THE ECHOCARDIOGRAPHIC EXAMINATION

P254
Can application of appropriateness of use criteria reduce the workload in a tertiary echocardiographic laboratory? A single centre experience
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Background: The American Heart Association has devised 202 appropriateness of use criteria (AUC) for echocardiography. They provide guidance for clinical decision-making and a potential framework for reimbursement. The impact of applying these criteria on current practice has not been assessed outside the USA.

Setting. Tertiary regional cardiac centre serving a population of 1 million and performing 8,000 TTEs per year in South-West Wales, UK.

Methods: We selected a random sample of transthoracic echocardiograms over a period of 6 months and analysed the requests forms, the clinical notes and the transthoracic echocardiography (TTE) reports in order to determine whether the requests were appropriate. We ascertained whether the result of the TTE was documented in the clinical notes, and whether it had prompted any change in the management of the patients' condition.

Results: We selected 70 scans and excluded 2 (N=68) because we could not trace the clinical notes. There were 43 M; mean age (SD) was 66.2 (15.6) years, range 25-89 years. Forty-seven requests (69%) were appropriate, and 21 (31%) were not. By specialty there were 19/23 (76%) appropriate scans requested by tertiary cardiologists, 7/20 (35%) by cardiology surgeons, 10/11 (91%) by secondary cardiologists, 9/9 (100%) appropriate requests (A8 — 24 requests; A7 — 9 requests). The leading appropriate request reasons were: assessment of chest pain after coronary revascularisation (11 patients, 28%), evaluation of chest pain in patients who were unable to exercise or in whom exercise ECG was equivocal (11 pts, 28%), and re-evaluation of patients treated medically (6 pts, 15%). There were 2 (5%) requests for inappropriate indications (in low-risk patients who were able to exercise) and 1 (3%) request of uncertain appropriateness (DSE for the assessment of transmural gradient in mitral stenosis).

Conclusion: In our practice, requests for DSE are overwhelmingly made for appropriate reasons, and ‘managing demand’ for this service is unlikely to produce major cost savings.

P255
Usefulness of the color doppler handheld echocardiography in the daily clinical practice
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The aim of the study was to evaluate the sensitivity and the specificity of a handheld ultrasound scanner compared to a standard machine in assessment of routine patients.

Methods: 32 consecutive patients (mean age 68 ± 12 years, 18 women) referred for routine echocardiography in a cardiology department underwent examinations with a handheld ultrasound scanner (HHUS) (2D and color doppler) and a high-end standard ultrasound scanner (SDUS). We assessed the sensitivity and specificity of the handheld device for chambers size quantification, severity of regurgitations and valve abnormalities.

Results: The sensitivity and specificity of HHUS used to detect wall hypertrophy was 99% and 73%, the corresponding values for chamber dilatation were 100% and 85%, and for aortic regurgitations, the sensitivity and specificity of HHUS were 78% and 100% respectively. Valvular abnormalities were identified in a lesser degree and standard ultrasound. The corresponding values for aortic valve and mitral valve abnormalities were 85% and 73%.

Conclusion: HHUS is an efficient tool for the identification of chambers size abnormalities. Valve abnormalities were identified in a lesser degree and standard ultrasound for complete assessment.

P257
Predictors of clinical usefulness of pocket-sized ultrasound in a general medical department
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The aim of this study was to evaluate the use of pocket-sized ultrasound (PSUS) in the daily clinical practice at the general medical department at Levanger Hospital. The following indications were defined a priori: (A8) - 24 requests, (A7) - 9 requests). The leading appropriate request reasons were: assessment of chest pain after coronary revascularisation (11 patients, 28%), evaluation of chest pain in patients who were unable to exercise or in whom exercise ECG was equivocal (11 pts, 28%), and re-evaluation of patients treated medically (6 pts, 15%). There were 2 (5%) requests for inappropriate indications (in low-risk patients who were able to exercise) and 1 (3%) request of uncertain appropriateness (DSE for the assessment of transmural gradient in mitral stenosis).

Conclusion: In our practice, requests for DSE are overwhelmingly made for appropriate reasons, and ‘managing demand’ for this service is unlikely to produce major cost savings.

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Purpose: By performing a cardiovascular and an abdominal screening by pocket-sized ultrasound lasting less than 10 minutes we changed, verified or added important diagnosis in 47% of patients admitted to a general medical department. The aim of this study was to evaluate predictors of usefulness with respect to diagnostic adjustments.

Methods: Patients admitted to a non-university hospital in Norway in the period from March 1st 2010 to September 30th 2010 were screened with pocket-sized ultrasound with b-mode and color flow imaging (size of unit: 135x73x28 mm). After a principal diagnosis was set in the emergency room, the patients underwent cardiac and abdominal ultrasound screening performed by one of three performing physicians, all cardiologists with some experience in abdominal ultrasound. The usefulness of the screening was classified as 1) change of principal diagnosis, 2) verification of principal diagnosis, 3) additional diagnosis made and 4) diagnostic change. All patients were categorized by the Study Committee. Diagnostic effectiveness was classified as any of the first three.

Results: 196 patients were included (male=57%, 68.1±15.0 years old). The Odds ratio (OR) for any diagnostic usefulness was 1.6, 95% CI (1.3-2.0), (p<0.001) per 10 years higher age and 2.0, 95% CI (1.7-2.3), (p=0.02) for those with known cardiovascular disease (CD). In the group of patients with either known CD or increased risk of CD (hypertension, diabetes mellitus) the OR was 2.9, 95% CI (2.6-3.2), (p<0.001). Looking only at the patients having their primary diagnosis changed the OR was 1.6, 95% CI (1.4-1.9), (p=0.003) per 10 years higher age and 1.2, 95% CI (0.8-1.6), (p=0.63) for those with known CD. In the group of patients with either known CD or increased risk the OR was 3.0, 95% CI (2.5-3.4), (p=0.002).

Conclusions: Age, known CD or increased risk of CD are predictors for clinical usefulness of a bedside screening with pocket-sized ultrasound in patients admitted to a medical department.

Background: Atrial fibrillation is the most common arrhythmia in clinical practice. Echocardiography is important for an initial evaluation and for the management in patient presenting AF. It is also useful to assess the left atrial (LA) function recovery after cardioversion (CV) to SR. The aim of the study was to assess the LA function recovery after CV for persistent AF to SR through a one month follow up.

Population. We enrolled 34 pts (mean age 65 ± 12.32 y.o.) who underwent successful CV from AF to SR. 17.6% had a recent onset of AF (less than 48 h), in the 41.1% AF lasted more than 7 days and less than 3 months and in the 42.4% AF lasted more than 3 months. We excluded patients with severe cardiovascular diseases (severe valvular disease, low EF) or previous transcatheter ablation.

Methods: Each patient underwent an echo study before CV. After restoration of the SR echo was repeated at day 0, after 48 hours, 1 week, 2 weeks, 3 and at one month from CV. Echo parameters evaluated were: LA size (linear measurements, areas, volumes), total emptying fraction (TEF), active emptying fraction (AEF). A wave by PW, Aa by PW TDI, speckle tracking LA. Statistical analysis was performed by repeated measures analysis of variance.

Results: LA volumes were average enlarged (46.5±17.8 ml/m2). We had no reductions in volume (p=0.8) and diameter (p=0.9). Statistically significant differences were recorded analyzing the TEF (p<0.0001), with a significant increase from baseline in the first week, and of the AEF (p<0.001) with significant increase from baseline in the third week. We had similar results analyzing the A wave by PW (p<0.005), the Aa wave by TDI (p<0.001) and velocity of the atrial basal segments studied by speckle tracking (p=0.03). Dividing the population by the onset of arrhythmia, patients with AF lasting <7 days had a prompt recovery either of the total emptying function (p=0.03) either of the active emptying function (stable values from the first control in SR, no significant improvement during FU). In patients with AF lasting from 7-90 days and in those with AF duration >90 days we had a significant recovery of TEF and AEF (790 days: TEF=p<0.01, AEF=p<0.01, >90 days TEF=p<0.01, AEF=p<0.002) with a significant improvement at the fourth week of FU (p=0.003).

Conclusion: Echocardiography plays a key role in the evaluation of the LA. It is important to add to the traditional measurements (LA volume, A and wave Aa), functionality parameters such as the TEF, AEF. The offline analysis by speckle tracking can also be useful. Moreover the timing of CV is critical for the recovery of the LA function.

P258
Assessment of atrial electromechanical function by tissue Doppler echocardiography and atrial fibrillation promotion in alloxan-induced diabetic rabbits: an experimental study

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Purpose: Diabetes mellitus is an independent risk factor for atrial fibrillation (AF). However, the underlying mechanisms are still not clearly elucidated. The aim of this study was to evaluate atrial electromechanical delay by tissue Doppler echocardiography (TDE), atrial electrophysiological changes and AF promotion in alloxan-induced diabetic rabbits.

Methods: In 8 alloxan-induced diabetic rabbits and 8 healthy controls, we measured atrial electromechanical coupling start parameters such as the TEF, AEF. The offline analysis by speckle tracking can also be used to evaluate cardiac remodelling following therapy or intervention. However, studies in this field are limited to the left ventricle (LV). Our aim was to extend a recently proposed technique for 3D shape indexes to the analysis of the left atrium (LA), and to describe its changes during the cardiac cycle in normal subjects.

Methods: Full-volume 3D data sets (Vivid E9, GE Healthcare, Horten, N) were acquired in 62 healthy subjects (age 18-65). LA endocardial surfaces were obtained with commercial software (3D AutoLV, EchoPac, BT 11, GE Healthcare, Horten, N). The method was based on 3D LA shape description using 1D signal by sampling the LA endocardial surface through a helical pattern, and on its comparison with the signal obtained from a reference shape. Four dimensionless indexes (range 0-1) were defined: sphericity (S), ellipticity (E), cylindricality (C) and concinity (Cn). LA shape values in the frames with maximal (M) and minimal (m) LA volumes were compared using Wilcoxon-signed rank test.

Results: All LA shape indexes (median, 25%-75%) showed a significant (p<0.03 for all) cyclic behaviour (Figure), but with different amplitude changes, which were maximal for S (12%) and minimal for E (3%). At M, it corresponded to max E (94.92-94.24) and max S (7.47-75), with min Cn (73.71-74) and CI (82.78-84), while at m lower E (92.9-93) and S (65.6-67) and higher Cn (76.75-78) and CI (85.81-88) were observed.

Conclusions: LA 3D shape analysis is feasible, showing cyclic changes in all shape indexes. This approach could be used, together with LV analysis, to assess the effects of remodeling on LA-LV functional coupling.

P260
Left atrial shape evaluation based on endocardial surfaces obtained by 3D echocardiography

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Purpose: With the advent of 3D echocardiography, novel interest has emerged to combine functional assessment with cardiac chamber shape quantitation, particularly to evaluate cardiac remodelling following therapy or intervention. However, studies in this field are limited to the left ventricle (LV). Our aim was to extend a recently proposed technique for 3D shape indexes to the analysis of the left atrium (LA), and to describe its changes during the cardiac cycle in normal subjects.

Methods: Full-volume 3D data sets (Vivid E9, GE Healthcare, Horten, N) were acquired in 62 healthy subjects (age 18-65). LA endocardial surfaces were obtained with commercial software (3D AutoLV, EchoPac, BT 11, GE Healthcare, Horten, N). The method was based on 3D LA shape description using 1D signal by sampling the LA endocardial surface through a helical pattern, and on its comparison with the signal obtained from a reference shape. Four dimensionless indexes (range 0-1) were defined: sphericity (S), ellipticity (E), cylindricality (C) and concinity (Cn). LA shape values in the frames with maximal (M) and minimal (m) LA volumes were compared using Wilcoxon-signed rank test.

Results: All LA shape indexes (median, 25%-75%) showed a significant (p<0.03 for all) cyclic behaviour (Figure), but with different amplitude changes, which were maximal for S (12%) and minimal for E (3%). At M, it corresponded to max E (94.92-94.24) and max S (7.47-75), with min Cn (73.71-74) and CI (82.78-84), while at m lower E (92.9-93) and S (65.6-67) and higher Cn (76.75-78) and CI (85.81-88) were observed.

Conclusions: LA 3D shape analysis is feasible, showing cyclic changes in all shape indexes. This approach could be used, together with LV analysis, to assess the effects of remodeling on LA-LV functional coupling.

ASSESSMENT OF DIAMETERS, VOLUMES AND MASS

P259
The atrial function after cardioversion for atrial fibrillation: one month of echocardiographic follow up

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Eur J Echocardiography Abstracts Supplement, December 2011
Assessment of left atrial volume in hypertension with and without left ventricle hypertrophy

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Objectives: This study was designed to identify an association between left atrial volume index (LAVI) and hypertension (HTN) with or without left ventricle hypertrophy (LVH).

Background: Left atrial enlargement has been suggested as a robust marker of cardiovascular disease. However, the association between left atrial enlargement and hypertension is not clearly defined.

Methods: A cross-sectional sample of 60 HTN patients <60 years of age underwent comprehensive Doppler echocardiography in Department of Cardiology and Vascular Medicine, Faculty of Medicine, University. All patients with normal LV systolic function were grouped according to the presence of HTN with and without LVH. Left atrial volume was assessed with Biplane-Area length method from four-chamber and 2-chamber views, and indexed to body surface area. The measurement of diastolic function was done according to Recommendations of European A Society of Echocardiography.

Results: Of 46 patients included, 23 with LVH and 23 without LVH. There were no significant different in clinical characteristic (age, gender, body surface area (BSA), blood pressure) between the two group. Left ventricular mass index (LVMi) in HTN group with LVH was 129.80 ± 26.03 gram/m2 and significantly different (p=0.001) compare to HTN group without LVH (89.49 ± 16.70 gram/m2), HTN group with LVH had LAVI 33.43 ± 9.23 ml/m2 while in HTN non LVH 26.05 ± 6.76 ml/m2 (p=0.004). LVMi grade was positively associated with LAVI (r=0.30; p=0.04). Proportion of diastolic dysfunction was higher in LVH group compare those non LVH (86% vs 47%; p=0.005). Conclusions: The LAVI was observed in HTN with LVH compared to those who had no LVH. It appears due to higher proportion of diastolic dysfunction in HTN with LVH.

P262
Three-dimensional assessment of left atrial remodelling in atrial fibrillation using 3D echocardiography and angio CT multislice 64
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Introduction: We aimed to study the correlation between the extension of structural and mechanical remodelling of left atrium (LA) (evaluated with Computerized 3D Echocardiography -C3DE and Multislice 64 Computed Tomography -MSCT) and recurrence of atrial fibrillation (AF) after cardioversion in order to identify predictors for recurrence of AF.

