). Patients without known CAD had worse specificity 37.5% but higher sensitivity 92%. Only female gender (OR: 5.86; 95% CI 1.60-21.51; p=0.008), WMSI variation (OR: 0.09; 95% CI 0.01-0.66; p=0.018) and absence of history of CAD (OR: 0.07; 95% CI 0.02-0.24; p<0.001) were independent predictors of positive execho without significant EpCS.
Conclusion: In concordance to previous studies, our data show execho as a useful tool to exclude significant EpCS. This method had a high sensitivity but a suboptimal specificity, especially in patients without known coronary disease. Female gender, reduced WMSI variation and absence of previous CAD were significantly associated to the false positive execho.

TISSUE DOPPLER AND SPECKLE TRACKING

P310

3D speckle tracking deformation assessed by homologues times: a new tool in the evaluation of left atrial disease

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Background: Atrial fibrillation (AF) is the most common arrhythmias, that also has a high socio-economic impact due to the relationship with long-term complications. Therefore, the correlation between hypertension (HT) and atrial structural changes should be studied. The former is easily investigated by 2D echocardiography whereas the function is better assessed by 3D echocardiography.
**Purpose:** We investigated entities of deformation as a marker of preclinical left atrial (LA) impairment, in HT and AF patients either isolated or combined and with or without left ventricle hypertrophy (LVH). Moreover, we evaluated the performance of the 3D-STE to distinguish normal subjects from others and specifically subjects with previous episodes of silent AF.
Methods: We enrolled 82 healthy subjects, 18 patients with HT, 10 patients with HT and LVH, and 20 patients with a previous PAF (paroxysmal or persistent) composed by 9 patients with only PAF and 11 patients with PAF, HT and LVH. To evaluate appropriately the atrial function, we introduced the concept of homologous times based on electromechanical time points that were defined on the tracings. A single cardiac cycle had 16 homologous times: 2 mechanical, LV end-systole and mitral valve opening, and 2 electrical, R wave peak and P wave peak whereas the other 12

times were obtained by sampling 4 equally spaced times between successive strictly homologous times. This approach enables to compare different individuals by eliminating interindividual beating discrepancies at a different heart rates. Global longitudinal (GLS) and global circumferential (GCS) strain were measured at atrial diastolic peak (5th homologous time). Receiver operating characteristic curves (ROC) were constructed for GCS and GLS, along atrial diastole (from 3 to 14 homologous times), to identify each category.
Results: GLS and GCS were significantly impaired in all groups (GCS and GLS: p-value <0.015). Using GCS and GLS as unique independent variables, MANOVA was performed and both parameters were statistically significant to differentiate healthy from PAF subjects (Control vs PAF:p-value<0.003). 3D-STE parameters can optimally classify controls from the other categories (AUC: GCS: Control vs PAF =0.75;Control vs PAF_LVH =0.79;Control vs HT =0.72;Control vs HT_LVH =0.88 and GLS Control vs AF =0.78;Control vs PAF_LVH =0.84;Control vs HT =0.79;Control vs HT_LVH =0.73). Diagnostic performance was improved by combining GLS and GCS (AUC:Control vs PAF=0.81;Control vs PAF_LVH =0.85).
Conclusions: Our results show anatomical and mechanical LA remodeling in AF and HT patients, despite the absence of a detectable diastolic dysfunction. We also demonstrated the high predictive values of 3D-STE and the approach with homologous times to differentiate normal subjects from the other groups suggesting that these parameters can help identifying PAF. Further studies are required to explore the clinical implications of these results
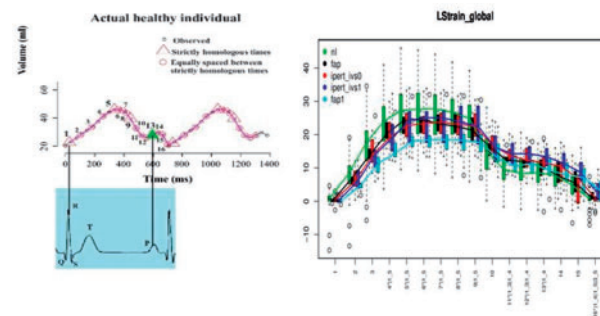
Abstract P310 Figure.

P311

ECG-gating dependent left atrial mechanics: is strain rate imaging better than strain imaging?

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Background: Left atrial (LA) strain (absolute deformation: S%) imaging has been studied in a variety of cardiac illnesses as a stand-alone marker of poor prognosis, despite the hitherto unavailable atria dedicated software. Normative values of LA S% have been published but they differ depending on whether LA S% was estimated using PP- interval (PP-gating) or RR-interval (RR-gating) of the ECG trigger.
Purpose: In this project, we wanted to study the magnitude of such differences in strain values using PP- vs. RR-gating. We also wanted to study if strain rate (rate of deformation: 1/s) imaging could be a better option to study LA mechanical functions.
Methods: Seventy-seven healthy human volunteers (40±9 years) participated in the study. A comprehensive echocardiography examination was performed that included speckle tracking of the right and left ventricles and LA. Typically, an LA strain curve clearly unmasks a reservoir strain (RS%) above the zero line and a mostly undetectable booster strain (BS%) below the zero-reference line. On the other hand, a typical strain rate profile includes a positive reservoir strain rate (SR-S/s) wave, and two negative strain rate waves during the early (SR-E/s: conduit phase) and late diastolic phase (SR A/s; booster phase). We obtained these 5 profiles of strain/strain rate both from RR- as well as PP-gating. Left (LVGLS%) and right ventricular average longitudinal strain (RV-S%) were also computed. Median deviation of strain values between two gatings were assessed by Hodges-Lehmann shift (HLS) test. Bland Altman and Spearman'(r) correlation statistics determined bias and correlation.
Results: Mean (SD) LVGLS % and RV-S% were 19±2 and 24±4 respectively. LA reservoir strain had an HLS of 9.5 between gatings, while LA booster had a deviation of 15.9. On the contrary, deviations for LA RS/s, LA SR-E/s, and LA SR-S/s respectively were 0.2, 0.3 and 0.4. LA-Res S/s by RR and PP had a bias of -0.2 (95% CI= -0.6 to 0.2) and r of 0.87 (p< 0.001). Similarly, LA- SR E/s had bias and r values of 0.2 and 0.94 (p<0.0001) respectively. LA-BS% had a bias and r values respectively of 0.3 and 0.89 (p< 0.0001).
Conclusion: As the Hodges-Lehman shift between PP and RR gated LA strain is much larger for strain data compared with the strain rate data, strain rate imaging, that provides excellent bias and correlation, may offer a better choice to assess LA deformation during all the three dynamic phases of the LA, irrespective of gating type. The findings though need to be corroborated and matched vs. different cardiac pathologies.

Abstract P311 Figure.

P312

Myocardial deformation techniques to evaluate hypertrabeculation and non-compaction, can they be useful to distinguish from non-trabeculated myocardium?

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Introduction: and aim
Hypertrabeculation is a common finding in functionally normal hearts. Distinction between a normal variant and a pathological finding is sometimes challenging and is established uniquely on morphological criteria, being very sensible but scarcely specific. Cardiovascular magnetic resonance myocardial (CMR) feature tracking (CMR-FT) has emerged as a robust method that can provide quantitative measurements of myocardial mechanics from conventional steady state free precession (SSFP) cine sequences. Our aim was to evaluate left ventricular (LV) strain with this new technique in patients with non-compaction cardiomyopathy (NCM) and hypertrabeculation (HT) and to compare both groups with healthy controls.
Methods: We performed a prospective and observational registry of patients referred for CMR (1.5 Tesla) to evaluate the presence of NCM, with former re-assortment of patients into two groups: HT or NCM, following the Petersen criteria. Patients with systolic dysfunction were excluded. Global longitudinal and circumferential strain (GLS and GCS respectively) was quantified and analysed with CMR-FT and the available software, these values were then compared with a cohort of healthy controls.
Results: A total of 38 patients were included of which 17 (45.2%) met the criteria for NCM and 21 (54.8%) for HT. There were no significant differences regarding neither ventricular volumes nor ventricular mass. These were compared to 63 healthy controls: no significant differences were found between HT and NMC regarding GLS (-17 vs -16.9, p=0.9) and GCS (-17.4 vs -16.7, p=0.56). However, there were significant differences between HT and NCM with respect to controls, both individually and globally (see table 1).
Conclusions: The observed data suggests that patients with HT and NCM, despite normal ejection fraction, present substantial differences in ventricular mechanics with respect to healthy controls. Further long-term studies are required to investigate whether these differences have a real clinical impact for further clinical application.

	Controls	HT	NCM
GLS	-19.03±0.36	-16.98±0.63	-16.86±0.57
	p < 0.05		p = 0.9
	Controls	HT + NCM	
	-19.03±0.36	-16.92±0.48	
	p < 0.0006		
GCS	Controls	HT	NCM
	-19.15±0.33	-17.43±0.094	-16.73±0.57
	p < 0.03		P = 0.056
	Controls	HT+ NCM	
	-19.15±0.33	-17.13±0.59	
	p > 0.0017		

Table 1. Global strain longitudinal (GLS) and global circumferencial (GCS) values in controls, hypertrabeculation (HT) and non-compaction cardiomyopathy (NCM).