Methods: Thirty-six patients with AF shorter than 6 months, in whom we performed C3DE and MSCT immediately after cardioversion. In all cases we performed a computerized analysis of LA shape, geometry and volumes, using an adapted 3D echo Glab software. Contraction amplitude of LA myocardial fibers was determined based on the amplitude of endocardial border movement and displayed as graphical representation and bulls-eye chart. LA contraction amplitude, left ventricular ejection fraction, LA volumes and diameters were determined. LA volumes and diameters were also assessed using MSCT. Follow-up was performed at 1 month and 3 months to analyse the recurrence of AF.

Results: 21 patients converted to sinus rhythm maintained the sinus rhythm at 3 months (group 1) and 15 presented AF recurrence (group 2). Both mechanical and structural remodelling were more pronounced in patients who presented AF recurrence. C3DE parameters characterising structural remodelling at 1 month were: LA maximum volumes - 94.2 ml in gr 1 and 142.3 ml in gr 2 (p=0.05), LA maximum diameters - 43 mm in gr 1 compared with 56.5 mm in gr 2 (p=0.03). MSCT derived parameters characterising structural remodelling were similar: LA maximum volumes - 89.5 ml in gr 1 and 146.3 ml in gr 2 (p=0.002), LA maximum diameters - 44 mm in gr 1 and 54.2 mm in gr 2 (p=0.03). Analysis of mechanical remodelling parameters showed a superior contraction amplitude in the rhythm control group − 2.1 mm, compared with recurrence group – 1.62 mm (p=0.02). Ventricular function was superior in the rhythm control group - LVEF 46.5%, compared with the recurrence group - LVEF 45.3% (p=0.02).

Conclusions: We recorded a good correlation between data obtained with 3D echo and MSCT as regard to assessment of structural remodelling in AF. 3D analysis identified several predictors for rhythm outcome, like parameters characterising left atrial structural (increase of LA diameters and volumes) or mechanical remodelling process (LA contraction amplitude), while ventricular function was more depressed in patients with AF recurrence. However, extension of structural remodelling showed a higher correlation with AF recurrence than contractile remodelling.

Cardiac structural abnormality in acute myocardial infarction patients at high risk of obstructive sleep apnea.

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Purpose: The aim of this study was to determine cardiac structural abnormalities by echocardiography in unselected group of acute myocardial infarction (AMI) patients who are at high risk of obstructive sleep apnea (OSA).

Methods: We identified AMI patients treated with primary angioplasty who are at high risk of OSA (high risk based on Berlin questionnaire and Epworth sleepiness scale result ≥10). All patients underwent echocardiographic study. Studies were carried out with Philips IE 33 and 2.5-3.5 MHz transharmonic probe. Left ventricular (LV) hypertrophy was defined as LV mass index >95 g/m2 in men and >115 g/m2 in women.

Results: 158 consecutive patients were enrolled in the study (mean age was 57.11 ± 8.72 SD, 68% were male). 54 (34.2%) patients were at high risk of OSA. Patients at high risk of OSA had higher body mass index (32.3 ± 4.6 vs. 27.3 ± 3.8 kg/m²; p < 0.0001), systolic (149.91 ± 34.2 vs. 128.36 ± 23.57 mmHg; p < 0.0001) and diastolic blood pressure (174.9 vs. 128.6 ± 12.06 mmHg; p < 0.0001) blood pressure on admission. High-risk patients’ LV diastolic diameter (52.2 ± 7.3 vs. 48.2 ± 5.1 mm; p=0.01), left atrial diameter (41.3 ± 5.4 vs. 38 ± 4.6 mm; p=0.0001) and interventricular septal thickness (12.6 ± 2.4 vs. 11.5 ± 1.7 mm; p=0.0028) were increased compared with low-risk subjects. The LV mass (300.7 ± 105.7 vs. 237.5 ± 98.6; p=0.0002), and LV mass index (140.3 ± 47.4 vs. 122.8 ± 29.2 g/m2; p=0.023) were significantly higher in high-risk patients. There was no statistically significant difference in LV ejection fraction (49.88 ± 8.73 vs. 49.79 ± 8.75; p=0.953), right ventricular diameter (25.36 ± 3.01 vs. 24.97 ± 3.12; p=0.199), and aortic thickness (32.2 ± 4.7 vs. 31.7 ± 3.76; p=0.021) between low- and high-risk patients. LV hypertrophy was present in 64.8% of high risk for OSA and in 61.5% of low risk group (p=NS). In multiple logistic regression analysis LV diastolic diameter >49 mm [OR 3.5 [95% Confidence Interval]: 1.05-11.6; p=0.042], LV mass index >122.6 g/m² [OR 0.26 95% CI: 0.07-0.94; p=0.04], and interventricular septal thickness >12 mm [OR 4.44 95% CI: 1.15-17.1; p=0.03], history of hypertension [OR 4.42 95% CI: 0.96-20.5; p=0.07], body mass index >30 kg/m² [OR 6.82 95% CI: 2.33-20; p<0.001], diastolic blood pressure >90 mmHg [OR 6.4 95% CI: 1.58-25; p=0.009] were independent risk factors for high risk of OSA.

Conclusions: High risk of OSA in AMI patients was associated with increased LV mass, and LV mass index. LV diastolic diameter, LV mass index, interventricular septal thickness, hypertension, body mass index, diastolic blood pressure are all independent risk factors for high risk of OSA.
P267 Noninvasive estimation of vascular pulmonary resistance during transathoracic echocardiography and dobutamine stress echocardiography in patients before orthotopic liver transplantation

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Aim: The aim of this study is to investigate pulmonary vascular resistance response to dobutamine stress testing in patients with end-stage liver disease.

Methods: We followed 54 patients (34 men and 20 women, aged 19 to 63 years, mean 41.8 years) from a large clinical spectrum: 20 athletes, 20 normals, 20 patients with risk factors, and 20 with dilated cardiomyopathy, with an ejection fraction (EF) from 12 to 76%. LA reservoir function was assessed from total LA strain (TLS), while LA conduit function from longitudinal (Ea) and systolic velocity (S') measurements (LWS): r=0.78, r²=0.53; and of LA conduit function were Ea and E/Vp: r=0.78, r²=0.61. LA reservoir function (TLAS) correlated positively with LV longitudinal, both systolic (Ep and local wave speed - LWS); endothelial function from flow mediated dilation (FMD).

Results: The mean age of patients was 52 ± 14 years, 44% were female. Forty-six percent had left heart disease, 21% were heart transplant patients and 18% had pulmonary arterial hypertensions. The proportions with increased PAMP (≥25 mmHg) increased pulmonary capillary wedge pressure (PCWP) ≥12 mmHg, increased PVR (≥3 Wu) or both increased PVR and PCWP were 54%, 40%, 36% and 15%. There was no significant linear correlation (correlation coefficient, R) between PCWP and AoT (R=0.18), interPVR (R=0.11) and AP (R=0.10). The positive predictive value was 94% with equal to or > 2 PR variables and the negative predictive value was 92% with no PR variables present (Table).

Conclusions: Assessment of PR in the pulmonary circulation identifies patients with normal as well as increased PVR and the finding suggest that echocardiography can be used as a gatekeeper for right heart catheterization.

Diagnostic performance

<table>
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<th>Variables</th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (95% CI)</th>
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<th>PPV</th>
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<td>64 (52–74)</td>
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</table>

P268 Best determinants of left atrial function are left ventricular longitudinal systolic function and arterial stiffness

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Interaction between ventricular and arterial function, "ventriculo-arterial coupling", was studied extensively. However, left atrial (LA) function, part of this continuum, was ignored, mainly because is difficult to assess it.

Methods: We studied 80 subjects (44; 18 years, 43 men) from a large clinical spectrum: 20 athletes, 20 normals, 20 patients with risk factors, and 20 with dilated cardiomyopathy, with an ejection fraction (EF) from 12 to 76%. LA reservoir function was assessed from total LA strain (TLS), while LA conduit function from longitudinal (Ea) and systolic velocity (S') measurements (LWS); r=0.78, r²=0.53; and of LA conduit function were Ea and E/Vp: r=0.78, r²=0.61 (all p<0.001). Conclusion, LA function is mainly determined by LV longitudinal function and arterial stiffness. This should be taken into account when targeting atrio-ventricular-arterial coupling by medication.

Correlations

<table>
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<th>Variables</th>
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<th>GLS</th>
<th>S'</th>
<th>Sa</th>
<th>MAPSE</th>
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<td>E/Vp</td>
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<td>r=0.68*</td>
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<td>r=0.48*</td>
<td>r=0.56*</td>
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</tr>
</tbody>
</table>

* p < 0.001.

P269 Novel strategies for echocardiographic evaluation of left ventricular function in a mouse model of myocardial infarction

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Purpose: Optimize the acquisition and analysis of echocardiographic images of the left ventricle (LV) to characterize cardiac dysfunction and adverse remodeling in a murine model of myocardial infarction (MI).

Methods: 13 female DBA/2j mice underwent permanent occlusion of the left anterior descending coronary artery (LAD) leading to MI. Animals were echocardiographed with a Vevo 770 at 110-130 fps before infarction (0d) and 7,14,30, 60 and 90 days after LAD ligation. LV systolic function was evaluated using the fractional area change (FAC%) computed in four high-temporal resolution ekVib mode parasternal
P270 Does the simplified approach on left ventricular (LV) elastance measurements provide reliable results of LV contractility?  
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Background: Much echocardiographic research into left ventricular (LV) function relies heavily on the assumption that LV systolic function can be described by the contractility index end-systolic elastance (Ees). It has been suggested that Ees can be simply calculated as the ratio between LV end-systolic pressure (ESP) to end-systolic volume (ESV). As based on pressure-volume loop analysis, this method relies on the fundamental assumption that the slope of the LV end-systolic pressure-volume relations intersects the volume axis at a negligible value and therefore can be approximated as zero, which however is controversial. We wished to critically test this assumption.

Methods and Results: Pressure and volume data were obtained at baseline and after lao intervention with norepinephrine (NTG) in n=66 patients (age =67 ±9 years). By online estimation, the contractility index end-systolic elastance (Ees) was defined as ESP/ESV. Ees was calculated as the ratio between LV end-systolic pressure (ESP) to end-systolic volume (ESV). As based on pressure-volume loop analysis, this method relies on the fundamental assumption that the slope of the LV end-systolic pressure-volume relations intersects the volume axis at a negligible value and therefore can be approximated as zero, which however is controversial. We wished to critically test this assumption.

Conclusion: The use of the long axis of LV to measure ESP since it provides better visualization of the LV infarction and higher correlation with cardiac systolic dysfunction than the short axis view. Isolated analysis of systolic/diastolic mechanisms may not be reflective of overall cardiac dysfunction. The combined myocardial performance index (Tei) properly characterizes global cardiac dysfunction in murine MI models.

P271 The diagnostic value of layer-specific quantification of myocardial deformation in the assessment of patients with coronary artery disease  
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Purpose: The aim of this study was to evaluate the accuracy of a 3D-4D quantification of left ventricular (LV) volumes and ejection fraction (EF) using a feature tracking echocardiographic software and related post-processing tools.

Methods: 20 subjects were enrolled in this study: of these 10 healthy subjects (5 male, 32 ±4 years), and 10 patients (4 male, 66 ±17 years) with heart diseases (2 with dilated cardiomyopathy, 3 previous myocardial infarction, and 5 patients with hypertrophic cardiomyopathy), underwent to 2D conventional echocardiography (Simpson method), XStrain 4D (XS4D) analysis and to cardiac magnetic resonance (MRI), in the same day and in random order to quantitate end diastolic volume (EDV, ml), end systolic volume (ESV, ml) and EF (%). The Simpson method was determined from four- and two-chamber (Ch) views. XS4D is a software solution merging Esato's XStrain 2D tracking technologies with Tomtec's 3D/4D rendering. Starting from standard apical 4Ch, apical 2Ch and apical long axis heart's views elaborated with 2D Strain, XS4D provides temporal compensation of the heart rate variation, spatial alignment of the views in 3D space and adaptation of a dynamic LV surface. Using well proven numerical methods XS4D provides various derived dynamic measurements among which global and regional volumes curves (including EDV/ESV and EF). The MRI quantification of LV volumes and EF included 9-13 short axis views (thickness 8 mm, gap inter-slice 0.5 mm). MRI was used as the gold standard method.

Results: LV volumes obtained by XS4D (EDV:92 ±43 ml; ESV: 45 ±31 ml) and Simpson method (EDV: 82 ±39 ml; ESV: 35 ±29 ml) were significant underestimated (P<0.001) in comparison with MRI (EDV:159 ±54 ml; ESV: 76 ±45 ml). No significant difference regarding EF was found among XS4D (54 ±12%), Simpson method (63 ±13%) and MRI (56 ±11%). Bland-Altman analysis between XS4D and cardiac MRI showed a low level of agreement for EDV (mean difference=66; SD=32); and for ESV (mean difference=31; SD=23); similarly Simpson method and MRI showed a low level of agreement for EDV (mean difference=76.5; SD=30) and for ESV (mean difference=31.6; SD=23). On the contrary, a very low bias (mean difference=2.2; SD=9.7) was found between XS4D and cardiac MRI for the quantification of EF, and between Simpson method and MRI (mean difference=4.6; SD=7.4).

Conclusion: Quantification of LV volumes using XS4D allows an accurate, and reliable assessment of LV EF and aroar evaluation of LV volumes compared with cardiac MRI. XS4D provides volumetric data that are similar to those computed using Simpson Biplane.

P273 New application of 2-dimensional midwall ejection fraction by speckle tracking echocardiography.  
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Purpose: Left ventricular midwall fractional shortening (FS) has been used as a more physiologically appropriate measurement of left ventricular systolic performance in patients with left ventricular hypertrophy than conventional FS. On the other hand, 2-dimensional echocardiography is more accurate for evaluating left ventricular volume and ejection fraction (EF) compared with M-mode echocardiography. The purpose of this study was to assess the usefulness of midwall EF using 2-dimensional speckle tracking echocardiography.

Method: Forty six patients with or without left ventricular hypertrophy were enrolled in this study. Left ventricular systolic function was assessed by EF, midwall FS and midwall EF. Relationship between these parameters and left ventricular mass index (LVMI) were investigated in this study. We also investigated the correlation between midwall EF and conventional tissue Doppler index.

Results: The EF did not correlate with LVMI (r=0.173, p =NS). There was significant correlation between midwall EF and LVMI (r=0.748, p < 0.0001). There was also significant correlation between midwall FS and LVMI (r=0.692, p < 0.0001). The early systolic transmural strain showed 0.82 (95% CI 0.70-0.94) and subepicardial strain 0.74 (95%CI 0.71-0.95).