Abstract P312 Figure.

P313

Left ventricular active protodiastolic contraction and its correspondence with postsystolic strain assessed by ecocardiography

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Background: According to the Torrent-Guasp myocardial band (MB) theory, the ventricular myocardium describes a double helix single band that forms two loops: a basal transverse loop and an apical oblique loop with a descending and an ascending component. Torrent-Guasp's hypothesis sustains the active muscular contraction during diastolic isovolumic phase.
Purpose: The aim of this study was to assess the left ventricular (LV) segments showing postsystolic shortening and relate them to the MB structure using two-dimensional speckle-tracking ecocardiography. This may suggest active myocardial contraction during isovolumic phase.
Methods: LV longitudinal strain parameters were studied in 90 healthy volunteers using STEc 2D, obtained from apical 4, 3 and 2-chamber views. Every myocardial shortening ocurring after aortic valve closure was considered postsystolic strain (PSS). We estimated the PSS frequency (%) in each of the 18 LV segments. Three categories were established: >50%, 41-50% and ≤40%.
Results: Mean age was 50,3 ± 11,1 years and 42% of the volunteers were women. Mean ejection fraction was 66,6 ± 5,5%. The highest frequency of PSS was registered in the basal segments, mid septal and apical anterior (black boxes). The mid anterolateral, mid inferolateral as well as the mid and apical inferior segments (light grey) showed the lowest frequency of PSS. The rest of the apical segments, mid inferoseptal and mid anterior (grey) presented an intermediate prevalence. See figure.
Conclusion: The LV segments with the highest frequency of PSS show anatomical correspondence with the ascending component of the apical loop described by Torrent Guasp, supporting its active contraction during the isovolumic diastolic phase.
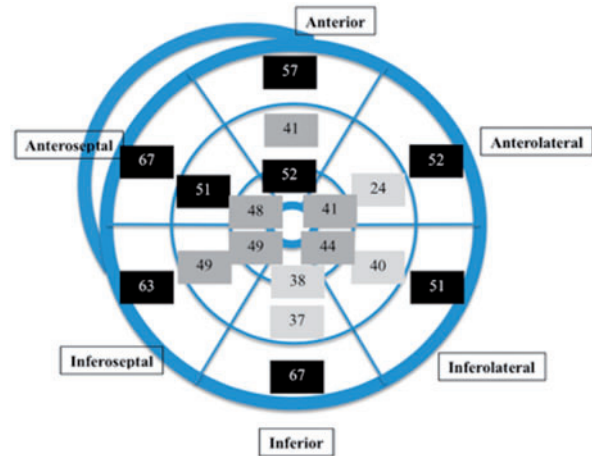
Abstract P313 Figure. Segment PSS frequency (%)

P314

Proposal of two new parameters to assess myocardial function from ventricular 2D strain

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Background: Left ventricular (LV) systolic function is usually estimated from ejection fraction (EF). However, myocardial function may be affected before. Objective: The aim of this study was to assess the normal values of 2 new LV myocardial function parameter that combines rotational mechanics with longitudinal shortening and which may represent a more complete method to assess myocardial function before systolic ventricular dysfunction occurs.
Methods: Left ventricular longitudinal strain (LS) and rotational parameters were studied with speckle-tracking in 98 healthy volunteers. Longitudinal strain was obtained from apical 4, 3, and 2-chamber views. Ventricular rotation from the LV basal and apical planes. Twist was estimated as the sum of apical and basal rotation. We propose the calculation of the "Combined Deformation Parameter", which includes the Deformation Product [Twist × LS (° × %)] and the Deformation Index [Twist/SL (° / %)]. The Deformation Product reports global myocardial function (longitudinal and rotational), and may be normal or decreased. The Deformation Index reports on the affected component (s) and their individual degree of participation, as well as a possible compensating interaction (which would result in a pseudonormal Deformation Product .
Results: Mean age was 50.3±11.1 years, 42% women. 8 patients were excluded due to poor ultrasound window (92% feasibility). No gender differences in EF, Twist, Deformation Product or Deformation Index. Longitudinal strain was greater in women. Subjects >55 years had only higher EF .. Intra and interobserver variability was good, with intraclass correlation coefficients >0.75.
Conclusions: This study shows that the deformation product and index are novel 2D Strain parameters with good feasibility and intra-interobserver agreement in their normal values. Their routine assessment may demonstrate early subclinical dysfunction in different cardiac diseases and oncological treatments.

Results

	EF (%)	LS (%)	Twist (°)	Twist × LS (° × %)	Twist / LS (° / %)
Total (n=90)	66.6±5.5	-21.1±2.1	20.3±7.6	-431±172	-0.9±0.3
Male (n=52)	66.4±5.4	-20.7±2.0	20.7±7.9	-433±177	-1.0±0.3
Female (=38))	66.9±5.7	-21.7±2.1	19.7±7.1	-431±170	-0.9±0.3
p	0.68	0.027	0.51	0.96	0.18
≤55 years (n=59)	65.7±5.3	-21.1±1.8	19.4±7.9	-415±182	-0.9±0.3
>55 years (n=31)	68.4±5.7	-21.1±2.5	21.9±6.6	-463±149	-1.0±0.3
p	0.03	0.98	0.14	0.21	0.09

P315

Acute cellular rejection in heart transplant recipients: impact in left ventricle myocardial strain assessed by means of velocity vector imaging echocardiography

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Introduction and objectives: There is growing evidence that left ventricle (LV) myocardial strain assessment by speckle tracking echocardiography can be a sensitive tool for the diagnosis of acute rejection (AR) in heart transplant recipients. However, inter-vendor variability is a concern in the widespread use of this technique, and the only published study that measured LV strain by means of velocity vector imaging software (VVI) was unable to detect significant changes in strain in studies with AR. Our objective was to evaluate the impact of AR in LV myocardial strain evaluated by means of VVI.

Methods: From September 15th, 2014 to October 31st, 2016 we performed an exhaustive echocardiographic exam in 18 consecutive adult heart transplant recipients in their first year post-transplantation within 3 hours of the routine surveillance endomyocardial biopsies (EMB) in a single center. Classic echocardiographic parameters and LV longitudinal, radial, and circumferential strain, measured by means of VVI, were analyzed and the association of LV strain echocardiographic variables with different grades of AR was investigated. Variables studied for each segment were systolic and peak strain, and time to peak strain. Global longitudinal LV strain was calculated as the mean of 12 segments in apical 4 and 2 chambers views. Average circumferential and radial LV was calculated as the mean of six segments in midventricular short axis view.

Results: A total of 147 pairs of EMB and echocardiographic examination were performed (median [interquartile range] 5 [3-8] studies/patient), 65 with no AR (grade 0R), 63 with AR grade 1R and 19 with AR grade ≥ 2R (treatment-requiring AR). Studies with any grade of AR (≥ 1R) presented lower global systolic longitudinal strain (in absolute value) compared with studies without AR (0R): -17.0±3.6% versus -18.3±3.5%, p=0.045. Average peak radial strain was significantly lower in studies with AR requiring treatment (grade ≥ 2R) than in the rest of studies: 29.0±9.2% versus 34.2±10.2%, p=0.04. No significant association of AR was observed with average systolic or peak circumferential strain. We also found an earlier time to average peak radial and circumferential strain in episodes of treatment-requiring AR (grade≥ 2R) than in the rest of studies: 261±30 ms versus 314±54 ms for radial strain (p<0.0005) and 252±31 ms versus 307± 48 ms (p<0.0005) for the circumferential strain. These time differences were consistent after adjusting for heart rate.

Conclusion: In this study, AR grade≥ 2R in heart transplant recipients in their first year after transplantation was associated with lower values of average peak radial LV strain, and shorter times to average peak radial and circumferential LV strain, evaluated by means of VVI. Lower global systolic longitudinal LV strain was associated with AR grade ≥ 1R. To our knowledge, this is the first study with this specific software with possible clinical relevance in this field.

P316

Usefulness of left atrial strain in predicting elevated left ventricular filling pressure in ischemic cardiomyopathy

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Background: Predicting left ventricular (LV) filling pressure is an essential step for accurate diagnosis and therapy. Left atrial (LA) strain was recently proposed as an alternative approach to estimate filling pressure. The aim of this study was to investigate the relation of LA strain with conventional echocardiographic LV filling pressures parameters and N-terminal pro-B- type natriuretic peptide (NT-proBNP) level in patients with ischemic cardiomyopathy.

Methods: This prospective study analyzed 56 patients (mean age 61.3 ± 11.4 years, range 37-89, 85.7% male) with ischemic cardiomyopathy (mean LV ejection fraction 46.5 ± 13 %) and sinus rhythm.

Peak atrial longitudinal strain (PALS) was studied using tow dimensional speckle-tracking echocardiography by averaging all segments in apical four and two-chamber views.

As for Echo variables, mitral inflow velocity and mitral annular velocity in early diastole (E and E', respectively) and late diastole (A), deceleration time (TDE), mean E/E' and E/A were obtained. LA maximum volume (LAVI) was measured using the area-length method from the apical four and two chamber views and was indexed to body surface area. All patients underwent a NT-proBNP measurement within 24 hours.

Results: Simple regression analysis demonstrated a significant linear correlation between PALS and Log NT-proBNP (r=0.511, p<0.001). Significant but weaker correlations were found between Log NT-proBNP and E/E' (r=0.493, p<0.001), LAVI (r=0.350, p=0.008). Similarly, significant correlations were also found between PALS and E/E' (r=0.632, p<0.001), and LAVI (r=0.459, p=0.001).

The area under the receiver-operating characteristic curve showed that PALS had good diagnostic power for E/E' > 15 at cutoff value of 19.72 with excellent sensitivity of 93.2% and specificity of 100% (AUC=0.969).

In a multiple linear regression model with Log-NT-proBNP as dependent variable and age, E/A, E/E', LAVI, and PALS as predictors, PALS were the only independent predictor of elevated NT-proBNP levels (β= -0.497, p<0.001).

Conclusion: In patients with ischemic cardiomyopthy, PALS and mean E/E' ratio presented good correlations with NT-proBNP. PALS is closely related to conventional echocardiographic filling pressures parameters. Left atrial strain can be a complimentary method to evaluate LV filling pressures.

P317

Interatrial block and atrial remodelling assessed using speckle tracking echocardiography

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Objectives: To determine whether there is an association between interatrial block (IAB) and atrial remodelling determined by speckle tracking echocardiography (STE).

Background: Using STE, paroxysmal atrial fibrillation (AF) has been shown to reduce strain and strain rate (SR) during atrial booster pump function (SRa) and early reservoir (SRs) phases. IAB is the etiologic substrate of AF, and left atrial (LA) deformity with STE has not been described in patients with IAB without a history of atrial arrhythmia.

Methods: We performed a cross-sectional study of 56 patients without IAB, 21 with partial IAB (pIAB) and 22 with advanced IAB (aIAB). LA STE was performed and clinical and echocardiographic findings were analysed.

Results: Transthoracic echocardiographic (TTE) showed higher LA volume/BSA in patients with IAB. With STE, the absolute value of SRa and SRs decreased as IAB increased. After adjusting for confounders, both multiple linear regression and multivariate multinomial regression showed good correlation with longer P-wave duration on electrocardiography and with the type of IAB, respectively. SRa (standardized β=0.37; p<0.001), SRs (standardized β=-0.30; p<0.001) and maximal peak LA longitudinal strain in reservoir phase (standardized β=-0.26; p=0.009) were independently associated with P-wave duration. SRa was also associated with the presence of pIAB (OR=11.5; 95% confidence interval (CI): 2.7-49.0; p = 0.001) and aIAB (OR=98.2; 95% CI: 16-120.4; p <0.001) and SRs, with pIAB (OR: 0.03; CI: 0.003-0.29; p = 0.003) and with aIAB (OR: 0.008; CI: 0.001-0.12; p = 0.004). SRa absolute value ≤ -1.20 S -1 was the best cut-off, which correlated with IAB (AUC 0.85, CI 0.77-0.93, P <0.001).

Conclusions: LA SRa and SRs determined using STE decreased in IAB. This decrease correlated with longer P-wave duration and higher degree of IAB, similar to that described in patients without IAB and with paroxysmal AF.
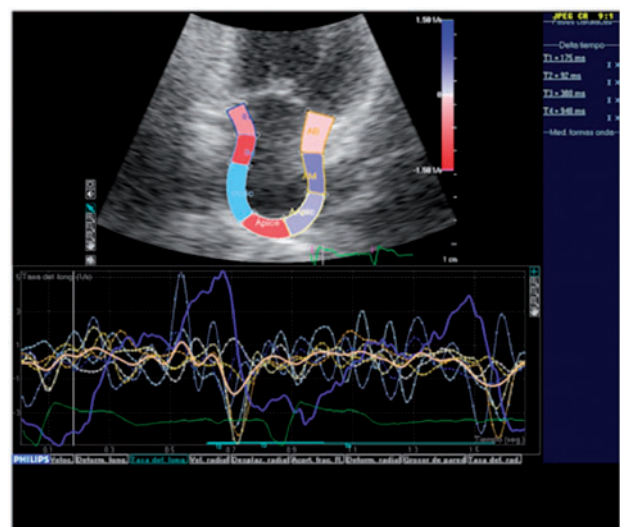
Abstract P317 Figure. Interatrial block strain rate.

P318

Global longitudinal strain variation by leg lifting maneuver: a new methodology to evaluate LV functional reserve

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On behalf of: Cardiovascular R&D Centre (UnIC) - Faculty of Medicine University of Porto - Portugal

Introduction: The variation of global longitudinal strain (GLS) in response to passive leg lifting maneuver (LLM) has recently been suggested as a marker of left ventricular (LV) myocardial functional reserve (FR) in patients with diastolic dysfunction. However, information on LV FR by this technique in healthy individuals is unknown.

Methods: and Results: We evaluated the variation of LV GLS by 2-dimensional Speckle Tracking Echocardiography (2D-STE), in response to LLM, in a population of 30 healthy individuals. Clinical, demographic and echocardiographic parameters (including LV longitudinal mechanics obtained with 2D-STE before and after LLM) were described. The population had a mean age of 27 ± 4 years and 73% were women. Increased venous return to the heart with LLM was confirmed by an increase in the maximal diameter of the inferior vena cava (16 ± 3.5 vs 22 ± 3.3 mm, p <0.01). No significant changes in left atrial volume, LV ejection volume and LV ejection fraction were observed in response to the LLM. There was a significant variation of global LV GLS (-21.9 ± 2.3 vs -23.2 ± 1.6%, p <0.001, Δ 1.25 %, 95% IC 0.5-1.91). We observed LV mechanics segmental heterogeneity in response to the LLM (image). An increase in right ventricular longitudinal function with LLM (TAPSE 22.5 ± 5.4 vs 25.5 ± 0.5 mm, p = 0.005, Δ 2.9, 95% IC 0.9-4.8) was also observed.

Conclusion: In this study, the absolute LV GLS value increased significantly in response to preload increase (LLM). The dependence of GLS on preload is in accordance with the Frank-Starling Law, in which an increase in preload in a healthy individual lead to an increase in myocardial contractility, translating myocardial FR. These findings suggest that LV GLS is a sensitive parameter for detecting subtle changes in LV longitudinal function. Further studies are needed to validate this technique in patients with specific cardiovascular conditions.
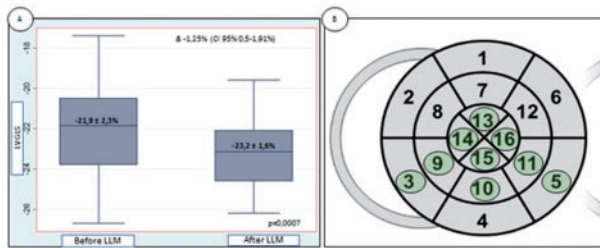

Figure - A: Left ventricular global longitudinal strain (GLS) variation with leg lifting maneuver (LLM); **B:** Representation of LV in 16 segments. Heterogeneity in the variation of the segmental longitudinal strain (LS): green segments with LS decrease in response to the leg lifting maneuver: segments 3, 9, 11, 13-16 (p <0.05); segments: 5 and 10 (0.05 <p <0.07).

Abstract P318 Figure. LV GLS variation: Leg lifting maneuver

P319

Only young females, age less than 50 years old, have better two dimensional echocardiographic strains than young males

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Background: Strain values by 2-dimensional strain echocardiography (STE) can be used as objective markers of ventricular systolic function. Females are different from males in many aspects. However, there is little data about strain values according to age and gender. We investigated gender difference of strain values by STE in normal subjects.

Methods: Strain values of right (RV) and left ventricle (LV) were analyzed from the digitally stored echocardiographic images from NORMAL (Normal echOcardiogRaphic diMensions and functions in KoreAn popuLation) study for the measurement of normal echocardiographic values performed in 23 Korean university hospitals.

Results: We enrolled total 1003 healthy persons in the NORMAL study. Of them, we analyzed 2-dimensional RV strain values in 493 subjects (261 females, mean 47±15 years old) only with echocardiographic images by GE machines. Their LV systolic and diastolic functions were normal. RV systolic function was normal. LV global longitudinal peak systolic strain (LVGLS) was -20.4±2.2% and RV global longitudinal peak systolic strain (RVGLS) was -21.5±3.2%. Females had higher absolute LVGLS (-21.2±2.2 vs -19.5±1.9%, p<0.001) and higher absolute RVGLS (-22.3±3.3 vs -20.7±2.9%, p<0.001) than males. Younger (<50 years old) females had higher absolute LVGLS (-21.5±2.3 vs -19.3±1.7%, p<0.001) and RVGLS (-22.9±3.2 vs -20.5±2.8%, p<0.001) than age matched males. In females, LVGLS gradually

worsened with age (p for trend=0.005) and becomes similar in age [3] 60years. However, RVGLS gradually increased according to age (p for trend=0.002) and becomes almost similar in age [3] 50 years. However, this trend was not seen in males (p for trend LVGLS and RVGLS=0.060 and 0.287, respectively).