Conclusions: Subendocardial function was more affected in NSTEMI and UAP patients with significant coronary artery stenosis compared to subepicardial function. Assessment of layer-specific strain echocardiography might identify NSTEMI and UAP patients with significant coronary artery stenosis.

Subendocardial LV GLS (%) -19.2 ± 2.3  
Subepicardial LV GLS (%) -14.3 ± 2.0  
Transmural LV GLS (%) -15.8 ± 1.5  
NSTEMI = non-ST elevation myocardial infarction; UAP = unstable angina pectoris; LV = left ventricular; GLS = global longitudinal strain.

Layer-specific left ventricular function

<table>
<thead>
<tr>
<th>Controls (n=21)</th>
<th>NSTEMI/UAP (n=30)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subendocardial LV GLS (%)</td>
<td>-19.2 ± 2.3</td>
<td>-16.4 ± 2.1</td>
</tr>
<tr>
<td>Subepicardial LV GLS (%)</td>
<td>-14.3 ± 2.0</td>
<td>-12.6 ± 1.6</td>
</tr>
<tr>
<td>Transmural LV GLS (%)</td>
<td>-15.8 ± 1.5</td>
<td>-13.5 ± 2.2</td>
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</tbody>
</table>

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Eur J Echocardiography Abstracts Supplement, December 2011

short axis images taken at different ventricular levels, and in one EKV-mode parasternal long axis. Pulsed wave and tissue Doppler modes were used to evaluate the diastolic function and Index Tei for global cardiac function. Infarct size was histologically quantified by measuring collagen deposition labeled by Sirius red and measured as the infarct percentage of injected area vs. total LV area. Subendocardial strain was analyzed using Shapiro-Wilk and Student’s-t tests. Pearson’s correlation coefficient was used to estimate the magnitude of the relationship between the infarcted size and FAC%. Results: LV dilatation extends progressively from the infarcted areas to the healthy myocardium. Isolated analysis of systolic/diastolic mechanisms may not without stenoses.

Eur J Echocardiography Abstracts Supplement, December 2011

1.9%, p =0.001). The end-diastolic area changed significantly as well (0d=18.98; 1.86, 7d=22.03 ± 2.11, 30d=22.83 ±2.37, 90d=24.08 ± 2.44; p =0.001). The LV FAC% decreased significantly between the basal and final time points being more visible in the parasternal long-axis view (0d vs 63.27, 7d=37.93 ± 9.30, 30d=35.41 ± 7.69, 90d=35.63 ± 8.12; p <0.001). The diastolic dysfunction displayed a significant increase of the ratio E/A 7 days post infarction (0d=1.57 ± 0.23; 7d=1.96 ± 0.47; p =0.05) in contrast to the IRT that increases steadily (0d=13.75 ± 1.50, 7d=17.50 ± 1.36, 30d=18.85 ± 2.80, 90d=17.72 ± 2.98; p =0.001). The Tei index increased significantly until the final point (0d=0.46 ± 0.07; 7d=0.55 ± 0.08; 30d=0.54 ± 0.06; 90d=0.57 ± 0.08; p =0.01). Linear regression analyses showed significant correlation between infarct size and FAC%(r=-0.946,R²=0.906;p<0.005).

Conclusion:The use of the long axis to measure %FAC since it provides better visualization of the LV infarction and higher correlation with cardiac systolic dysfunction than the short axis view. Isolated analysis of systolic/diastolic mechanisms may not be reflective of overall cardiac dysfunction. The combined myocardial performance index (Tei) properly characterizes global cardiac dysfunction in murine MI models.
Echocardiographic risk stratification in pulmonary arterial hypertensive patients

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Purpose: The aim of this study was to create an echocardiographic algorithm for risk stratification following a retrospective analysis of echocardiographic data in pre-capillary pulmonary hypertensive (PH) patients.

Methods: All patients referred to the National Pulmonary Hypertension Service of Hammersmith Hospital from 2002 until 2008 were included in the study. The patient cohort was solely focused in all pre-capillary PH patients and consisted of 762 patients. The data was analysed using a time-dependent Cox model. The survival outcome was determined by death. Of 762 patients, 226 (30%) died. Indices that determined survival were inserted into a receiver-operating curve (ROC) analysis in order to identify the optimal cut-off value for predicting mortality at 12 months.

Results: When specific cut-off points were determined for each echo parameter, moderate TR (AUC: 0.675) had the greatest sensitivity and specificity to predict 12-month survival, followed by a fractional area contraction (FAC) < 30% (AUC: 0.725). An eccentricity index in end-systole (EIs) > 1.98 (AUC: 0.664), an MPI > 0.84 (AUC: 0.654), presence of PerEF (AUC: 0.623), acceleration time (AT) < 62 msec (AUC: 0.583), right atrial volume (RAvol) > 414 ml (AUC: 0.546), and finally a tricuspid annular plane systolic excursion (TAPSE) < 14 mm (AUC: 0.544) were high risk echocardiographic markers for low survival within 12 months of follow up.

Conclusions: In a homogenous group of pre-capillary PH patients, echocardiographic predictors of overall survival were severity of tricuspid regurgitation, MPI, PerEF followed by TR, AT, RAvol and TAPSE. These may risk stratify prospective pulmonary hypertensive patients.

Right ventricular outflow tract systolic excursion. A novel echocardiographic parameter of right ventricular function associated with poor survival

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Background: Right ventricular (RV) function has important prognostic and therapeutic implications. Assessment of RV function using echocardiography is challenging. The aim of this study was to evaluate a new parameter of RV function, right ventricular outflow tract systolic excursion (RVOT-SE).

Methods: RVOT-SE was measured using the parasternal short axis view at the level of the aortic valve and M-Mode echocardiography (Figure). We measured the systolic excursion of the RVOT anterior wall. RVOT-SE was measured in 45 patients (age 63 ± 19y, 26 males) with normal RV function (RV fractional area change (RVFAC) < 32%) and 27 patients (age 68 ± 14y, 23 males) with reduced RV function (RVFAC < 32%) and TAPSE < 15 mm.

Results: RVFAC was 47 ± 6% in the normal RV group and 22 ± 5% in the reduced RV group (p < 0.0001). TAPSE was 2 ± 0.4 mm in the normal RV group and 1 ± 0.2 mm in the Reduced RV group (p < 0.0001). RVOT-SE was 9.5 ± 1.4 mm in the normal RV group and 1.6 ± 1.1 mm in the reduced RV group (p < 0.0001). An RVOT-SE ≤ 6 mm identified patients with reduced RV function with a 100% specificity. Survival at one year was 66% in patients with RVOT-SE < 6 mm and 86% in patients with RVOT-SE ≥ 6 mm, p < 0.002. The figure below shows RVOT-SE measurements (arrows) in a patient with normal (A) and reduced (B) RV function.

Conclusions: RVOT-SE is a novel, simple, and promising parameter for assessing RV function, and it is associated with poor survival. Further study is needed to determine the usefulness of RVOT-SE for echocardiographic assessment of RV function.
METHODS: Transthoracic echo-Doppler was performed in 9 patients referred for LVAD implant at baseline and with serial echocardiograms after LVAD implantation (Jarvik 2000). In a subgroup of patients an additional immediate echo evaluation, after intra-aortic balloon pump (IABP) implantation, was performed. All echocardiographic images were analyzed off-line to calculate the free wall RV longitudinal strain (RVLS).

RESULTS: All patients, except two, which presented the lowest RVLS values at baseline, showed a progressive increase of RVLS after LVAD implantation. Analyzing five patients undergone to IABP as an intermediate step, it was clear that only patients that presented an increase of RVLS after IABP implant, showed progressive increase of RVLS levels after LVAD implant. Three patients, that did not experienced an increase of RVLS after IABP implant, presented a RV failure after LVAD implantation.

CONCLUSIONS: This new parameter of RV myocardial deformation, RVLS, may have interesting clinical implications for LVAD patients; it can be applied for evaluation of RV function before LVAD implant, to potentially help in decision-making about the management of this kind of patients, and after LVAD implant, for the follow-up of patients.

ASSSESSMENT OF DIASTOLIC FUNCTION

P278
Atrial septal defect in adults: reasons for closure
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Purpose: The aim of the study was to evaluate the influence of atrial septal defect (ASD) closure in adults on left ventricular (LV) diastolic function assessed by conventional and tissue Doppler imaging.

Methods: Thirty consecutive patients with a history of ASD (77% type secundum, 10% type primum, 13% type sinus venosus) and 30 healthy controls matched by sex and age were included in the study. Atrial septal defect closure was performed under anaesthesia with single-dose general anaesthesia. LV diastolic function and filling pressure assessed by Doppler techniques. Closure pre- and postoperative LV diastolic function and filling pressures were compared.

Results: There was no significant difference in any parameter obtained in patients before and after closure and controls (E/A, MF DT, Em/Am, IVR, E/Em). We also didn’t observe significant difference between these parameters obtained one month and one year after closure compared with controls and baseline (Table 1).

Conclusions: The presence of ASD in adults doesn’t have influence on left ventricular diastolic function and filling pressure assessed by Doppler techniques. Closure preserves this function, immediately and one year after it.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control group</th>
<th>ASD Baseline</th>
<th>ASD 1 month after closure</th>
<th>ASD 1 year after closure</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>E/A</td>
<td>1.2 ± 0.5</td>
<td>1.3 ± 0.4</td>
<td>1.3 ± 0.5</td>
<td>1.2 ± 0.6</td>
<td>&gt; 0.05</td>
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<tr>
<td>MF DT, ms</td>
<td>176 ± 44</td>
<td>167 ± 38</td>
<td>172 ± 41</td>
<td>171 ± 47</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Em/Am</td>
<td>1.4 ± 0.4</td>
<td>1.5 ± 0.4</td>
<td>1.5 ± 0.3</td>
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<td>&gt; 0.05</td>
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<tr>
<td>IVR, ms</td>
<td>0.57 ± 0.22</td>
<td>0.64 ± 0.28</td>
<td>0.59 ± 0.25</td>
<td>0.58 ± 0.23</td>
<td>&gt; 0.05</td>
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<tr>
<td>E/Em</td>
<td>5.1 ± 1.2</td>
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<td>5.2 ± 1.3</td>
<td>5.4 ± 1.2</td>
<td>&gt; 0.05</td>
</tr>
</tbody>
</table>

P279
Impaired LV diastolic function in long term type I diabetes is associated with advanced glycation endproducts
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Purpose: Recent reports have indicated that use of the diastolic to systolic flow velocity ratio (DSVR) measured by transthoracic Doppler echocardiography (TTE) in the distal anterior descending and circumflex arteries (ASD and Cx) is a simple noninvasive method for detecting coronary stenoses located more proximally in the LAD, with significant reduction of the diastolic relative to the systolic flow component when measured post-stenotically. However, various cut-off values for significant stenosis have been proposed, with peak DSVR (pDSVR) > 1.6 - 1.8 representing significant stenosis in different studies. To the best of our knowledge, there are no data on TTE DSVR measurements of the circumflex coronary artery (Cx). The purpose of this study was to evaluate by TTE the potential of DSVR measured in distal-to-mid LAD (dmLAD) and marginal branches of Cx (CmB) for detecting coronary stenoses in the left anterior descending coronary artery (LAD) and Cx arteries.

Methods: A total of 108 patients scheduled for coronary angiography because of chest pain or acute coronary syndrome were studied. When the relevant coronary segment was identified with antegrade flow, the pDSVR was measured in dmLAD and CmB. Peak DSVR results were compared with results from QCA, with stenosis severity in the LM/LAD and LM/Cx divided into 2 groups: (1) diameter stenosis 0-49%; (2) diameter stenosis 50-100%. Among coronary arteries with DSVR measurements, QCA identified 34 group 2 stenoses in LAD and 5 group 2 stenoses in Cx. Peak DSVR was significantly different between the groups, with pDSVR 1.90 ± 0.31 in group 1 and 1.50 ± 0.16 in group 2 (p = 0.001). ROC analysis showed that a pDSVR cut-off value of 1.68 had sensitivity of 90% and specificity of 84% for detection of group 2 stenoses. Excluding the Cx, the same pDSVR cut-off value had specificity of 91% and sensitivity of 86% for detection of group 2 stenoses in LAD.

Conclusions: DSVR measurements in dmLAD were feasible in the majority of patients and could be used in CmB in 1/3 of patients. The ROC analysis showed that a pDSVR cut-off value of 1.68 had high precision for identifying significant stenoses in LAD and Cx, defined as diameter stenosis 50-100%.

ISCHEMIC HEART DISEASE

P280
Transthoracic echocardiography for detection of coronary artery stenoses by use of coronary poststenotic diastolic to systolic velocity ratio in the left anterior descending and circumflex arteries
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Purpose: Recent reports have indicated that use of the diastolic to systolic flow velocity ratio (DSVR) measured by transthoracic Doppler echocardiography (TTE) in the distal anterior descending and circumflex arteries (ASD and Cx) is a simple noninvasive method for detecting coronary stenoses located more proximally in the LAD, with significant reduction of the diastolic relative to the systolic flow component when measured post-stenotically. However, various cut-off values for significant stenosis have been proposed, with peak DSVR (pDSVR) > 1.6 - 1.8 representing significant stenosis in different studies. To the best of our knowledge, there are no data on TTE DSVR measurements of the circumflex coronary artery (Cx). The purpose of this study was to evaluate by TTE the potential of DSVR measured in distal-to-mid LAD (dmLAD) and marginal branches of Cx (CmB) for detecting coronary stenoses in the left anterior descending coronary artery (LAD) and Cx arteries.

Methods: A total of 108 patients scheduled for coronary angiography because of chest pain or acute coronary syndrome were studied. When the relevant coronary segment was identified with antegrade flow, the pDSVR was measured in dmLAD and CmB. Peak DSVR results were compared with results from QCA, with stenosis severity in the LM/LAD and LM/Cx divided into 2 groups: (1) diameter stenosis 0-49%; (2) diameter stenosis 50-100%. Among coronary arteries with DSVR measurements, QCA identified 34 group 2 stenoses in LAD and 5 group 2 stenoses in Cx. Peak DSVR was significantly different between the groups, with pDSVR 1.90 ± 0.31 in group 1 and 1.50 ± 0.16 in group 2 (p = 0.001). ROC analysis showed that a pDSVR cut-off value of 1.68 had sensitivity of 90% and specificity of 84% for detection of group 2 stenoses. Excluding the Cx, the same pDSVR cut-off value had specificity of 91% and sensitivity of 86% for detection of group 2 stenoses in LAD.