Conclusion: We calculated normal 2-dimensional strain values in normal population. Females have higher absolute strain values than males, especially in younger age groups (<50 years old).

P320

Early changes in myocardial deformation detected by three-dimensional speckle tracking echocardiography in patients treated with anthracyclines

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Background: Chemotherapy-related cardiotoxicity has an important prognostic impact in cancer survivors. Three-dimensional speckle tracking echocardiography (3DSTE) has revealed more consistent data than a two-dimensional technique and may represent a more accurate tool in the evaluation of myocardial function in patients undergoing chemotherapy.

Purpose: To evaluate the parameters of myocardial deformation using 3DSTE in patients with breast cancer treated with anthracyclines.

Methods: We evaluated patients with breast cancer treated with anthracyclines in 3 stages: baseline and after cumulative dose of 120 mg/m² and 240 mg/m² of doxorubicin. Ultrasensitive troponin I (TnI) and a standard echocardiographic study were performed at each stage. We analyzed the left ventricular ejection fraction (LVEF) by the Simpson method, the two-dimensional speckle tracking (2DSTE) with longitudinal strain and radial strain values, and 3DSTE with values of longitudinal strain, radial strain, circumferential strain, twist, torsion, rotation and area strain.

Results: We evaluated 44 female patients with age of 48.7 ± 10.8 years. After the cumulative dose of 240 mg/m² of doxorubicin, TnI changed (> 34 pg/mL) in 20 patients (45%; p = 0.001) and LVEF remained unchanged (p = 0.218). The changes in longitudinal strain by 2DSTE was statistically significant (p = 0.001), but with a relative variation of 5.4% (-18,2% to -17.4%). 3DSTE detected changes in several parameters of myocardial deformation (table). After a lower cumulative dose of doxorubicin (120 mg/m²), in a multiple comparisons analysis, the circumferential strain (p = 0.021) and the area strain (p <0.001) were the only parameters that changed.

Conclusion: In patients with breast cancer treated with anthracyclines, an analysis of myocardial deformation using 3DSTE detected early changes in circumferential strain and area strain, representing a promising technique in the study of chemotherapy-induced cardiomyopathy.3DSTE PARAMETERS

	Baseline	120 mg/m²	240 mg/m²	p
Longitudinal Strain (%)	-16.4±1.9	-15.9±1.9	-14.8±1.8	<0.001
Radial Strain (%)	31.4±12.6	26.9±11.5	25.2±11.6	0.03
Circumferential Strain (%)	-34.3±4.8	-32.2±4.5*	-30.0±4.4	<0.001
Twist (°)	5.7±2.5	5.3±3.1	4.7±2.4	0.175
Torsion (°/cm)	2.6±1.4	2.5±1.6	2.2±1.3	0.43
Rotation (°)	5.5±2.8	4.8±2.1	4.5±2.2	0.097
Area Strain (%)	-45.9±3.8	-43.4±4.2**	-39.9±3.3	<0.001

Data are expressed as mean ± SD. *p = 0.021 and **p < 0.001 after 120 mg/m² of doxorubicin.

P321

Assessment of right ventricular function in asymptomatic type 1 diabetic children

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Background: Right ventricular function in diabetic children was not fully addressed. Previous reports were mainly directed for the left ventricle. Our objective was to investigate the subclinical effects of diabetes on right ventricular systolic and diastolic function in asymptomatic children with type 1 D.M. using echocardiographic two dimensional strain and strain rate.

Methods: This study was conducted on 45 children with type 1 DM and 20 apparently normal children with comparable age, sex and socioeconomic status as a control group. Each patient was subjected to history taking, physical examination, routine laboratory investigations and conventional echocardiographic examination .Apical four chamber view was used for offline analysis of RV deformation data including assessment of systolic strain (ε), peak systolic strain rate (SRs), peak early diastolic strain rate (SRe) and Peak late diastolic strain rate (SRa) obtained from the basal, mid and apical segments of the RV free wall.

Results: Although conventional echocardiography failed to reveal any impairment in RV systolic performance (measured with Tricuspid Annular Plane Systolic Exercursion, TAPSE), the values of systolic strain and peak systolic strain rate in the

basal, mid and apical segment of the RV free wall were significantly lower in DM group as compared with control group indicating impairment of RV systolic function. Similarly, decreased peak early diastolic strain rate in children with diabetes in RV free wall reflecting abnormalities of RV diastolic performance.

Conclusion: Diabetes mellitus type 1 leads to RV systolic and diastolic dysfunction. Strain and strain rate imaging appear to be a sensitive tool for early detection such abnormalities

P322

Left ventricular mechanics is more impaired in patients with strauss than those with conventional criteria for left bundle branch block despite preserved left ventricular ejection fraction

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Background: Recent data suggested that one third of patients meeting conventional electrocardiographic (ECG) criteria for left bundle branch block (LBBB) may be misdiagnosed and new, stricter, ECG criteria for LBBB have been proposed (Strauss's criteria).

Purpose: we used two-dimensional speckle tracking echocardiography (2DSTE), to compare left ventricular (LV) mechanics in patients with LBBB according to conventional versus Strauss's ECG criteria for LBBB.

Methods: We studied 49 asymptomatic patients with incidental LBBB: 16 with conventional (mean age 69 years, 56% were men) and 33 with Strauss's criteria (mean age 66 years, 61% were men), LV ejection fraction (LVEF) $\geq$ 45%, and no significant obstructive coronary artery disease by invasive or computed tomographic coronary angiography. Three-dimensional echocardiography was performed to measure LV end diastolic (LVEDV) and end systolic (LVESV) volumes, sphericity index (SpI), LV remodelling index (LVRI) and LVEF. 2DSTE was used to measure parameters of LV dyssynchrony: septal to posterior wall time to peak radial strain (SW-PW delay), longitudinal strain delay index (L-SDI), longitudinal strain rate dispersion index (L-SRDI) and LV mechanical dispersion (LVMD). In addition, we also measured LV cardiac work indices: global work efficiency (GWE), global work index (GWI), global constructive work (GCW), and global wasted work (GWW).

Results: Among dyssynchrony parameters; L-SDI was significantly higher in patients with Strauss's criteria than in conventional one (37$\pm$17% vs 25$\pm$10% respectively, p = 0.007). Moreover, GWW tended to be higher in patients with Strauss's criteria than in conventional one (325$\pm$132% vs 267$\pm$124% respectively, p = 0.07). In all patients, LVESV index was positively correlated with GWW (r= 0.51, p= 0.001). This correlation may further support the use of LVESV index change as an echocardiographic predictor to assess LV remodelling after cardiac resynchronization therapy (CRT).

Conclusion: Patients in whom LBBB was diagnosed according to stricter (Strauss's) ECG criteria showed significantly higher intraventricular dyssynchrony and tendency for higher LV wasted work than patients with LBBB according to conventional ECG criteria. Further studies are needed to assess if the same occurs in patients with LVEF $\leq$ 35% considered for CRT and further stratification of patients according to ECG pattern may improve the selection of patients who would benefit from CRT.

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Left atrial deformation predicts paroxysmal atrial fibrillation in patients with chronic renal failure

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Purpose: Previous studies of our group have established the association of left atrial (LA) deformation indexes obtained by 2D speckle tracking echocardiography (2DSTE) with paroxysmal atrial fibrillation (PAF) history, in patients with end-stage renal failure (ESRD). We assessed prospectively the prognostic impact of these indexes on PAF recurrence in the same population.

Methods: 78 ESRD patients (42 men, mean age 57$\pm$15) under dialysis (61$\pm$57 months dialysis history) on sinus rhythm comprised the study population. Patients were followed for a period of 16$\pm$8 months and PAF was reported following serial interviews. Left ventricular (LV) and LA volumes, LV ejection fraction, LA ejection fraction and LV mass were estimated using 2D echocardiography. E/e was evaluated by Doppler echocardiography. LA longitudinal Strain (LA reservoir function), LA longitudinal Strain Rate (LA pump function) and LV longitudinal Strain were obtained using 2DSTE. Additionally plasma CRP levels were measured and CHADsVASc and Cardiac Valve Calcification (CVCs) score were reported.

Results: Ten out of 78 patients reported one or more episodes of PAF during the follow up period and these patients were older compared to patients with no reported paroxysms (55$\pm$15 vs 67$\pm$13, p=0.01), exhibiting similar CHADsVASc scores (2.1$\pm$0.6 vs 2.8$\pm$1.8, p=NS). The 2 groups did not differ in terms of LV ejection fraction (60$\pm$10 vs 62$\pm$9 %, p=NS), LV mass (150$\pm$58 vs 166 $\pm$43 g, p=NS), LA ejection fraction (61$\pm$14 vs 60$\pm$12 %, p=NS), LA volume index (24$\pm$16 vs 28$\pm$14 ml/m2, p=NS) and E/e (7$\pm$4 vs 9$\pm$4, p=NS). Interestingly patients with PAF had significantly lower values of LA Strain (27$\pm$12 vs 20$\pm$8 %, p=0.04) and LA Strain Rate (1.75$\pm$0.6 vs 1.27$\pm$0.6 1/s, p=0.026) showing LA mechanical dysfunction. The extent of inflammation status as reflected by CVCs and plasma CRP levels was significantly

enhanced in the PAF group (p=0.05 and p=0.022 respectively). We further examined any associations of LA strain with standard echocardiographic indexes and established strong positive correlations with LV strain (p=0.001) and LA ejection fraction (p=0.02) and significant negative correlations with LA volume (p=0.001), E/e (p=0.009) and LV mass (p<0.001). Multivariate regression analysis revealed that LV mass was the most significant variable associated with LA strain value in this specific cohort (b=-0.450, p<0.001)

Conclusions: Left atrial deformation indexes is a simple tool for risk stratification of PAF in ESRD patients. These indexes seem to be impaired earlier than standard echocardiographic variables that have been associated with AF recurrences. Additionally their strong association with inflammation markers and LV hypertrophy might possibly reflect emerging fibrosis, ageing of the heart and cardiac remodeling in ESRD patients, conditions that consist the pathophysiologic substrate for PAF. Further prospective studies are needed for the evaluation of the prognostic power of these indexes in other cohorts.

P324

Two-dimensional longitudinal strain during dobutamine stress echocardiography for the detection of myocardial ischemia in patients with previous percutaneous intervention

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Purpose: To study the possible additive role of peak systolic longitudinal strain (PSLS) during dobutamine stress echocardiography (DSE) in the detection of myocardial ischemia in patients with high pretest propability for obstructive coronary artery disease (CAD).

Methods: 93 patients (mean age 66 $\pm$ 7 years) with a previous percutaneous intervention (PCI) underwent a DSE for the detection of ischemia (5-40 µgr/ kgr/min of dobutamine $\pm$ atropine). Strain images were obtained separately at the DSE protocol both at rest and the 1st minute of the recovery while the frame rate was increased to $\geq$ 90 f/s at high heart rate to optimize speckle-tracking. Scan angle was also simultaneously decreased to achieve target frame rate without compromising endocardial border detection.

We performed using the 16-segment model 1) Visual analysis of wall motion score (WMSc) of all segments in both apical and short-axis views at all stages of the test and any wall motion abnormality induced by dobutamine was considered a positive result (WMSc +) 2) Measurement of PSLS for the myocardial regions subtended by the 3 major coronary arteries and a decrease of PSLS in 2 adjacent regional segments was considered a positive result (PSLS +)

Results: 27 patients were WMSc (+) and 24 of them were also were PSLS (+) in the same region. In addition we found 12 PSLS (+) patients which were WMSc (-). In these in total 39 patients which were WMSc (+) and/or PSLS (+) we performed coronary angiography which revealed CAD in 34. Estimation of PSLS revealed an increased positive predictive value (PPV) over visual analysis for the prediction of CAD ((94 over 88 % respectively). Patients treated conservatively remain asymptomatic at follow up to 2 years after the study.

Conclusion: Estimation of PSLS during DSE in patients with previous PCI improves the diagnostic accuracy and prognostic value of the test.

P325

Evaluation of left ventricular function using myocardial deformation imaging in HIV patients

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Introduction: Cardiomyopathy in HIV, before the introduction of antiretroviral therapy, presented as symptomatic left ventricular systolic dysfunction and dilation. Nowadays, it presents as subclinical ventricular dysfunction. However, there are no established diagnostic criteria, so the identification of early markers of ventricular dysfunction would be extremely useful in HIV patients.

Aims: To evaluate left ventricular systolic function through myocardial deformation imaging by 2D speckle tracking in HIV patients without known cardiovascular diseases.

Methods: Retrospective study including 23 HIV patients without known cardiovascular diseases and 23 healthy controls. Clinical, demographic, conventional echocardiographic and tissue Doppler data were collected. Left ventricular systolic function was assessed using myocardial deformation imaging by 2D speckle tracking.

Results: The HIV group was predominantly composed by males (69,6%), with mean age of 47,0 $\pm$ 7,2 years, mean time elapsed since infection of 6,9$\pm$4,0 years, mean CD4+ count of 577,9 $\pm$ 415 cells/mm3 and median viral load of 0 copies/ml. The HIV patients had an increased ventricular mass compared to the controls (76,37$\pm$9,62 vs. 68,45$\pm$12,87 g/m2, p=0,023). No differences were found between groups regarding conventional echocardiography and tissue Doppler parameters. Myocardial deformation imaging showed that HIV patients presented worse values of global longitudinal strain (-18,8$\pm$1,8 vs. -20,6$\pm$1,8%; p=0,002) and global longitudinal strain rate (-1,05$\pm$0,17 vs. -1,20$\pm$0,17 s-1; p=0,002).

Conclusion: HIV patients without known cardiovascular disease presented subclinical systolic dysfunction, with worsening of global longitudinal strain and strain rate.

P326

Assessment of right atrial and right ventricular function using 2D speckle-tracking imaging in pulmonary hypertension

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The right heart (RH) failure is the main cause of mortality in pulmonary hypertension (PH). Objective assessment of RH using echocardiography is still a challenge; novel objective parameters are still needed. The right atrial peak global longitudinal strain (RAGLS) and right ventricular peak global longitudinal strain (RVGLS) are supposed to be a valuable tools in assessment of RH function.

The aim of the study was to assess utility of RAGLS and RVGLS compared to conventional parameters, like right ventricular systolic pressure (RVSP), acceleration time (AcT), S wave velocity, tricuspid annulus plane systolic excursion (TAPSE) and RA area. Correlation between RAGLS, RVGLS and NT-proBNP were examined.

Material and methods: 34 patients (pts) aged 52 $\pm$ 15.3 years (29 women, 5 men) were enrolled. In 8 pts idiopathic pulmonary arterial hypertension (PAH), in 7 pts PAH due to congenital heart defects, in 13 pts PH due to connective tissue diseases, in one portopulmonary hypertension and in 5 chronic thromboembolic PH was diagnosed. Following parameters were measured: RAGLS, RVGLS, RVSP, AcT, TAPSE, Swave velocity, RA area. Echocardiography was performed with Philips EPIQ7 ultrasound platform. The peak global RAGLS and peak global RVGLS were analysed by 2D-STE. In all pts NT-proBNP level was examined. Correlation between RAGLS and RVGLS and other parameters describing RV function and NT-proBNP were analysed.

Results: In all pts all parameters describing right heart function were impaired: RVSP 96.5 $\pm$ 33.11 mmHg, AcT 79.42 $\pm$ 14.36 ms, S wave velocity 12.21. $\pm$ 3.50 cm/s, RA area 27.14 $\pm$ 8.10 cm2, TAPSE 18.4 $\pm$ 5.69 mm. RVLGS was -15.04 $\pm$ 6.24 and RAGLS was 20.98 $\pm$ 9.6. Mean NT-proBNP level was 2007,76 $\pm$ 1965.63 pg/ml. Strong correlation between peak systolic RAGLS and TAPSE, S velocity were found. Peak systolic RVGLS was strongly correlated with RA area and RVSP (tab.1.).

Conclusion: Both RAGLS and RVGLS are valuable tools in assessment of right heart function and describing severity of right heart dysfunction in PH, which can be commonly used in common practise, apart from other conventional parameters.Tab.1.

Parameter	Value	Correlation with RAGLS r- index	Correlation with RVGLS r -index
RVSP (mmHg)	96.5 $\pm$ 33.11	- 0.28	0.55
AcT (ms)	79.42 $\pm$ 14.36	0.48	- 0.21
RA area (cm2)	27.14 $\pm$ 8.10	- 0.64	0.81
S velocity (cm/s)	12.21. $\pm$ 3.50	0.52	0.31
TAPSE (mm)	18.4 $\pm$ 5.69	0,78	0.31
NT pro BNP (pg/ml)	2007,76 $\pm$ 1965.63	- 0.41	- 0.38

P327

Evaluation of LA function in HTN patients with normal LA size by TDI

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Background: Hypertension alters atrial dynamics significantly, with resultant increased LA volume and active emptying volume consequent to altered LV diastolic function. Patients with hypertension are at risk of structural and functional changes in the left atrium(LA).

Aim: To evaluate LA function and to determine the incidence of abnormal left atrium function among hypertensive patients with normal left atrium size by tissue Doppler imaging (TDI).

Methods: Echocardiographic parameters, including TDI of LA were obtained from 40 patients with hypertension and compared with 40 age and sex matched healthy persons. Cardiac dimensions including left ventricular internal diameter at end diastole (LVID), posterior wall thickness (PWT) and interventricular septal thickness (IVST) were measured, left ventricular liner dimension & systolic function were measured by M mode tracing. Left ventricle (LV) Diastolic function was evaluated using PW mitral inflow & TDI. LA size was assessed by M mode technique and LA indexed volume. Left atrium function was evaluated by TDI calculating three parameters: local peak systolic velocity (V), local peak systolic (SR) and local peak systolic (S).