Conclusions: DSVR measurements in dmLAD were feasible in the majority of patients and could be used in CmB in 1/3 of patients. The ROC analysis showed that a pDSVR cut-off value of 1.68 had high precision for identifying significant stenoses in LAD and Cx, defined as diameter stenosis 50-100%.

P281
Lipoprotein-phospholipase A2 is associated with abnormal digital reactive hyperemia and impaired coronary flow reserve in patients with stable CAD
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1University of Athens, Athens, Greece; 2University of Athens, Atikon Hospital, 2nd Cardiology Department, Athens, Greece
Lipoprotein phospholipase A2 (Lp-PLA2) is an emerging inflammatory marker with prognostic value. Reactive hyperemia peripheral arterial tonometry (RH-PAT) is a method to assess peripheral microvascular endothelial function and is linked to coronary microvascular endothelial dysfunction. We investigated the association of Lp-PLA2 with RH-PAT, coronary flow reserve (CFR), and carotid intimal medial thickness in CAD patients.

**Methods:** Using RH-PAT, digital pulse volume changes during reactive hyperemia were assessed in 43 patients with angiographically documented CAD. RH-PAT index, a measure of reactive hyperemia, was calculated as the ratio of the digital pulse volume during reactive hyperemia divided by that at baseline using the Endo-PAT apparatus. Coronary flow reserve (CFR) of the LAD after adenosine infusion was assessed using Doppler echocardiography. The mean intima-media thickness (IMT) in common carotids and carotid bulbs using ultrasound imaging was also measured. According to the values of the 25th percentile of CFR, RH-PAT and IMT, patients were categorised in to those with CFR <2.1, RH-PAT index <1.4, or IMT >0.9 mm.

**Results:** Increasing levels of Lp-PLA2 were related to smoking, decreasing CFR, decreasing RH-PAT index and increasing IMT values (r=0.41, r=0.39, r=0.45 and r=0.38 respectively, p<0.05). Lp-PLA2 was higher in patients with CFR<2.1 than in those with CFR>2.1 (169±48 vs. 117±24 ng/ml, p=0.003), in patients with RH-PAT index <1.4 than in those with RH-PAT index>1.4 (144±40 vs. 115±29 ng/ml, p=0.02) and in patients with IMT>0.9mm than in those with IMT<0.9mm (136±36 vs. 97±40 ng/ml, p=0.015).

**Conclusions:** Increasing levels of Lp-PLA2 are related to endothelial dysfunction, impaired CFR and evidence of carotid atherosclerosis suggesting a potential role for Lp-PLA2 to identify stable CAD patients with adverse prognosis.

**P282**

Duration of myocardial systolic lengthening at rest predicts the presence of significant coronary artery disease

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**Purpose:** Ischemic myocardium with reduced active force will lengthen when left ventricular (LV) pressure is rising during early systole before onset of systolic shortening. The object of this study was to investigate whether the duration of LV systolic lengthening measured by two dimensional speckle tracking echocardiography (2D-STE) at rest could accurately identify patients with significant coronary artery disease (CAD).

**Methods:** We included 65 patients with suspected CAD referred to an elective diagnostic coronary angiography. None of these patients had a previous history of overt myocardial infarction. 2D-STE was performed before angiography. Global longitudinal strain and duration of LV systolic lengthening were recorded in 3 apical long-axis recordings and averaged from 16 LV segments (Figure).

**Results:** Of the 65 patients, there were 26 with significant CAD defined as ≥50% diameter stenosis in any coronary artery. The duration of systolic lengthening was significantly prolonged in patients with CAD as compared with patients without significant coronary artery stenoses (84±41ms vs. 36±24ms, P<0.001). Correspondingly, global systolic longitudinal strain was significantly lower in patients with CAD (−17.7±3.2% vs. −19.6±2.6%, P=0.01).

**Conclusions:** Duration of myocardial systolic lengthening was prolonged in patients with significant coronary artery stenoses and might be a useful tool to identify these patients. Our results indicate that patients with significant CAD have myocardial segments with reduced active force also at rest.

**P284**

Coronary flow analysis after acute myocardial infarction: are there differences in conventional echocardiographic parameters in patients with microvascular dysfunction?

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**Background:** Assessment of distal left anterior descending coronary artery (LAD) flow after reperfused acute myocardial infarction (AMI) may provide important insights in myocardial reperfusion assessment and microcirculatory dysfunction. However, its relation to other echocardiographic parameters describing left ventricular (LV) function after AMI is not well established.

**Aim:** To evaluate LAD flow pattern after reperfused AMI and to analyze its relation with other echocardiographic parameters.

**Methods:** 53 patients (pts) without known coronary artery disease (CAD), 42 men, m=58±13 y, with ST-elevation AMI submitted to primary percutaneous coronary intervention (PCI) and baseline echocardiographic evaluation. PCI was performed in 48 pts and primary PCI was performed in another 5 pts. The mean time from symptom onset to PCI was 1.4±0.6h. Either fibrinolytic therapy or primary PCI were administered in 40 pts before PCI and percutaneous thrombus aspiration was achieved in 18pts. A complete transthoracic echocardiogram with LAD flow evaluation was performed between the second and fifth day (m=3±1.9days) after the PCI. We evaluated demographic, clinical, angiographic and echocardiographic parameters (right and left ventricular (LV) function, LV deformation and volumes, filling patterns) between two groups: LAD deceleration time below and above 600ms (A and B respectively), the accepted cut-off value defining microvascular obstruction after recanalization.

**Therapeutic strategies were compared.** We also assessed cardiovascular outcome comparing between both groups at 18.1±11.9months of follow-up after the event.

**Results:** 37pts (69.8%) had LAD criteria for microvascular dysfunction after PCI (mean deceleration time=266.6±ms, peak flow velocity 42.1±22.9cm/s and coronary flow systolic inversion in 4pts). In this group of pts, LV ejection fraction was significantly depressed as compared to group B (55.7% vs. 50% vs. none; p=0.001). We also found significant differences in the wall motion score index (1.77±0.23 vs. 1.55±0.33; p=0.008), global longitudinal strain (−10.4±2.41% vs. −12.6±2.33% p=0.002) and E wave deceleration time (166.8±44.2 vs. 206.9±56.2; p=0.018). Neither fibrinolytic therapy nor thrombectomy and time to PCI were different among the groups. Cardiovascular outcome was also not different among.

**Conclusion:** In these patients with AMI, microvascular dysfunction as assessed by non-invasive coronary flow pattern was associated with several criteria of worse LV performance.
Purpose: The aim of our study was to evaluate contraction of the left atrium (LA) using speckle tracking echocardiography (STE) technique in patients with AMI and to define the feasibility of this method in AMI patients with LV remodeling.

Methods: A total of 136 patients (mean age 57 ± 9.8) with a first AMI and 36 controls (mean age 60.8 ± 10.2) were enrolled into the study. All of them underwent an echocardiographic investigation with STE for evaluation of LA strain. AMI patients were examined within 24-72 hours of the onset of AMI symptoms and in 4 months after AMI. 46 (33.8%) patients with LV remodeling were identified where LV remodeling was defined as a 15% increase from the baseline in LV end diastolic volume.

Results: Conventional atrial measurements such as LA diameter, LA volume and LA volume index did not differ between the AMI patients and controls. LA peak systolic strain was markedly improved in AMI patients (27.5 ± 9.1% vs 36.7 ± 6.5%, p < 0.001). LA peak systolic strain was evaluated in AMI patients with LV remodeling and without LV remodeling. Both groups had comparable baseline clinical and echocardiographic characteristics, except for predominating anterior wall MI (p < 0.01), higher leukocyte count value at admission (p < 0.01), lower ejection fraction (p < 0.05) and increased end systolic volume (p < 0.05). LA peak systolic strain was lower in patients with LV remodeling if compared to non-LV remodeling patients (21.8 ± 7.4% vs. 29.5 ± 8.8%, p < 0.05) while LA diameter and LA volume did not have significant differences between the two groups at the baseline. Logistic regression analysis showed that LV ejection fraction (OR: 0.9; 95% CI 0.84-0.99, p < 0.05) and atrial peak systolic strain (OR:0.8; 95% CI 0.83-0.97, p < 0.01) were independent determinants of LV remodelling after AMI.

Conclusions: Our study demonstrates that STE is a promising non-invasive technique to assess LA atrial function in patients with AMI and may have an impact on LV remodeling prediction.

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Ischemic right ventricular dysfunction predicts lower exercise capacity in patients after myocardial infarction.

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Postgraduate Medical School, Grochowski Hospital, Warsaw, Poland

Background: Right ventricular (RV) systolic myocardial velocity (SmRV) was shown to be an indicator of RV systolic function. RV dysfunction causes worsening of exercise capacity (EC) in patients with chronic heart failure but data on impact of RV function on EC in patients after inferior myocardial infarction (MI) with preserved left ventricular (LV) EF are scarce.

Aim: To assess EC in patients with RV dysfunction complicating inferior MI in comparison to patients without RV dysfunction.

Methods: We evaluated prospectively patients with first inferior MI with ST segment elevation treated by primary percutaneous coronary intervention (pPCI) and preserved or mildly impaired LV systolic function (EF LV ≥ 45%). ECHO was performed post pPCI within 48 hours from the onset of symptoms. RV systolic dysfunction was defined as SmRV = 11.5 cm/s at the basal segment of RV free wall in pulse wave Tissue Doppler Echocardiography (TDE). Cardiopulmonary exercise test (CPET) was done on day 14 ± 10. Oxygen uptake at peak exercise (VO2peak) and at anaerobic threshold (VO2AT) and percent of predicted values (%) were assessed as EC parameters. Results: Patients: (n=90, 75.5% males, mean age 60.5 ± 10 years) were divided into two groups: the group with RV systolic dysfunction (n=49, 77% males, mean age 60.4 ± 9.1 years) and the group without RV dysfunction (n=41, 80% males, mean age 60 ± 9 years). The group with RV dysfunction has a significant lower EC measured as percent of predicted values of VO2max (Table). LV systolic parameters and maximal troponin level have no impact on EC.

Conclusion: RV systolic dysfunction assessed with TDE in patients after acute inferior MI, correlates well with other RV systolic parameters and has a significant impact on exercise capacity estimated with cardiopulmonary stress test.

P287

Early prediction of infarct size after primary PCI by left ventricular rotation and longitudinal mechanics - which parameter is the best?

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Background: Assessment of myocardial deformation after reperfusion in acute myocardial infarction was shown to predict LV remodeling, functional recovery of myocardium within infarct zone and is closely related to the transmural extent of the infarction. Nevertheless, power of early strain, strain rate and especially LV rotation to predict final infarct size is still challenging.

Aim: examine whether longitudinal global and segmental myocardial deformation and LV rotation assessed 48h after primary PCI can predict final infarct size estimated by SPECT one month later.

Methods: 20 patients with first anterior myocardial infarction successfully treated with primary PCI were examined 48h after primary PCI. Transthoracic echocardiography was done using Sequoia 256 echo machine and postprocessing was done using Syngo US workplace. Systolic and peak strain, systolic and diastolic strain rates (SR S; SR E and SR A) were measured as indices of longitudinal LV function in apical 4-, 2- and 3-chamber views. Global and territorial (for LAD territory) strain and strain rates were calculated. Rotations of LV base and apex were measured (rotation angle and rotation velocities), LV twist and LV torsion were calculated. SPECT imaging with 99mTc-MIBI was done a month after index event and defect in myocardial perfusion measured as percent of the total myocardial surface.

Results: both global and territorial peak strains were closely related to SPEFT perfusion defect (r = 0.68, p=0.001 and r = 0.76, p=0.004). Global and territorial systolic SR correlated well with SPEFT perfusion defect (r=0.59, p=0.007 and r=0.68, p=0.023), whereas global SR E showed less strong correlation (r=0.42, p=0.05). The strongest correlation SPECT perfusion defect had with apical rotation angle (r = -0.80, p=0.001), LV twist (r = -0.77, p=0.001) and LV torsion (r = -0.74, p< 0.001). In multivariant logistic regression analysis that includes global peak longitudinal strain, global SR S, LV EF 48h after the primary PCI, peak CK-MB mass and LV apical rotation angle, LV apical rotation angle (beta= -0.615, p=0.012) and peak CK-MB mass (beta=0.365, p=0.013) were independent predictors of infarct size.

Conclusion: LV apical rotation, as well as territorial and global longitudinal strain and strain rates 48h after reperfusion therapy in patients with first anterior myocardial infarction well correlate with size of infarction as determined by SPECT a month later. The best correlation had LV apical rotation. These parameters could be of clinical value for risk stratification early after myocardial infarction.
HEART VALVES

P289 Feasibility and accuracy of 3DTEE vs computed tomography in evaluation of aortic valve annulus to left main ostium in patients candidates to percutaneous aortic valve implantation.

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Purpose: Percutaneous aortic valve implantation (PVI) has become a valid alternative to conventional surgery in selected high-risk patients (pts), however some major complications have been reported including coronary ostia impairment due to the presence of low coronary ostia and the occluding effect of aortic leaflets displacement by prosthetic implantation. Moreover a reduction of the distance between aortic valve annulus and left main coronary artery ostium (AN-LM) has been demonstrated due to remodeling of the aortic root in calcific aortic stenosis. Therefore a careful preoperative evaluation of AN-LM is necessary and it is usually obtained by computed tomography (CT), the gold standard in this context, but cannot be accurately performed in arrhythmic pts. In the PVI pts management, 3DTEE is known to be very useful. Aim of our study was to analyze the feasibility of AN-LM 3DTEE evaluation and its accuracy compared with CT values.

Methods: In 103 pts with aortic valve stenosis candidate to AVI, 3DTEE and CT AN-LM measurements were obtained and compared. Inter and intra-observer variability were calculated. Max (D1) and min (D2) AN diameters were also evaluated. AN-LM 3DTEE measurements were calculated by 3D analysis software (Figure).

Results: In all pts, 3DTEE was obtained and left main ostium visualized. 3DTEE measurements were calculated by 3D analysis software (Figure).

Conclusions: evaluation of AN-LM by 3DTEE was feasible and accurate and may be a valid alternative to CT in cases with inability or contraindication to obtain CT data.

P290 Feasibility and accuracy of 3DTEE vs computed tomography in evaluation of aortic valve annulus to left main ostium in patients candidates to percutaneous aortic valve implantation.

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P291 3D imaging reveals an oval LVOT, leading to underestimation of LVOT and aortic valve area by 15% on average, when using 2D echocardiography.

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Background: Measurement of left ventricular outflow tract area (LVOTa) for estimation of aortic valve area (AVA) and for transcatheter aortic valve implantation (TAVI) using transthoracic 2D echocardiography (2DE) and the continuity equation assumes a round shape for the LVOT. The aim of this study was to determine the effect of direct measurement of LVOTa using cardiac computed tomography angiography (CCTA) and 3D echocardiography (3DE) on LVOTa and AVA estimation.