Results: SBP in hypertensive patients was (145.0 $\pm$ 15.53) and DBP (88.50 $\pm$ 8.64). Regarding the LA indexed volume and LVMI, there were statistically significance in LA indexed volume and LVMI between both groups with increasing values in hypertensive group. All left atrium functions (conduit, reservoir and pump function) were impaired hypertensive group inspite of normal LA indexed volume. Also what was interesting is that such impairment of LA function was independent of LVMI and LV diastolic dysfunction grade and was only correlated with high blood pressure either systolic or diastolic. There were significant negative Correlation between SR-LAa and (SBP, LA indexed volume and peak velocity of mitral A wave).

Conclusion: In the subjects with a normal value of LA size, the effect of hypertension on LA functions were independent of age, sex, heart rate, LA volume, LV mass index, and LVEF. It was evident that in hypertensive patients, all TDI parameters of LA function (Tissue velocity, strain and strain rate) were impaired even in the absence of LV hypertrophy or even diastolic dysfunction and normal LA size alone cannot be a marker of normal LA function.

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Morpho-functional cardiovascular adaptation in hypertensive patients: two-dimensional speckle - tracking echocardiographic study

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Twenty-four-hour Blood Pressure (BP) variability is an important predictor of organ damage and cardiovascular events. Although epidemiological data are widely based on evaluation of office (Clinic) BP, 24-hour Ambulatory BP monitoring (ABPM) accurately assess the severity of hypertension to predict cardiovascular events in hypertensive patients, because it more accurately reflects BP load on heart and blood vessels.

Conventional non–invasive techniques, such as M-mode, two-dimensional (2D) transthoracic echocardiography (TTE) and more advanced techniques, such as tissue Doppler imaging (TDI) and speckle tracking echocardiography (STE), are used to identify pathological changes of the hypertensive heart disease. In addition, the study of systemic arterial compliance (SAC) predicts the impact of the arterial stiffness on the LV remodeling.

Aim of the study was to evaluate the influence of the 24-hour average BP, integrated with echocardiographic parameters, on cardiovascular adaptations in hypertensive patients.

Methods: We studied 58 patients (34 males and 24 females, aged 53 $\pm$12 years) with hypertension for at least one year. All patients were subjected to ABPM, with evaluation of 24-hour, day time, night time and sleep and awake average systolic and diastolic BP; subsequently they were evaluated with TTE.

TTE parameters examined were: left ventricle (LV) mass indexed to body surface area (LVMi), LV ejection fraction (EF), left atrial volume indexed to Body Surface Area (LAVi), mitral inflow velocities (E, A and E/A), mitral annulus velocities (S' and E ') and E/E' ratio by TDI, LV global longitudinal strain (GLS) using 2D STE. SAC was derived by the ratio SVi/PP, using echocardiographic stroke volume index to BSA (SVi) and pulse pressure (PP).

Results: LVMi showed a correlation with the 24-hour average BP (SBP r =0.32; DBP r =0.26), SBPd (r = 0.32), DBPd (r = 0.28) and SBPn (r = 0.29). GLS was correlated with the 24-hour average BP (SBP r = 0.30; DBP r = 0.32), SBPd (r = 0.32), DBPd (r = 0.32) and with LVMi (r = 0.42), LAVi with 24 hour SBP (r = 0.28), while SAC with LVMi (r = 0.29) and LAVi (r = 0.33).

Conclusions: ABPM and TTE evaluation can be particularly useful in hypertensive patients, even with normal office BP, to highlight the influence of 24-hour blood pressure profile on LVM, and to a lesser extent, on LAV. Systemic arterial compliance, instead, seems to be correlated both to LVM and LAV, independently of BP levels.

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Left ventricular speckle tracking echocardiography for the detection of cardiac sarcoidosis in presence of a preserved left ventricular ejection fraction

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Purpose: Echocardiography is a cost-effective imaging technique, but lacks sensitivity to detect cardiac sarcoidosis (CS). Speckle tracking echocardiography (STE) may detect myocardial sarcoid infiltration with strain imaging. The aim of this study is to obtain the diagnostic value of left ventricular longitudinal strain in the detection of CS in sarcoidosis patients with a preserved left ventricular ejection fraction (LVEF).

Methods: We retrospectively included consecutive systemic sarcoidosis patients, screened per protocol for the presence of CS or pulmonary hypertension by echocardiography. Strain analysis was performed (QLAB 10.5). Patients with (a history of) structural heart or valvular disease, a LVEF < 50%, rhythm or conduction disturbances during echocardiography, or inappropriate image quality were excluded.

Results: In total, 68 patients (25 female, age 48$\pm$12 years) were included, 15 of the 68 patients were classified as probable or definite CS by our multidisciplinary team. Longitudinal strain results and echocardiographic characteristics are shown in table 1. In univariate analysis apical 4-chamber longitudinal strain was significant lower in CS patients (p = 0.04). LV global longitudinal strain (GLS) showed less negative values in CS patients, but did not reach statistical significance (p = 0.10). Other echocardiographic features showed no statistical difference, except for left ventricular end diastolic diameter (LVEDD) and diastolic (dys)function.

Conclusion: In patients with CS and a preserved left ventricular ejection fraction, the apical 4-chamber longitudinal strain and diastolic function were significantly impaired. GLS showed a trend towards less negative values. STE might play a role in the detection of CS in systemic sarcoidosis patients. Further research with a larger cohort of patients is necessary to draw definite conclusions.Longitudinal strain and echocardiography

Variable	No cardiac sarcoidosis (n= 53)	Cardiac sarcoidosis (n= 15)	P-value
Apical 2-chamber longitudinal strain, %	- 21.1 $\pm$ 2.7	- 20.4 $\pm$ 3.1	0.39
Apical 3-chamber longitudinal strain, %	- 21.0 $\pm$ 2.9	- 19.8 $\pm$ 3.1	0.16
Apical 4-chamber longitudinal strain, %	- 21.0 $\pm$ 2.5	- 19.4 $\pm$ 3.2	0.04
LV GLS, %	- 21.1 $\pm$ 2.3	- 19.9 $\pm$ 2.9	0.10
IVSd, cm	0.91 $\pm$ 0.15	1.0 $\pm$ 0.29	0.20
LVEDD, cm	4.7 $\pm$ 0.51	4.4 $\pm$ 0.44	0.02

Continued

Continued

Variable	No cardiac sarcoidosis (n= 53)	Cardiac sarcoidosis (n= 15)	P-value
Normal diastolic function, n (%)	50 (94.3)	11 (73.3)	0.04
LVEF, %	59.7 ± 5.8	61.2 ± 6.3	0.49

Results are presented as mean ± standard deviation or as number and percentage.
IVSd = interventricular septum thickness at end-diastole.

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Echocardiographic assessment by global longitudinal strain in renal transplant recipients

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Purpose: A growing evidence indicates that Global Longitudinal Strain (GLS) by 2Dimensional Speckle Tracking Echocardiography (2DSTE) provides incremental and earlier information than conventional ejection fraction (EF) in detecting subtle changes of myocardial contractility and Left Ventricular (LV) function. Moderate physical activity is normaly allowed in renal transplant recipients (RTR) mainly after surgical treatment to reduce cardiovascular risk factors. This study investigated the prognostic value of GLS in those subjects after 12 months of physical activity.
Methods: The study included 40 RTR clinically stable and submitted to a mixed (aerobic and resistance) exercise program, which was defined on an individual basis according to the ACSM guidelines. GLS was calculated using 2DSTE (XStrain-ESAOTE). 2D echo parameters were measured by using MyLab Seven. The EF was measured using Simpson's biplane method. RTR followed the exercise program prescribed at time for a period of at least 12 months during which periodical re-evaluations of the main 2D echo parameters and of the GLS were performed. ANOVA test was used to compare the data
Results: The mean GLS at baseline was -19.2 % ±5.1 and EF was 62.7±4. GLS was very significantly (p<0.01) higher after 6 months of exercise (GLS 23.7 % ±4.1) and it maintained significant increase (p<0.05) after 12 M (GLS: 24.4 % ±1.5) despite no significant variation of EF (62.7±4; 65.4 ±3; 64.7±5).
Conclusions: GLS is a superior parameter in echocardiography for a long term follow up of regularly trained RTR. Especially in those subjects at high CV risk it provides additive prognostic value mainly in patients with preserved EF.
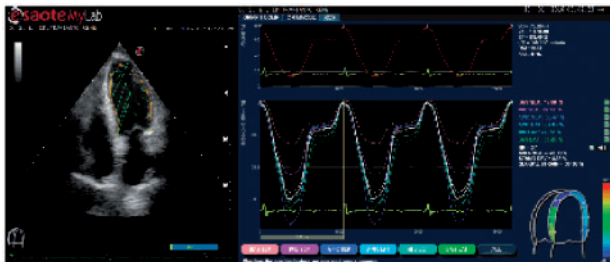
Abstract P330 Figure.