Methods: We prospectively studied 50 patients (age 68 ± 12y, 24 males, 25 with aortic stenosis (AS) and 25 without AS). LVOTa and AVA were estimated using 2DE and the continuity equation (Pai x sqrt(LVOT/2) assuming a circular LVOT). LVOTa and diameters (D1 & D2) were measured using retrospective gated 128 slice CCTA and 3DE. AVA was also planimetered using CCTA in mid systole. LVOTa and AVA estimated by 2DE were correlated with 3DE and CCTA measurements.

Results: LVOT was usually oval and not circular, with an eccentricity index (D2/D1) of 1.24 ± 0.10 for CCTA and 1.18 ± 0.1 for 3DE. There was good correlation between 2DE and CCTA for LVOTa (r=0.84) but 2DE systematically underestimated LVOTa (and therefore AVA) by 15 ± 16% (AS vs. no AS p=0.8). The correlation between CCTA and 3DE for LVOTa was only moderate (r=0.72), due to inadequate 3DE image quality. AVA was 0.92 ± 0.44 cm2 by 2DE and 1.15 ± 0.72 cm2 by CCTA (p=0.003). There was good correlation between 2DE and CCTA for AVA (r=0.94), but 2DE underestimated AVA by 13 ± 19% compared to CCTA. After correcting 2DE determined AVA by a factor of 1.15 (accounting for the elliptic LVOTa), the difference was only 0.3 ± 22%.

Conclusions: 3D imaging revealed an oval LVOT in most patients, resulting in underestimation of LVOTa and AVA by 15% using 2DE. This accounted for the difference in AVA between 2DE and CCTA. Current 3D TTE image quality is inadequate to accurately determine LVOTa. These findings carry important implications for selecting AS patients for surgery or TAVI.

P292 Transcatheter aortic valve implantation : our experience at three years of follow-up.

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Purpose: Transcatheter aortic valve implantation (TAVI) is an emerging technique in the treatment of symptomatic patients with severe aortic stenosis and contraindications to surgery. Transcatheter echocardiography plays an essential role for the proper selection of candidates for TAVI. Echocardiographic follow-up is also essential for determining performance of the prosthesis and hemodynamic changes over time. We report our echocardiographic experience of the early 30 patients who underwent successful transcatheter aortic valve implantation at three years of follow-up.

Methods: From July 2007 to March 2011, 184 patients (76 male, mean age 81 ± 5 years) with contraindications to surgery (mean logistic Euro-score 22 ± 14) who underwent TAVI, were evaluated by clinical and echocardiography follow-up at 24 hours, 1 month, six months, one, two and three years after the procedure. Left
ventricular function, transaortic pressure gradient, aortic valve area and aortic regurgitation were assessed.

Results: Median echocardiographic follow-up was 32 ± 3 months. Procedural success was of 95.7%. We reported one intra-procedural death (0.7%). Pre-procedural aortic valve area was 0.59 ± 0.2 cm², transaortic peak pressure gradient and mean pressure gradient averaged 89 ± 26 mmHg and 56 ± 26 mmHg respectively. Ejection fraction was 52% ± 10%. At 3 years of follow-up survival was 71%. After the procedure, 91% of patients had an improvement in NYHA functional class, aortic valve area significantly increased and both peak and mean transaortic pressure gradients decreased (P < 0.001 and P < 0.001, respectively). Improvement was stable at follow-up. At 1- and 3-years follow-ups, patients showed no severe degree of aortic regurgitation. Paraprosthetic leaks were detected in 96% of cases, but only two of these resulted in significant paravalvular AR. Post-procedural paraprosthetic regurgitation was trivial or mild in severity in 68%, moderate in 30% and severe in 2% of cases. No residual regurgitation worsened during 3-years follow-up, in contrast AR reduced of one degree in 9.7% of cases at the follow-up. This reduction occurred mainly after six months-1 year from TAVI.

Conclusions: Transcatheter aortic valve implantation shows good long term durability. Echocardiography at three years demonstrates correct prosthesis positioning and function after percutaneous aortic implantation. The procedure can offer an adequate solution in selected patients with aortic stenosis.

P293
2D strain analysis under dobutamine provocation in patients with moderate and severe aortic stenosis and nonobstructive coronary arteries
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Purpose: When in patients with aortic stenosis (AS) left ventricle (LV) systolic dysfunction does occur, it may be reversible after valve replacement. Thus early detection of LV systolic dysfunction could be a clue for surgery treatment. Therefore, we evaluated LV peak global longitudinal strain using speckle tracking imaging (ST) at rest and during low-dose dobutamine provocation in asymptomatic patients with moderate and severe AS and preserved LV ejection fraction (EF).

Method: Peak global longitudinal 2D strain was measured from acquired apical 4ch and 2ch cine loops using EchoPac PC-workstation at rest and during 5, 10, and 20 μg/kg/min dobutamine provocation, respectively. The global strain was the average of the segment strains from the apical views. For each measurement, at least two cardiac cycles were averaged.

The image acquisition frame rate was 60-90Hz, mean value 75Hz.

Results: A total of 62 patients with moderate and severe AS (average aortic valve area (AVA) = 1.15cm²), mean age 66.12 ± 9.11 (57.14% males), were enrolled in this prospective study. All patients underwent coronary angiography and had no obstructive coronary disease (defined as having no stenosis greater than 50% in diameter). At rest, average AVA was 0.83 ± 0.23cm², mean gradient (Pmean) was 43.57 ± 0.29mmHg and mean EF was 72.24 ± 0.45%. Peak global strain 4ch at rest was -10.4% with increase during maximal DS of 20 μg/kg/min to -11.5% and in 2ch view from -9.9% to -9.8%, p<ns. Heart rate was increasing in correlation with increasing dobutamine doses from 70 ± 5.03 at rest to 84 ± 13.2 at peak dobutamine, p<ns. In patients with severe AS (Pmean>40mmHg) global strain increased from -9.2 ± 4.4% to -12 ± 4.5% (p < 0.05), while in patients with moderate AS global strain increased from -10.3 ± 7.0% to -11.7 ± 4.3%, p<ns.

Conclusion: 2D strain speckle tracking analysis of myocardial deformation with measurement of peak systolic strain during dobutamine provocation is feasible and accurate method to determine myocardial systolic function and contractile reserve and may contribute to clinical decision making in management of patient with significant AS. However, decrease of LV systolic function in AS cannot be simply related to the severity of valve obstruction and needs to be evaluated in comparison with healthy control groups.

P294
Blood pressure impact on aortic stenosis severity evaluation in everyday clinical practice
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Purpose: Aortic stenosis (AS) is frequently associated with hypertension but its real impact on AS severity evaluation is not clear. Hypertension promoting blood pressure to allow comparison between serial echocardiographic studies. The aim of this study was to assess the impact of blood pressure on parameters of AS severity during a single echocardiography.

Methods: Brachial blood pressure was measured at the beginning and at the end of a transthoracic echocardiography for 30 consecutive patients referred for aortic stenosis evaluation. Aortic continuous-wave and pulsed-wave Doppler were acquired at both time in order to measure off-line maximum velocity, mean gradient and valve area. Results: Systolic blood pressure significantly decreased between the beginning and the end of the examination (p=0.001). Mean transvalvular gradient, maximum velocity and stroke work loss increased (p<0.001). On the contrary, effective orifice area decreased (p<0.001). Cardiac output did not change. Systolic blood pressure was correlated with effective orifice area (r=0.51, p<0.01) and was inversely correlated with maximum velocity (r=-0.47, p<0.05). Seven patients crossed a threshold value which made AS change of classification : 3 patients turned from sclerosis to mild AS, 1 from mild to moderate AS and 3 from moderate to severe AS. No patient crossed threshold value making AS appearing less severe.

Conclusion: Blood pressure variation during echocardiographic examination has an impact on AS severity, which appears to be more severe at the end of the examination. One should take care to have optimal blood pressure conditions when acquiring doppler measurements for evaluation of AS severity, thus allowing a more reliable assessment.

P295
Surprising secular increasing mortality of asymptomatic aortic stenosis
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Introduction: The guidelines that asymptomatic severe Aortic Stenosis (AS) has low mortality and therefore should be managed conservatively have recently been challenged. We assessed whether mortality has changed over the decades.

Method: We analysed all published data on the follow up of patients with asymptomatic aortic stenosis from 1960 to 2010. We calculated five-year mortality figures for each study from the Kaplan-Meyer curves and produced weighted averages for each decade using the mid-recruitment point from each study for time-stratification.

Results: 7 studies incorporating 1359 patients were identified. 5 year mortality was sig- nificantly correlated with mean age (r²=0.417, p=0.12), average length of follow up (r²=0.06, p=0.15) or, if given, the presence of coronary disease (r²=0.04, p=0.67), LVH (r²=0.36, p=0.15) or ejection fraction (r²=0.04, p=0.67).

Conclusion: The published mortality data in patients with severe asymptomatic aortic ste- nosis managed conservatively has increased over the decades from the 1970’s to the 2000’s. This increase is not adequately explained by ageing of the population and is in contrast to decreases in other cardiovascular diseases.

P296
Arterial stiffness relates to heart failure symptoms in patients with severe aortic stenosis and preserved ejection fraction
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Background: In patients with severe aortic stenosis (AS) the development of symp- toms plays an important role in clinical decision making. The occurrence of heart failure (HF) symptoms could be unpredictable, even in patients with normal left ventri- cular (LV) ejection fraction, and regardless of AS severity. The double load (valvular and vascular) imposed on the LV in AS leads to progressive LV remodeling and dysfunction which makes AS change of classification : 3 patients turned from sclerosis to mild AS, 1 from mild to moderate AS and 3 from moderate to severe AS. No patient crossed threshold value making AS appearing less severe.

Purpose: To assess the relation between arterial mechanical properties and the pres- ence of HF symptoms in patients with severe AS and preserved LV ejection fraction.

Methods: A comprehensive echocardiogram was performed in 36 consecutive patients (73 ± 11 years, 20 men) with severe AS (aortic valve area, AVA = 0.47 ± 0.13 cm²) and preserved LV ejection fraction (68 ± 10%). Carotid stiffness index (beta) was measured by a real time echo-tracking system. Aortic beta index was calculated based on systolic and diastolic ascending aorta diameters and systolic and diastolic arterial blood pressure. Systemic arterial compliance (SAC) and
valvuolar-arterial impedance (Zva) were also determined. Global longitudinal strain (GLS) was assessed from the apical views using a commercially available 2D Strain software. Patients were divided into two groups according to the presence (18 patients) or absence (18 patients) of HF symptoms.

Results: Carotid beta index (11.9 ± 4.4) was significantly correlated with aortic beta index (13.5 ± 6.3) (r=0.78, p < 0.001) and SAC (r=0.37, p=0.03) but not with Zva or AS severity indices (p>0.05 for all). Symptomatic patients were older (79 ± 8 years vs 67±11 years, p=0.001), had higher values for carotid beta index (p=0.004), aortic beta index (p=0.03), LV mass index (p=0.03), and logBNP (p=0.01) and lower values for GLS (p=0.001) than asymptomatic patients. There were no significant differences between groups with respect to AS severity indices, Zva or SAC. Receiver operating characteristic curve analysis confirmed that carotid beta index, E/E', GLS and logBNP all provide incremental information (area under the curve = 0.75, 0.81, 0.78, 0.76, p<0.05 in all) for distinguishing patients with HF symptoms.

Conclusion: In patients with severe AS and preserved LV ejection fraction, increased arterial stiffness correlates with HF symptoms. The automatic measurement of carotid beta index, using an echo-tracking system, could be an useful additional tool for identification and follow-up of patients at risk for HF symptoms development.

P297
Mitral valve remodelling caused by increased diastolic shear-stress mediated forces: observations in patients with a bicuspid aortic valve
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Background: Recent studies have shown that mitral valve leaflets enlarge as a response to increased systolic stress produced by subvalvular tenting. This adaptative remodeling is mediated by systolic leaflet stress and reduces the degree of functional mitral regurgitation. However, flow-mediated shear-stress is the most important hemo-dynamic force responsible for physiological development of most vascular structures. Eccentric aortic regurgitation in pts. with a bicuspid aortic valve BAV rises diastolic shear-stress on the anterior mitral leaflet during diastole and could be responsible for triggering leaflet remodelling.

Objective: We aimed to characterize mitral valve geometry in patients with (BAV) with and without aortic regurgitation (AR).

Methods: 50 patients (43 ± 14 years old, 82% male) with BAV were studied. Mitral valve (MV) annular diameter (MAD), leaflet length and thickness, leaflet coaptation pattern (% of anterior leaflet projection on the MAD), tenting area (area between leaflet and mitral annulus) and LV volumes were measured using 2D echocardiography. AR was graded as absent or nonsignificant (Group I), or moderate or severe (Group II), based on American Society Echocardiography guidelines.

Results: 19 patients had significant AR; These GII patients showed significantly higher values of anterior leaflet length compared with GI (4.6 ± 0.3 vs. 3.5 ± 0.5 cm p < 0.001). This caused posterior displacement of the coaptation point (72 ± 6 vs. 59 ± 12 cm, p < 0.001). Valve thickness was not different between both groups. Despite larger leaflet volumes in GI (143 ± 60 vs 105 ± 35 ml, p=0.01), tethering forces were not higher (tenting area GI:1.9 ± 0.2 vs GI:1.01 ± 0.2 cm2, p = 0.5). In a multivariate linear regression analysis we observed an independent association between the grade of AR and the length of the anterior leaflet and not to the LV diastolic volumes.

Conclusion: Diastolic shear-stress on the mitral valve is associated with remodeling changes in mitral valve geometry. Diastolic jet impact seems responsible of anterior mitral leaflet enlargement and posterior displacement of coaptation point. These changes in mitral valve geometry are independent of tethering forces. This hemodynamic mechanism and not intrinsic congenital abnormalities are most probably responsible for abnormal mitral structural findings frequently observed in patients with BAV.

P298
Mid-term outcome of aortic valve plasty utilizing an autologous pericardial patch in patients with severe aortic regurgitation
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Background: We previously reported our experience with an aortic valve plasty (AVP) technique for repairing a stenotic aortic valve. We investigated the feasibility of AVP in patients with aortic regurgitation (AR). Method: Ninety patients underwent aortic valve plasty using a pericardial patch. Patients characteristics of the patients were as follows: mean age: 68 ± 12 years; the left ventricular ejection fraction, 56 ± 12%; and the left ventricular end-diastolic dimension, 58.1 ± 5.6 mm. Transesophageal and transthoracic echocardiography were performed up to three years after the operation.

Results: There was no postoperative AR in 81 patients and trivial postoperative AR in 9 patients. The peak systolic pressure gradient across the aortic valve was 14.5 ± 5.6 mm Hg after valve plasty. No patient underwent reoperation for any reason. Peak systolic gradient was significantly lower in aortic valve plasty group compared with aortic valve replacement group using bioprosthetic valve with or without stent (14±5.6 vs 28.6 ± 10.2, respectively, p < 0.001). The peak systolic gradient was 13.0 ± 7.1 mm Hg after two years. Up to three years later, there was no significant increase in the peak systolic gradient or significant worsening in AR (Figure). Conclusion: Aortic valve plasty using an autologous pericardial patch to treat aortic regurgitation is safe and feasible.

Aortic valve plasty follow up

P299
Patient-specific mitral valve model from 3D echocardiographic imaging: towards the virtual heart for surgery planning
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Purpose: Finite element models (FEMs) represent an innovative approach for biomechanical analysis of cardiac structures. Our aim were to: 1) obtain a realistic FEM of the mitral valve (MV) by using mitral annulus (MA) and papillary muscles (PMs) patient-specific information from transthoracic (TEE) real-time 3D echocardiography (RT3DE), applying this strategy to 3 normals (NL) and 3 patients with organic MV pro-lapse (MPV); 2) test for differences in FEM quantitative parameters; 3) validate FEM morphology in MVP by comparison with transesophageal (TEE) RT3DE.

Methods: RT3DE (Philips) was performed via TEE in all subjects, and also by intraoperative TEE in MVP patients. The MA position was obtained frame-by-frame from TTE data, by custom 3D tracking, and integrated into patient-specific FEM, where time-dependent pressure up to 120 mmHg was applied on the leaflets to simulate closure. TEE data were separately analyzed (Qlab, Philips) to obtain 3D MV reconstructions.

Results: Compared to NL, in MVP leaflets maximum principal stresses showed asymmetric distribution at systolic peak, larger in anterior MA and decreasing towards the free margin, with the most stress focused in fibrous tringles. Both PMs tension and MA reaction forces at tringles increased by 50% in MVP, consistent with abnormal anchorage associated to MV insufficiency. FEM morphology captured with good approximation the position and extent of regurgitant areas, compared to TEE data (Figure).

Conclusions: The adopted FEM strategy seemed flexible enough to reproduce different pathological scenarios and inter-subject variability, providing quantitative biomechanical parameters useful to interpret the effects of organic MV insufficiency. This approach represents the basis for the development of a patient-specific surgical planning tool.

Comparison of obtained model with TEE

P300
Ischemic mitral regurgitation in response to the increase of closing force in anterior and inferior myocardial infarction
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Purpose: This study was conducted to explore the role of closing force in the mechanism of ischemic mitral regurgitation (IMR) in anterior (ant) and inferior (inf) myocardial infarction (MI) through the low dose dobutamine echocardiography (LDESE).

Methods: Forty two patients (ant-MI: inf-MI=20:22, age=62 ± 14yrs) with significant (> grade1) IMR were enrolled and underwent LDESE (peak dose: 10μg/kg/min). Left ventricle end diastolic volume (LVEDV), end systolic volume (LVESV) and LV ejection fraction (LVEF) were calculated by the modified Simpson’s method. The MR severity was defined by effective regurgitation orifice area (EROA) using conventional PISA method. Peak systolic trans-mitral valvular pressure gradient (trans-MV PG), reflecting
closening of the mitral valve, was estimated by measuring peak velocity of MR jet. Mitral valve tenting area (MVTa) and tenting height (MVTf) were also measured. All variables were acquired before and after stress.

Results: In the baseline data, there were significant differences between ant and inf-MI in LVEDV (127 ± 42 vs. 85 ± 25ml, p=0.02), LVEFS (79 ± 26 vs. 45 ± 15ml, p=0.03), LVEF (36 ± 5 vs. 45 ± 3%, p=0.01) MVTa (2.0 ± 0.5 vs. 1.7 ± 0.12cm, p=0.03), (1.1 ± 0.26 vs. 0.89 ± 0.08cm, p=0.03), (0.72 ± 0.26 vs. 0.67 ± 0.05cm, p=0.04) significantly decreased in both ant and inf-MI. LVEF (36 ± 5 vs. 43 ± 5%, p=0.01), (45 ± 3 vs. 52 ± 7%, p=0.02) and trans-MV PG (110 ± 44 vs. 145 ± 35mmHg, p=0.001), (116 ± 52 vs. 148 ± 27mmHg, p=0.001) showed significant increase during stress in both ant and inf-MI, reflecting the increase of closing force. EROA significantly decreased in inf-MI (17 ± 3 ± 6.62 vs. 9 ± 2.55mm2, p=0.01) during stress while it significantly increased in inf-MI (19 ± 4.5 vs. 21 ± 3.2mm2, p=0.025), particularly in patients showing posterior directed MR jet.

Conclusion: This study suggests that the closing force plays a different role in the mechanism of IMR between ant and inf-MI. The higher closing force gets, the less IMR develops in inf-MI. On the contrary, the higher closing force gets, the more IMR develops in inf-MI.

P302
Right ventricular dilation and pulmonary arterial systolic pressure are both independently associated with the degree of tricuspid regurgitation in patients with pulmonary arterial hypertension.

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Purpose: Elevated pulmonary arterial systolic pressure (PASP) is known to cause functional tricuspid regurgitation (TR). In pulmonary arterial hypertension (PH), a significant degree of TR is related with worse outcome. However the differential contribution of pressure load and right ventricular dilation has not been established yet. We aimed at evaluating both variables related with TR.

Methods: We conducted in a larger database project a cross-sectional study of consecutive transthoracic echocardiographic studies of patients followed at our institution with PH. Of these patients demographic data (age, gender) as well as echocardiographic 2D and Doppler right ventricular parameters were collected from November 2010 until January 6th 2011. TR was graded in a semi-quantitative manner from 0 to a maximum of 4 out of 4. Right ventricular dilation was defined as no, mild, moderate and severe. Pearson’s correlation coefficients between the different obtained parameters and TR were calculated. To assess independence between parameters, multivariate linear regression analysis of the significantly correlated parameters was done.

Results: Eighty-two patients (32.9% male; mean age of 61±15 years with PH (46.3% Group 1; 0% Group 2; 45.1% Group 4; 2.4% Group 5 according to the 2009 DANT classification of PH) were evaluated. Significant correlations were found between TR and PASP (0.547; p<0.001), Pulmonary Acceleration Time (PAT) (>0.367; p<0.001), right ventricular dilation (0.643; p<0.001), and Vena Cava Inferior diameter measured at inspiration (0.435; p<0.001). In the multivariate analysis, only right ventricular dilation (dilation=0.002) and PASP(p=0.009) were independently correlated with TR.

Conclusion: These echocardiographic findings suggest that not only PASP but also right ventricular dilation itself are independently related to increasing severity of TR. Therefore it is plausible that, when focussing on the severity of TR to improve prognosis in patients with PH, the PASP as well as the right ventricular dimensions should be targeted.

P303
Infective endocarditis in a Tunisian high-volume tertiary care center: Demographic, laboratory and echocardiographic results and prognosis

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Background: Infective Endocarditis (IE) remains a serious disease affecting the population in the Developing Countries. The aim of the study was to describe the epidemiological, laboratory, and echocardiographic aspects of IE in a Tunisian cardiology department and to identify the predictors of in hospital mortality.

Materials and methods: Our study is retrospective enrolling 297 patients, hospitalized in our institution between January 2001 and January 2010 for infective endocarditis. According to the modified Duke criteria. Demographic, clinical, laboratory, and echocardiographic characteristics were examined.

Results: The Mean age was 41.45±18.17 years. The mean diagnosis delay was 9.34 days. Rheumatic heart disease (RHD) was the predominant (40.5%) underlying heart condition. Diagnosis was definite in 48.5% of cases. Left-sided native valve IE, left-sided prosthetic valve IE, right-sided IE were noted respectively in 53.6% cases, in 31% cases, in 10.4% cases. Device-related IE is noted in 5% cases. Echocardiographic findings showed that vegetations were detected in more than 53.7% of cases. Vegetation size >15 mm was found in 17.1%. Abscess was noted in 5.4% of cases. Dehiscence of a prosthetic valve was revealed in 4.4% of patients. Fistula and perforation were respectively detected in 2.3% and 7% of cases.

In 155 cases (52%), blood cultures remained negative. Serology was positive in 12 cases. Causative microorganisms were mainly Streptococci (n = 48) and Staphylococci (n = 32). Surgery was indicated in 49% cases. Overall mortality was 16.1%. On multivariate analysis: RHD (P=0.001), prosthetic valve IE (P=0.002) and congestive heart failure (p = 0.0001) were predictive of in-hospital mortality.

Conclusion: Rheumatic heart disease remains the most common underlying heart disease for infective Endocarditis in Tunisia. Despite progress in therapeutic modalities, IE remains very serious condition carrying high mortality rates.

CARDIOMYOPATHIES

P304
Left ventricle synchrony and contractile function in heart failure patients with systolic dysfunction

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Objective: Evaluate in heart failure patients due to left ventricle (LV) systolic dysfunction the relationship between LV longitudinal dysynchrony and LV global function.
LV Ejection F 34.1 ± 1.1
LV end-Diast 63.9 ± 2.4

Results: LV dysynchrony correlated with: (1) LV systolic function. LVEF (=0.30 ±0.004), LV end-diastolic dimension (r=0.337=0.001), TDI Mi-S (r=0.27 ±0.014), LV-GS (r=0.494 ±0.001), LS-GSRS (r=0.504 ±0.001), (2) Diastolic function: TDI Mi-M (r=0.246 ±0.08), TDI Mi-E (r=0.264 ±0.010), GSRRe (r=0.425 ±0.001) and GSRSr (r=0.263 ±0.001). (3) By multiregression dysynchrony was independently associated with GSRs (p=0.011) and GSRp (p=0.076).

Conclusion: LV Dysynchrony in HF patients is associated with longitudinal contractile function impairment, which reinforces the need for cardiac resynchronization therapy.

P306
Impact of left ventricular hypertrophy and diastolic dysfunction on left atrial volume in patients with hypertrophic cardiomyopathy
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Background: Patients with hypertrophic cardiomyopathy (HCM) and left atrial (LA) enlargement have increased mortality and morbidity, including a high risk of atrial fibrillation (AF). Although LA size may reflect chronic changes due to diastolic dysfunction (DD) the relationship between LA size and left ventricular filling pressures is modest in HCM patients.

Purpose: To identify the independent correlates of LA volume and the relationship between LA dilation and new onset atrial fibrillation in patients with HCM.

Methods: We prospectively enrolled 37 consecutive patients with HCM (51 ± 16 years, 18 men) and sinus rhythm. Indexed LA volume (IVLV) was determined using the area length method. Left ventricular (LV) filling pressures were assessed using average E/A ratio. DD has been graded according to the ASE/EAE recommendations. Global longitudinal LV strain (GLS) was assessed from the apical views using a commercially available 2D Strain software. Basal and apical LV rotation and backrotation rate, peak systolic LV torsion and peak untwisting rate have also been measured. Time intervals from peak R wave (ECG) to each of them were measured and normalized to the RR interval. Mitral regurgitation (MR) severity was graded as mild, moderate or severe. A subgroup of 20 patients has been followed up for 1 year for the occurrence of paroxysmal/persistent AF.

Results: All patients had preserved LV ejection fraction (65 ± 7%), LV hypertrophy (187 ± 64 mm²) and enlarged LA (67 ± 34 ml/m²). LV outflow tract obstruction was present in 20 patients. LAVI correlated significantly with LVmass (r=0.64, p=0.001), GLS (r=0.54, p=0.02) and time to LV peak untwisting velocity (r=0.35, p=0.04). In patients with moderate to severe MR (n=24), LAVI was significantly higher for patients with mild MR (75 ± 38 vs 50 ± 13 ml/m², p=0.03). LAVI was not significantly related to E/E', DD degree or dynamic LV outflow tract gradient (p≥0.2 for all). In multivariate regression analysis LVmass (β=0.71, p=0.001) and time to LV peak untwisting velocity (β=0.32, p=0.01) have been independently correlated with LA volume (β=0.32, p=0.01). Moreover, LAVI emerged as the only parameter that was significantly different between patients with (n=8) and without AF during follow up (86 ± 31 vs 61 ± 20 ml/m², p=0.04).

Conclusions: In patients with HCM, increased LV mass and delayed LV untwisting are independent predictors of LA enlargement. The degree of LA dilatation is related to the occurrence of paroxysmal/persistent AF.

P307
Coronary flow reserve of left anterior descending coronary artery in hypertrophic cardiomyopathy: relation with pathological characteristics
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Background: Microvascular dysfunction reflected by the decreased coronary flow reserve (CFR) in response to adenosine infusion is a common finding in hypertrophic cardiomyopathy (HCM). Decreased CFR is recognized as a major mechanism for ischemia which is related with unfavorable long term outcome. Its pathophysiology is multifunctional, including reduced arteriolar density, fibrosis, myocyte disarray, elevated left ventricular end-diastolic pressure and structural abnormalities of small coronary vessels. Plasma levels of NT-pro-BNP in HCM correlates positively with cardiac filling pressures and is excellent marker for the abnormal LV wall stress and disease progression.

Aims: To examine relations between CFR, assessed in left anterior descending coronary artery (LAD) in HCM patients using transthoracic echocardiographic (TTE) techniques and morphological characteristics, LV mass and LVOT pressure gradient. 2. To explore relation between plasma levels of NT-pro-BNP and microvascular function.

Methods: In 63 pts (mean age 48.6 ± 16.4 yrs; 27male) with asymmetric HCM, 21 pts with LVOT obstruction and 42 pts without LVOT obstruction, transthoracic echocardiographic examination with measurement of CFR in LAD was done. CFR was defined as the ratio between maximal velocity of diastolic coronary blood flow during maximal hyperemia and in rest, induced by i.v. infusion of adenosine (140mcg/kg/min).

Results: When HCM pts with LVOT obstruction were compared to HCM pts without LVOT obstruction, first group had strong trend for lower value of CFR-LAD (1.93 ± 0.42 vs. 2.20 ± 0.56, p=0.06). In the whole study group CFR-LAD was significantly inversely correlated with LVOT PG (r=-0.392, p=0.024). CFR-LAD was also inversely correlated with LVmass (CFR-LAD: r=-0.320, p=0.01) and with septal thickness (r=-0.51, p<0.001). Levels of NT-pro-BNP were significantly inversely correlated with LAD-CFR in the whole study group (r=-0.54, p=0.001).