P331

The ratio of trans-mitral inflow velocity to tissue doppler velocity E/E' as a prognostic marker of sacubitril/valsartan treatment response in heart failure with reduced ejection fraction

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Introduction: Although sacubitril/valsartan, a first in class angiotensin-receptor-neprylisin inhibitor (ARNI), has recently shown its benefits and safety in wide spectrum of symptomatic patients with chronic heart failure with reduced ejection fraction (HFrEF), there is no evidence yet on prespecified predictive markers of its efficacy.
Purpose: The aim of this study is to investigate echocardiographic indices as prognostic markers of sacubitril/valsartan treatment response in patients with HFrEF.
Methods: We included twenty five (25) symptomatic patients (aged 68 ± 10 years) with chronic HFrEF (LVEF <35%, New York Heart Association (NYHA) class II/III (44% in NYHA II and 56% in NYHA III), who received sacubitril/valsartan (mean dose of 97± 30 mg twice a day) on optimal medical treatment. All subjects underwent a complete echocardiographic study and a cardiopulmonary exercise test at baseline and six months later.
Results: Blood pressure (BP) decreased from 124/74 ± 9/7mmHg to 110/70 ± 10/6 mmHg (p < 0.05) during the study period. Moreover, exercise duration (ED) and peak oxygen uptake (VO2max) were significantly increased from 6.27 ± 1.1 to 7.54 ± 1.1 min (p < 0.05) and 15.41 ± 1.4 to 17.71 ± 1.8 ml/kg/min, (p < 0.05) respectively.

Multivariable regression analysis showed sustained positive association between the baseline ratio of trans-mitral inflow early diastolic velocity to mitral annulus early diastolic velocity (E/E)' and the improvement in ED (ΔED= 1.5 ± 0,3 min) and VO2max (ΔVO2max= 2.3 ± 0,3 ml/kg/min), (r= 0,51, p<0.05 and r= 0,54, p<0.05 respectively).
Conclusions: E/Eö may be an important predictive marker of sacubitril/valsartan treatment response in HFrEF. Further studies are needed to assess its precise role as a prognostic factor of sacubitril/valsartan efficacy.

P332

Quantitative myocardial perfusion and gated left ventricular measurements from 82Rb PET/CT assessed by different commercial software packages

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Introduction: 82-Rubidium cardiac PET/CT not only provides information about ischaemia and LV function but also absolute myocardial blood flow (MBF) and myocardial perfusion reserve (MPR) since dynamic imaging can be performed during the first pass of the tracer. Various software are commercially available to analyse the qualitative and quantitative data. We aim to compare 3 such software packages to assess the reproducibility and variations among them.
Methods: Data were processed using 3 software with minimal manual intervention by a single observer blinded to clinical information. The MBF, MPR (corrected with resting rate pressure product), summed scores and gated volumes were assessed using each method. Bland-Altman analysis was used to determine the level of agreement with 95% limits plotted as the mean ± coefficient of repeatability. ANOVA determined whether the mean values were statistically different, considering p<0.05.
Results: However method C derived global MPR and stress MBF values differed significantly from method A and B. Pairwise differences of MPR values were no more than 0.37 and 0.42mL/min/g for stress MBF and MPR. Method C derived EF values were also different compared to A and B (p<0.01) and EF mean difference was under 6.34% among the 3 methods. The mean summed scores from all methods were not different as determined by one-way ANOVA (p=0.64, p=0.95 and p=0.49, for SSS, SRS and SDS respectively). Bland-Altman analysis showed very high level of agreement (91-98%) among the 3 methods for all variables.
Conclusion: The mean values of MPR, stress MBF and EF derived from C differed significantly from those obtained from A and B. Users should therefore be cautious when using different software interchangeably as systematic differences amongst them may introduce wider quantitative variation which could be clinically significant.Population Results

Characteristics	f(%)/mean±sd (range)
Patients	55
Age	66±9.5 (34-85)
Males	70%
Weight, Kg	88±18.2 (62-145)
Body Mass Index (kg/m^2)	30±7.4 (18-60)
Diabetes	38%
Current Smoker	9%
Hyperlipidaemia	62%
Hypertension	56%

COMPUTED TOMOGRAPHY AND NUCLEAR CARDIOLOGY

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Value of resting 12-lead electrocardiogram to predict myocardial scar on FDG-PET in heart failure patients

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Background: A resting 12-lead electrocardiogram (ECG) is widely available, fast, and safe. However, its value to predict a myocardial scar in patients with ischemic cardiomyopathy (ICM) has not been studied extensively.
Purpose: To assess whether Q waves on resting ECG were predictive of myocardial scars in heart failure patients with ICM.
Methods: We analysed resting ECGs of 101 patients with ICM undergoing cardiac positron emission tomography (PET) with 18F-fluorodeoxyglucose (FDG) at our institution between 2005 and 2015. Pathological Q waves and QS complexes were assigned to one of three coronary artery territories (left anterior descending (LAD): V1-V4; right coronary artery (RCA): II, III, aVF; left circumflex artery (LCX): I, aVL, V5, V6) and compared to the FDG PET findings. Myocardial scar was defined as 2 or more contiguous myocardial segments with an average FDG-uptake <50% of the maximum value.

Results: On patient-based analysis, pathological Q waves had a sensitivity and specificity of 61% and 48%, respectively and a PPV and NPV of 54% and 55%, respectively, to detect myocardial scar on FDG PET. For QS complexes sensitivity and specificity was 43% and 64%, PPV and NPV were 55% and 52%, respectively. Logistic regression analysis demonstrated a significant association between the presence of Q waves and reduced FDG uptake (odds ratio 0.77; p=0.012). While sensitivity of Q waves was low in all three coronary territories, specificity was significantly higher in the LCX and RCA compared to the LAD territory (p<0.001).

Conclusion: Pathological Q waves on resting 12-lead ECG have poor or at best moderate sensitivity and specificity to detect myocardial scar on FDG PET. These findings support the use of more advanced imaging techniques to assess myocardial viability in ICM.

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Increasing value of calcium score as a predictor of cardiovascular risk comparing to traditional risk scores

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Objective: Evaluation the accuracy of traditional cardiovascular (CV) risk scores in patients (P) with chest pain, suggestive of stable angina pectoris, submitted to coronary computed tomography angiography (CCTA) or invasive coronary angiography (ICA) for diagnosis of coronary artery disease (CAD). Assessment of incremented value of calcium score (CaS) in prediction of obstructive coronary artery disease.

Methods: Prospective analyses of P submitted to CCTA or ICA for DAC diagnosis in a tertiary academic medical center. P with known coronary artery disease were excluded.

Heart Score, Framingham Score and Procam Score were calculated before coronary anatomy known. In P who underwent CCTA, CaS was calculated before coronary angiography. Obstructive CAD was defined as coronary stenosis >70% (>50% in left main)

Results: 64 P were included, 70.3% male, mean age 66.3±8.2 years. 28 (43.8%) presented obstructive CAD. Traditional risk scores showed insufficient accuracy in distinction of patients with and without obstructive CAD. Heart Score were similar between patients with obstructive CAD(3.1±1.7%) and without obstructive CAD (3.0±2.9%) (p=0.910). P with obstructive CAD presented Framingham score of 13.6±9.8% similarly to 11.7±9.3% presented by patients without obstructive CAD (p=0.489). The calculation of 10 year risk of acute coronary event using Procam Score showed no difference between Pwith and without obstructive CAD (47.5±10.3 vs 46.2±10.5; p=0.628). Contrariwise, CaS was significant higher in obstructive CAD P (948±1348 vs 2458±560; percentile 85±12 vs 45±34; p=0.001). The majority of P were correctly reclassified when CaS was added to traditional risk scores, considering the cut off value of calcium score percentile 75 as predictor of CAD – high risk P.

Re-estimation

Heart Score + Calcium Score

Heart score alone classified as low/intermediate risk (10 year risk of CV disease ≤4%) 82.1% of P with obstructive CAD. Of these, 90% were correctly reclassified as high risk when CaS was added.

Framingham score + Calcium Score

Framingham score alone classified 46.4% of P with obstructive CAD as low risk (<10%). Of these, 100% were correctly reclassified as high risk when CaS was added. Framingham score alone classified 27.8% of P without CAD as intermediate/high risk (>10%). Among these, 100% was correctly reclassified as low risk when CaS was added.

Procam Score + Calcium Score

With Procam Score 35.7% of CAD P were classified as low risk (<10%). Of these, 100% were correctly reclassified as high risk when CaS was added.

Procam Score classified 52.8% of non obstructive CAD P as intermediate/high risk. Among these, 71% was correctly reclassified as low risk when CaS was added.

Conclusion: Traditional CV risk scores had low accuracy for predicting the presence of obstructive CAD. Calcium score constitutes extremely valuable information for predicting the presence of significant CAD and should be a tool in risk stratification.

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Effectiveness of non-invasive cardiac imaging tests as gatekeepers to invasive coronary angiography

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Introduction: The UK NICE 2010 guidelines on stable chest pain recommended that patients with mild and moderate pre-test probability (PTP) should be investigated with CT coronary angiography (CTCA) and functional imaging tests respectively while patients with high PTP were recommended to have invasive coronary angiography (ICA). ESC guidelines 2013 recommended functional imaging tests for all patients, with CTCA recommended as an alternative for patients with low to moderate PTP. NICE have just updated their guideline to recommend CTCA for all patients with stable chest pain.

Purpose: We wanted to compare the effectiveness of the non-invasive tests at detecting severe coronary artery disease (CAD) and as gate keepers to ICA.

Method: We examined our catheter lab database for patients undergoing ICA for new onset stable chest pain over a 12 month period and documented whether they had undergone an initial non-invasive test: CTCA, functional imaging test or exercise tolerance test (ETT). We classified the ICA findings as: 1) severe CAD 2) Moderate CAD 3) Mild CAD or normal coronaries.

Results: In total, 457 patients underwent ICA (mean age 63, 55% male). Of these, 67 underwent a CTCA beforehand, 34 had a functional imaging test, 26 had an ETT, and 330 were referred directly to ICA. Table 1 shows the percentage yield of severe and moderate CAD for each of these subgroups. The yield of severe CAD was 39% for CTCA, 35% for functional imaging tests, 46% for ETT and 31% for direct referrals.

The ETT had the highest yield of severe CAD because only those with clear cut positive ETT went on to have ICA. CTCA had a slightly higher detection rate of severe CAD compared to the functional imaging tests. But, when considering the detection rate of moderate and severe CAD the diagnostic yield of CTCA and functional imaging tests were similarly high.

Discussion: All the non-invasive tests had a higher yield of severe and moderate CAD compared with the direct referrals to ICA. The yield of severe CAD should improve with the new NICE guideline.Table 1: Severity of CAD within patients

IMAGING MODALITY	CTCA	FUNCTIONAL TEST	ETT	NO TEST
Mild	21	11	12	163
Moderate	20	11	2	68
Severe	26	12	12	99
Total	67	34	26	330
% Moderate	30	32	8	21
% Severe	39	35	46	30

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Radiological diagnosis of concomitant cases echinococcosis of the heart and liver

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Purpose:. Hydatid disease is an infestation by the larval stage Echinococcus granulosus and is still common in the countries of high temperate zones. In time of echinococcosis heart damage is revealed in 0,2-2% cases.

The aim of our study was to reveal concomitant lesions of the heart and liver in cases of echinococcosis by Transthoracic Echocardiography (TE), MDCT and MRI and to determine correct preoperative diagnosis.

Methods: 4 patients with concomitant lesions of the heart and liver were revealed. The age of patients varied from 10 to 55 years. The diagnosis is based on serological reactions, TE, MDCT and MRI examinations. The clinical presentation of hydatid disease depends on the size and site of the lesion. In the process of the disease an important role plays not only the mechanical influence of the cysts on adjacent tissues, but also its toxical affect. Presenting symptoms of heart echinococcosis have a wide variety, but the main symptom was precordial pain. The electrocardiogram was always abnormal and showed T wave inversion in 2 cases, ST depression in 1 cases, incomplete right bundle-branch block in one case. The most frequent location is the ventricle myocardium.

Clinical features of Presenting symptoms of heart and liver echinococcosis were precordial, abdominal pains, feel of heaviness upper abdominal pain and sensation of fullness.

Results: The cysts were localized in the different sites of the heart: ventricular septum - 2 (the mean diameter of cystic mass 5,6 cm), LV apical segment (mean diameter - 4,3 cm) - 1, LV anteriolateral wall - 1 (mean diameter 8.9 cm). All masses by TE presented either as solitary or multi-chambered cystic lesions with sharp outlines. Detection of "double wall" is a specific sign that indicates presence of an echinococcosis. Abdomen CT examination on the projection of the right lobe of the liver displayed the round, sharply margined, cystic mass containing detached germinative membrane which is known as "water-lily sing" of the hydatid disease. In 3 cases the cysts were located in the right lobe of the liver. All patients underwent surgical treatment and multistep echinococcectomy from heart and brain; After surgical removal of the specimen, echinococcosis was also confirmed histopathologically. In all patients medical treatment was continued post-operatively.

Conclusion: TE is the primary modality for imaging of heart echinococcosis. MDCT and MRI are highly informative method not only for the diagnosis of echinococcosis, but also for the planning of treatment, especially in cases of concomitant lesions of different organs. Correct preoperative diagnosis is essential for following treatment.

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Myocardial perfusion imaging in middle-aged diabetics with borderline coronary lesion, does it make sense?

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Data suggest that patients (pts) with borderline coronary lesion (BLCL) - stenosis about 50% in LAD and about 70% in any other coronary artery, and myocardial perfusion defects have a 13% event rate of coronary events over two years period. Screening for stress induced ischemia in BLCL may be of extremely clinically value for the appropriate treatment strategy to reduce the risk of future coronary events. We tested the hypothesis that the myocardial perfusion imaging (MPI) technique can help to reveal silent myocardial ischemia (SMI) in the cohort of asymptomatic middle-aged T2DM patients with BLCL with the aim to prevent coronary events in forthcoming future.

In total, 52 consecutive middle-aged (<60 yearsëƒ 38males, 72.1%) asymptomatic T2DM pts with angiographically confirmed BLCL were enrolled into the study. MPI was performed according to the EANM procedural guidelines for stress-rest ECG gated SPECT one-day protocol using 99mTc-tetrofosmin. Perfusion images were judged blindly from the results of coronary angiography, and SMI was diagnosed consensually as myocardial perfusion abnormalities without associated symptoms.

Tested subjects were classified as ischemic (22 pts, 42.3%) and non-ischemic (30 pts, 57.7%) based on the perfusion scan results. Pts in the ischemic group with perfusion defects were revascularized with the result of none coronary event over the follow-up period of 24 months against 4 (13.3%) events in the rest of the pts.

In conclusion, BLCL in diabetic pts is not always not-ischemic. MPI seems to be an appropriate tool for the detection of SMI in asymptomatic middle-aged T2DM pts with BLCL. Revascularization can improve a short-time prognosis in these cases. Our data suggest further research exploring this issue.

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Comparison of radiolabeled leucocytes SPECT/CT accumulation and echocardiographic lesions in infective endocarditis diagnostic workup

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Background: Heterogeneous nature of infective endocarditis (IE), characterized by diverse clinical manifestations and underlying cardiac comorbidities, makes it a diagnostic challenge. IE diagnostics requires multimodality and comprehensive approach. Echocardiography is an essential imaging method. Recent studies showed high diagnostic value of single photon emission tomography and computed tomography with technetium99m-hexamethylpropyleneamine oxime–labeled leukocytes (99mTc-HMPAO-SPECT/CT) in IE assessment.

Purpose: The aim of this study was to compare radiolabeled leucocytes accumulation in 99mTc-HMPAO-SPECT/CT and transthoracic echocardiography (TTE) lesions in patients with suspected IE.

Methods: 40 consecutive patients with suspected IE were enrolled into the study in years 2015-2016. Patients had TTE for assessment of lesions typical for IE. All patients had 99mTc-HMPAO-SPECT/CT. Scans were assessed for presence and location of increased radioactivity foci, which show accumulation of radiolabeled leukocytes in inflammatory lesions. 99mTc-HMPAO-SPECT/CTs were evaluated as positive for IE if at least one focus of abnormal tracer uptake involving endocardium or implantable devices was found. Patients were divided into two groups – Group 1 included patients with present intracardiac foci in 99mTc-HMPAO-SPECT/CT and Group 2 those without.

Results: Intracardiac inflammatory foci were shown in 16 (40%) of 99mTc-HMPAO-SPECT/CTs. Scintigraphic exams showed native valve IE in 3 patients, prosthetic valve IE in 2 patients and device-related IE in 11 patients. Overall in TTE 28 (70%) of patients had lesions typical for IE – 89% of them had vegetations, 4% had an annular abscess and 7% presented with new severe valvular regurgitation. Patients in group 1 had a higher prevalence of lesions diagnostic for IE in TTE (p=0,04). They also presented significantly more often with vegetations within intracardiac portion of electrode in TTE (p=0,01). There were no significant differences in prevalence of valvular echocardiographic lesions between the groups.

Conclusions: Patients with intracardiac imflammatory foci in 99mTc-HMPAO-SPECT/CT had a higher prevalence of lesions diagnostic for IE in TTE. 99mTc-HMPAO-SPECT/CT may be a usefool tool especially for identifing localization and range of the infection.

Demographics and TTE results.

	Group 1 (n=16)	Group 2 (n=24)	p
- Age (years)	59±18	58±19	0,98
- Gender (female, male)	4,12	8, 16	0,57
- Diabetes mellitus	4 (25%)	5 (21%)	0,76
- Coronary artery disease	5 (31%)	9 (38%)	0,68
- Atrial fibrillation	6 (38%)	6 (25%)	0,40
- Implantable cardiac device	15 (94%)	17 (71%)	0,08
- Prosthetic cardiac valve	4 (25%)	5 (21%)	0,76
-C-reactive protein (mg/ml)	65±95	44±69	0,57
- TTE positive for IE	14 (88%)	14 (58%)	0,04
- TTE - vegetations within electrode	12 (75%)	8 (30%)	0,01
- TTE - vegetations	12 (75%)	12 (50%)	0,12
- TTE - valvular vegetations	4 (25%)	6 (25%)	1,00
- TTE - new severe valve regurgitation	1 (6%)	2 (8%)	0,80
- TTE - perivalvular abscess	0 (0%)	1 (4%)	0,40