Conclusion: In patients with asymmetric HCM, coronary microvascular function determined as CFR is significantly inversely related to LV mass as well as to septal thickness. Coronary microvascular function is inversely correlated to gradient of LVOT obstruction showing that LVOT obstruction additionally aggravates microvascular dysfunction in LAD territory. In the whole study group, even in non-obstructive form of HCM coronary microvascular function is significantly related to left ventricular wall stress.
P308
Magnetic resonance imaging of myocardial fibrosis in hypertrophic cardiomyopathy
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Introduction: hypertrophic cardiomyopathy (HCM) is the most common genetic cardiovascular disorder and increasingly diagnosed using cardiovascular magnetic resonance (CMR), which is requested for confirmation of a suspected diagnosis by echocardiography. CMR accurately measures left ventricular (LV) thickness, is highly sensitive in detecting myocardial scar and hypertrophy and is considered to be a gold standard for scar quantification and LV dimension measurement.

Purpose: We studied the incidence and pattern of fibrosis in HCM using late enhance- cardiovascular magnetic resonance (CMR).

Methods: 23 consecutive patients (pts), (14 males; mean age 52 ± 16 years, range 17-77 years), with HCM, were included. Diagnosis was made on clinical and echocardiography evaluation and established by CMR using accepted criteria. All pts under-went complete CMR examination on 1.5 T scanner (Intera, Philips). LV was evaluated using a 17-segments model: a) SSFP short-axis LV volumes and ejection fraction; b) SSFP 2, 3, 4-chambers for thickness measurement; c) LV segmental LGE (segmented inversion-recovery fast gradient-echo sequence, 10-15 min after 0.2 mmol/kg of Gd-DTPA); the presence, the location and amount of LGE was assessed.

Results: Septal hypertrophy (maximal thickness > 12 mm) was present in all pts (mean septal thickness was 17.65 ± 4 mm). LV end-diastolic volume was 101 ± 33 ml, LV end-systolic volume 28 ± 18 ml, LV mass 170 ± 46 g and ejection fraction 73 ± 9%. LGE was detected in 12 pts (52%) and median LGE mass was 14.5 g (interquar-tile range from 10 to 18.9).

Conclusion: CMR LGE was a frequent finding in HCM. CMR should be considered in HCM pts for precise calculation of ventricular thickness and accurate scar quantification.

P309
Prognostic role of transmitral Doppler/Tdi in hypertrophic cardiomyopathy
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Background: clinical usefulness of echo-Doppler parameters of left ventricular (LV) diastolic dysfunction in hypertrophic cardiomyopathy (HCM) is presently debated.

AIM: to assess the value of TDI imaging, and in particular of E/E’ ratio, in predicting the clinical course of patients with HCM.

Methods and results: Eighty HCM patients consecutively observed in our Department from 2000 to 2010 (60% males; mean age 43 ±19 years) and studied by echo-Doppler and TDI were prospectively included in the study and followed-up for a combined clinical end-point (cardiovascular death, heart transplantation or septal myectomy). E/E’ ratio was evaluated by ratio of peak E wave velocity at pulsed Doppler transmitral curve and of E’ wave at basal septal TDI. The patients were divided into 2 groups: - group 1: E/E’ > 15 (35 patients/44%); - group 2: E/E’ < 15 (45 patients/66%). In comparison with group 2, patients of group 1 were significantly older (51 ± 18 vs 37 ± 19, p<0.001), showed more frequent atrial fibrillation (18% vs 2%, p=0.014), a more severe LV hyper-trophy (interventricular septum 22 ± 7 mm vs 18 ± 5 mm, p=0.003; posterior wall 14 ± 4 mm vs 12 ± 3 mm), a larger left atrium area (29 ± 9 cm² vs 22 ± 8 cm²) and a more fre-quent systolic anterior motion (43% vs 20%, p=0.003). During a mean follow-up of 46 ± 96 months, 9 patients (11%) reached the combined clinical end-point; event-free survival rates were 80% vs 96% in group 1 vs group 2, respectively (p=0.03).

Conclusions: Evaluation of E/E’ ratio at diagnosis is an important tool in identifying patients with a particularly poor prognosis. Elevated values of E/E’ (> 15) are probably related to a more advanced stage of the disease.

P310
Prognostic role of echocardiography during follow-up in cardiac amyloidosis
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Aim: to assess the prognostic impact of follow-up echo-Doppler assessment in cardiac amyloidosis.

Methods and Results: We retrospectively evaluated a series of 25 patients (69% males; mean age 63 ± 12 years) with a biopadic diagnosis of systemic amyloidosis and cardiac involvement (documented at echocardiography) in all patients were studied by echo-Doppler both at diagnosis and after a mean follow-up of 17.4 ± 19.8 months. At diagnosis, the mean IV septum thickness was 16 ± 4 mm, and 31% pre-sented a restrictive filling pattern (RFP) at Doppler evaluation. Two follow-up echo-Doppler variables were selected as prognostically useful: 1) concentric reverse remodelling (CRR) defined as a decrease of interventricular septal thickness ≥ 2 mm) persistence or development of RFP. At follow-up echocardiogram 6 patients (24%) showed CRR, 4 patients (16%) developed a RFP and 7 patients (28%) maintained a RFP. During a mean follow-up of 24 ± 22 months 16 patients (64%) died; survival rates were 83% vs 29% in patients with CRR with respect to those without RFP during follow-up (14% vs 25% vs 57%, respectively: p = 0.017).

Conclusions: The prognosis of cardiac amyloidosis is confirmed as severe in the short time. The absence of CRR and persistence or development of RFP during follow-up emerges as markers of worse prognosis in the mid-term. In cardiac amyloidosis echocardiography has not only a diagnostic role at initial evaluation, but also an important prognostic role during follow-up.

P311
New findings about ventricular and atrial function assessed by Speckle Tracking and 3D echocardiography in arrhythmogenic right ventricular cardiomyopathy (ARVC)
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Purpose: the evolution of ARVC is more diffuse right ventricle (RV) involvement and, sometimes, left ventricular (LV) abnormalities, that may result in heart failure. We evaluated the potential utility of two-dimensional (2D) Strain-Strain rate (S-SR) and 3D echocardiography to quantitatively assess RV, LV and atrial function in ARVC patients (pts), with apparently normal LV.

Methods: we studied 70 subjects: 35 pts with ARVC and 35 healthy controls. By E/E’ we measured LV ejection fraction (EF%), LV diameters and volumes, RV dimension (apex, outflow tract and intero-basal segment, near tricuspid valve), fractional area change (FAC%), RVOT fractional shortening (RVOTfs%), RA volume. By DTI we measured velocity of early (E’) and late (A’) diastolic and systolic wave (S) at level of tricuspid annulus. We measured 2D longitudinal systolic ventricular and atrial S-R in apical 4 and 2-chambers views, at level of LV segments (4 basal,4 mid,4 apical), RV segments (1 basal,1 mid,1apical) and atrial walls and circumferential and radial peak systolic LV 2D S-R in short axis views. By 3D echocardiography with volumetric probe we measured RA, RV volumes and RV EF.

Results: RV dimension, 3D RV end-diastolic (52.8 ± 9vs33 ± 11mm/mq) and end-systolic volume (27 ± 6,6vs16 ± 6m/mq) were higher in all pts than controls; FAC (27.8 ± 12.1%), RVOTfs (27.2 ± 16%) and 3D RVEF (49 ± 7.4vs67 ± 8%) were lower. While 2D RA volume were in higher pts (52.8 ± 20vs37 ± 7.5m/mq) and indexes 25.6 ± 10.4 vs18.7 ± 6m/mq), no significant differences were found for 3D RA volume (56.4 ± 12.3 vs 51.8 ± 10.3 3Dm/mq).

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Echocardiographic findings in cardiac sodium channel alpha-subunit gene mutation carriers.

P313

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Background and aims: Mutations in the human cardiac sodium channel alpha-subunit gene (SCN5A) are involved in the pathophysiology of cardiac arrhythmias (Brugada syndrome (BS), Long QT syndrome (LQTS), cardiac conduction defects and idiopathic ventricular fibrillation), cardiomyopathies (dilated cardiomyopathy (DCM) and left ventricular non-compaction (LVNC)) and other cardiac structural abnormalities. We aim to evaluate echocardiographic findings in carriers of SCN5A variants.

Methods: Sequencing of SCN5A gene was performed in 103 patients diagnosed with BS (93.89%), LQTS (8.8%) and cardiac arrest or ventricular arrhythmias in (3.3%). SCN5A mutations/variants (3 families G1743R and 1 family each R27H, S524Y, R620H, V728I, E901K, E1032K, E1151stop and N1443S) were identified in 11 unrelated probands after excluding known polymorphisms. Echocardiographic findings from both probands and relatives from these 11 families were analysed. Echocardiograms from carriers (34.6%) and non-carriers (18.35%) were compared.

Results: 52 individuals (ind.) from 11 different families (mean 4.7 ind. per family) comprised the study population. Reason for SCN5A study was BS in 9 families (39 ind.), cardiac arrest in 1 (5 ind.) and ventricular arrhythmias in 1 (8 ind.), 12 (23%) ind. had echocardiographic abnormalities. 3 ind. had DCM (all from the same family, all carriers), 3 had left ventricular hypertrophy (from 3 different families, all carriers of SCN5A mutations, 2 with G1743R, 1 with E901K), 2 had left ventricular hypertroabeculation (both from same family and carriers of the same mutation S624Y), 1 had right ventricular dilatation (carrier of G1743R), 4 had significant valvular disease (3 aortic regurgitation and 1 mitral regurgitation, 3 of them carriers). 2 out of the 3 patients with aortic regurgitation had significant aortic and left ventricular dilatation (both carriers of R620H). 1 non-carrier had subacute myocardial infarction (anterior scar from an old myocardial infarction. 10 (26%) of carriers had echocardiographic abnormalities versus 2 (11%) non-carriers (p=0.1).

Conclusions: Echocardiographic abnormalities seems to be particularly frequent in SCN5A carriers. Chamber dilatation, left ventricular hypertrophy, left ventricular non-compaction and valvular disease have been demonstrated in our series. Larger and multicentre registries are needed to appropriately address this observation.

P314

Acute depression of left ventricular function after single alcohol consumption.

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Background: Little is known on the acute impact of single alcohol consumption on myocardial function.

Methods: We studied 19 party guests by high-end ultrasound-scanners before and 16-18 hours after alcohol consumption. 5 individuals served as controls. Population and echocardiographic parameters were analysed blindly.

Results: Baseline data of controls and alcohol-consumers were comparable. Body-weight and vital signs remained unchanged at the second visit. In the alcohol consumption group, peak-blood alcohol-concentration was 1.4±0.4 g/kg without gender differences (p=0.6). Diastolic function was impaired (E/A-ratio: 1.7 ± 0.4 vs. 1.6 ± 0.4; p=0.02). Systolic LV-function was reduced (EF 58 ± 8 vs. 52 ± 6; p<0.001 and GS -22.9 ± 2.9 vs. -19.2 ± 3.2; p<0.001). GS-reduction correlated with peak alcohol concentration (r=-0.7, p<0.002).

Conclusion: By means of echocardiography we observed for the first time a dose-dependent depression of left ventricular function after single acute alcohol consumption.

Further studies are warranted to elucidate the clinical relevance of this effect in patients with impaired left ventricular function.

P315

Early Trastuzumab-induced cardiotoxicity in breast cancer patients.

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Background: Trastuzumab (TZB) is a recombinant humanized monoclonal antibody used for the treatment of HER2-positive breast cancer. In spite of its recognized cardiotoxicity, pathophysiological mechanisms explaining side effects remain poorly understood and the methods for its early sub-clinical detection are not well defined.

Aim: To evaluate TZB-induced cardiotoxicity in patients (pts) with breast cancer followed for a 3-month period of treatment.

Methods: Prospective study (evaluation of cardiotoxicity induced by chemotherapy - ACT-QT study) of consecutively pts, enrolled between May and September 2010, treated with TZB for advanced HER2-positive breast cancer. A comparison of clinical, laboratory and echocardiographic data, prior and at the 3rd month after starting TZB, was performed. Left ventricular systolic function deterioration (LVSF), defined according to the criteria established by the CREC - Cardiac Review and Evaluation Committee, and diastolic function, under the classification proposed by ASE– American Society of Echocardiography, were studied. Hospitalization and mortality were also recorded.

Results: Data were available for 51 women, mean age=55±14.0y. At 3 months, no pts had symptomatic heart failure. LVFS by Simpson biplane formula calculation did not differ at 3 months (69.9±7.4 vs 67.1±6.5, p=0.05), decreasing in 57.9% pts (only one to left ventricular ejection fraction <55%); 19.4% pts developed impaired ventricular relaxation, with a significant increase in E wave (3.9±0.8 vs 8.0±1.9, p<0.001). Pericardial effusion was present in five pts at the 3rd month (>1mm). Both left atrial and left ventricle volumes remained unchanged after TZB treatment. N-terminal pro-B type natriuretic peptide values did not increase. During the follow-up two pts died and two were admitted to the hospital, both for non-cardiovascular causes.

Conclusion: During the first 3 months of TZB treatment none of the pts presented overt heart failure or significant LVSD deterioration although almost one-fifth of them...
developed impaired ventricular relaxation, eventually as an early sign of T2B-induced cardiotoxicity.

**P316**
Cardioprotective role of lisinopril and rosuvastatin in the prevention of anthracycline induced cardiotoxicity

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**Purpose:** In the present study we aimed to evaluate by echo-Doppler echocardiography the cardioprotective effect of an angiotensin-converting enzyme inhibitor and a statin added to the standard chemotherapy regimen in the prevention of anthracycline induced cardiotoxicity.

**Methods:** In this prospective study we evaluated by Doppler echocardiography 26 patients with various malignant tumors treated with epirubicin in doses up to 500 mg, who were receiving a cardioprotective treatment with Lisinopril 10 mg and Rosuvastatin 10 mg (study group - SG) and a gender and age matched group of 31 oncologic patients who were not receiving the cardioprotective treatment (control group - CG). None of the patients had any history of cardiovascular disease. The left ventricular (LV) systolic function was assessed by measuring the LV ejection fraction (LVEF) by Simpson method and the LV diastolic function was assessed by measuring transmitial flow: the maximal velocity of the E wave (rapid filling) and A wave (atrial filling), the ratio of E max/Amax, the pressure half time (PHT) of the E wave, the E wave deceleration time (EDT) and the isovolumic relaxation time (IVRT). The echo-Doppler study was performed at the beginning and at the end of chemotherapy.

**Results:** We documented a further deterioration of LV diastolic function in patients without cardioprotection with Lisinopril 10 mg and Rosuvastatin 10 mg compared with those in the SG by finding a significant decrease of Emax, an increased Amax and a prolongation of IVRT (p < 0.02), the prolongation of IVRT (p < 0.02), of PHT (p < 0.02) and of the EDT (p < 0.01) in the CG. LV systolic function was less influenced by this treatment (p < 0.21).

**Conclusions:** In our echo-Doppler study we have documented the cardioprotective role of Lisinopril and Rosuvastatin in the prevention of cardiac dysfunction. The patients who were not receiving the above mentioned cardioprotective treatment had a much rapid deterioration of the LV diastolic function. It appears that the LV systolic function was less influenced by this cardioprotective treatment.

**P317**
Prognostic role of myocardial performance index after heart transplantation: a prospective study

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**Background:** Myocardial performance index (MPI) is a Doppler-derived index of cardiac performance, which is calculated as the ratio of the duration of isovolumic contraction to the sum of the durations of isovolumic contraction and relaxation. A recent study has shown that MPI is a more powerful predictor of outcome than the LVEF after heart transplantation (HTx).

**Methods:** In this prospective study 152 long-term (mean follow-up time: 5.8 ± 3.6 years) HTx pts (54.6 ± 12.2 years) were enrolled. Protocol includes echocardiographic assessments at 3 months after HTx and thereafter at 6 months, 1 year, 5 years and 10 years. The primary endpoint was a composite of death by any cause or the requirement for a re-HTx or a heart transplantation. The secondary endpoint was cardiac allograft vasculopathy.

**Results:** We documented a further deterioration of LV diastolic function in patients without cardioprotection with Lisinopril 10 mg and Rosuvastatin 10 mg compared with those in the SG by finding a significant decrease of Emax, an increased Amax and the prolongation of IVRT (p < 0.02), of PHT (p < 0.02) and of the EDT (p < 0.01) in the CG. LV systolic function was less influenced by this treatment (p < 0.21).

**Conclusions:** In our echo-Doppler study we have documented the cardioprotective role of Lisinopril and Rosuvastatin in the prevention of cardiac dysfunction. The patients who were not receiving the above mentioned cardioprotective treatment had a much rapid deterioration of the LV diastolic function. It appears that the LV systolic function was less influenced by this cardioprotective treatment.

**P318**
Additive effect of noninsulin dependent diabetes mellitus on left ventricular mass in systemic hypertension. Assessment with cardiac magnetic resonance

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Non-insulin-dependent diabetes mellitus (NIDDM) may increase left ventricular mass (LVM). NIDDM is a frequent finding in patients with systemic hypertension (HT). Our objective was to quantitate with cardiac magnetic resonance (CMR) the additive effect of NIDDM on LVM in hypertensive patients.

**Methods:** All hypertensive patients aged 30-85 yrs referred for a stress myocardial perfusion CMR between January 2008 and December 2010 were studied. Cardiovascular risk factors were recorded. The CMR protocol included TrueFISP cine sequences in the usual views, myocardial perfusion sequences after administration of iv dipyridamole (0.4mg/kg) and late gadolinium enhancement sequences. Patients with signs of necrosis on CMR or with features suggestive of other type of cardiomyopathy or secondary hypertension were excluded.

**Results:** 875 hypertensive patients were included. 585 H (51% males, 65 ± 11yrs) and 290 HD (45% males, 67 ± 10yrs). Two-way ANOVA (factors: group H/HD, gender; covariates: age, body mass index, duration of HT) was done. Group HD showed increased septum and posterior wall diastolic thickness (SD, PWD, mm), LVM (g), indexed LVM (LVMi, g/m²) and relative wall mass (RWM, g/mL). Chi-square analysis showed that group HD had a higher risk of developing a concentric remodelling pattern (CR, OR:1.69; 95% CI: 1.09-2.62), left ventricular hypertrophy (LVMH, OR=2.17), while group H had a higher risk of developing eccentric hypertrophy (eLVMH, OR=1.78). Linear regression analysis showed that, in hypertensive patients, concomitant NIDDM induced a mean further increase of 6gr in LVM.

**Conclusions:** In hypertensive patients, concomitant NIDDM causes a significant further increase in LVM, as well as a more severe pattern of LV remodelling and of LV hypertrophy. These findings may contribute to explain the worse prognosis of hypertensive patients with concomitant NIDDM.

**P319**
Right ventricular impact in patients with arterial hypertension and sigmoid interventricular septum

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Lisbon Cardiovascular Institute, Lisbon, Portugal

**Aim:** An increased incidence of sigmoid interventricular septum (SIS) is noted in patients (pts) with arterial hypertension (HTN). This morphological aspect can represent an important tool to evaluate the heart in hypertensive pts. The impact of HTN in the right ventricle (RV) is still underdefined. We evaluated the repercussion of arterial hypertension in the RV (global and regionally) in patients with SIS.

**Methods:** Prospective study of 44 pts with essential HTN, all in sinus rhythm, 38.6% females, 60.5 ± 9.3 years old, body mass index 27.9 ± 4.2 Kg/m². Complete echocardiographic study including tissue Doppler imaging of the RV and myocardial deformation imaging through speckle tracking. Longitudinal strain(S) and strain rate (SR) of the RV were analysed by post processing. Pts were divided in 2 groups: pts with sigmoid interventricular septum (SIS) – 19 pts and without sigmoid septum (NSS) – 25 pts.

**Results:** No differences were noted between both groups regarding age, gender, arterial hypertension, number of pts with controlled arterial hypertension and number of pts with structural changes of the left ventricle (remodelling/hypertrophy).

**Conclusions:** An increased incidence of SIS is noted in patients with arterial hypertension (HTN). The morphological aspect can represent an important tool to evaluate the heart in hypertensive pts. The impact of HTN in the right ventricle (RV) is still underdefined. We evaluated the repercussion of arterial hypertension in the RV (global and regionally) in patients with SIS.

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**Eur J Echocardiography Abstracts Supplement, December 2011**
P320 Role of post-systolic shortening of left ventricle for heart failure with preserved ejection fraction in untreated hypertension
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1National Cheng Kung University Hospital, Tainan, Taiwan; 2Tainan Hospital Sin-Hua Branch, Tainan, Taiwan

Purpose: Decreased global longitudinal strain (GLS) of left ventricle (LV) was noted in heart failure with preserved ejection fraction (HFpEF). This study investigated the contribution of both GLS and post-systolic shortening of LV to HFpEF in untreated hypertension.

Methods: This study recruited 63 patients (mean age 57 ± 12 years, 34 men) with untreated hypertension with normal LV ejection fraction. All patients did not have overt vascular diseases, valvular heart diseases, renal diseases, and other coronary risk factors. HFpEF was diagnosed based on typical symptoms of heart failure without other known causes. Two-dimensional speckle tracking echocardiography with automated function imaging was used for measurement of GLS and post-systolic strain index (PSI). PSI was calculated as [post-systolic peak longitudinal strain – end-systolic strain] × 100%. Mitral early filling velocity to average mitral annulus early velocity ratio (E/e') was used as an index for LV filling pressure.

Results: HFpEF was diagnosed in 17 patients (27%). Patients with HFpEF had lower early mitral velocity, lower mitral early to atrial velocity ratio, and longer isovolumic relaxation time. There were no differences in biplane LV ejection fraction, blood pressure, heart rate and body weight. LV GLS was significantly lower (-16.1 ± 3.1 vs. -19.1 ± 3.1%, p = 0.001), and PSI (303 ± 249 vs. 84 ± 51%, p < 0.001), left ventricular mass index (110 ± 38 vs. 87 ± 22 gm/m2, p = 0.006), E/e' (12.2 ± 3.5 vs. 8.5 ± 1.9, p < 0.001) were significantly higher in patients with HFpEF. Multivariable analysis showed GLS (OR 1.695, 95%CI 1.055-2.723, p = 0.029), PSI (every 10% increment OR 1.159, 95%CI 1.029-1.304, p = 0.015), and E/e' (OR 1.798, 95% CI 1.035-3.071, p = 0.032) were independent factors for HFpEF. Area under receiver-operating characteristics curve for diagnosis of HFpEF was 0.888 for PSI, 0.814 for E/e', and 0.757 for GLS.

Conclusions: Both systolic and post-systolic shortening were contributing to HFpEF. PSI had significant effect on HFpEF in untreated hypertension.

P321 Nt-ProBNP and ventricular global function in pulmonary hypertension
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Introduction: Nt-ProBNP is an important prognostic marker in heart failure patients. Objective: Assess Nt-ProBNP relationship with right (RV) and left (LV) ventricles global function by 2D-strain study.

Methods: 20 patients, age 65.4 ± 13.5, with PAH on specific therapy, median Nt-ProBNP 730, TAPSE 21.0 mmHg) at sealevel to 23.1 mmHg (CI, 8.0 to 41.0 mmHg) at 3775m. Two subgroups showed TR PG=30mmHg (32 & 41 mmHg) and they took oral sildenafil of 50mg and TR PG decreased from 37 to 28mmHg after 30minutes with headache. In conclusion, a rapid one day ascent to Mt. Fuji might induce pulmonary hypertension and the oral sildenafil could relieve pulmonary hypertension with minimum side effect.

Parameters by Nt-ProBNP tertiles

<table>
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<th>287-1029.0</th>
<th>&gt;1029.9</th>
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<td>Tri-S vlt</td>
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<td>MA</td>
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<td>RV-GS</td>
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P322 Systemic lupus erythematosus: impact of myocardial strain evaluated by speckle tracking
S. Ribeiro; D. Doroites; S. Goncalves; L. Santos; C. David; G. Vinhas De Sousa; AG. Almeida
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Systemic lupus erythematosus (SLE) may be associated with pulmonary hypertension and left ventricular dysfunction, which have clinical impact. The purpose of this study was to evaluate myocardial deformation using speckle tracking echocardiogram in patients with SLE and normal left ventricle ejection fraction (LV EF), for the detection of earlier ventricular function disturbances when LV EF is still normal.

Methods: 55 (consecutive) patients with SLE (39 ± 4 years; 50 female) were studied. Patients with LV EF <55%, hypertension, ischemic or valvular heart disease were excluded. A control group was composed by 17 healthy subjects (37 ± 4 years; 13 females). The parameters analyzed in both groups were: global systolic strain and strain rate (two-chamber, four-chamber and short-axis), left atrium volumes and ejection fraction, E/E' mitral and Tei index.

Results: The quality of image was adequate to the study by speckle-tracking in most studies, rejecting readings in <1% of the segments. Compared with the control group, volumes and LV EF of patients with SLE did not differ significantly, as well as left atrium volumes and ejection fraction and global systolic strain. Patients with SLE showed significantly lower global strain rate than the control group (-0.97 ± 0.20 vs. -1.14 ± 0.17, p = 0.01), and also significantly increased Tei index (0.40 ± 0.11 vs 0.31 ± 0.03, p = 0.01).

Conclusion: Myocardial deformation assessed by speckle tracking and Tei index may detect early cardiac involvement in patients with SLE and normal LV EF. Clinical and prognostic implications of these findings should be examined in future studies.

P323 Sildenafil inhibits altitude-induced pulmonary hypertension on One Day Ascent to Mount Fuji
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Exposure to high altitude especially with rapid ascent would induce pulmonary hypertension that may lead to life-threatening conditions. The oral sildenafil was effective for pulmonary hypertension and this study was intended to examine its effectiveness on one day rapid ascent to Mt. Fuji (3775m) in normal subjects. Twelve subjects were exposed to 3,775 m at top of mount Fuji from sealevel to 3400m with automobile and then to ascent with their own foot. Systolic TR pressure gradient(echocardiography) increased from 15.6 mm Hg (CI, 9.0 to 21.0 mmHg) at sealevel to 23.1 mm Hg (CI, 8.0 to 41.0 mmHg) at 3775m. Two subjects showed TR PG ≥30mmHg (32 & 41 mmHg) and they took oral sildenafil of 50mg and TR PG decreased from 37 to 28mmHg after 30minutes with headache. In conclusion, a rapid one day ascent to Mt. Fuji might induce pulmonary hypertension and the oral sildenafil could relieve pulmonary hypertension with minimum side effect.

P324 Systemic endothelial function and role for punishment in connective tissue diseases
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1Department of Dermatology, Medical University of Silesia, Katowice, Poland; 2Department of Dermatology, Medical University of Silesia, Katowice, Poland

Background: Pulmonary artery hypertension (PAH, Pulmonary Artery Hypertension) is the most serious cardiopulmonary findings in patients with connective tissue diseases (CTD, Connective Tissue Diseases) and its early identification is of critical value for proper diagnosis, treatment and final prognosis. PAH is characterized by pulmonary endothelial dysfunction and intense smooth muscle cell proliferation. There are limited data regarding to potent relationship between pulmonary pressure and systemic endothelial function.

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Aim: was to assess relationship between systemic arteries’ vasodilatation and risk for PAH established by standard transthoracic echocardiography (TTE, Transthoracic Echocardiography) in patients with CTDs.

Material and methods: 32 patients (K/M: 27/5, age: 55.8 ± 3.1 years) with CTDs (30 - systemic sclerosis, 2 - systemic lupus erythematosus) were enrolled into the study. Pulmonary fibrosis and extrasympathetic causes of pulmonary hypertension were excluded in all patients. Clinical data, TTE parameters, baseline brachial artery diam- eter (BaD), Brachial Artery diameter), flow-mediated dilatation (FMD, Flow-Mediated Dilation) and nitroglycerin—mediated dilatation (NMD, Nitroglycerin—Mediated Dilation) were assessed in all subjects. According to the values of tricuspid regurgitation velocity (TRV, Tricuspid Regurgitation Velocity) and right ventricular systolic pressure (RVSP, Right Ventricular Systolic Pressure) all patients were divided into the three groups: the PH unlikely - group I (n=21), the PH possible — group II (n=7) and the PH likely - group III (n=4).

Results: Mean FMD values were comparable between the groups I, II and III (12.6 ± 8.2 vs 11.5 ± 8.6 vs 14.8 ± 6.6%, respectively; p=0.84). The group III showed increased NMD values compared to the group I and II (group I, II, III, respectively: 2.16 ± 8.6 vs 15.0 ± 6.5 vs 41.3 ± 13.9%, p=0.01). Mean values of baseline BaD were as follows: 3.37 ± 0.8 vs 3.11 ± 0.3 vs 2.76 ± 0.8 mm in the groups I, II and III. The BaD values correlated to FMD (r = 0.68, p=0.03) and NMD (r = -0.71, p=0.02) in the entire examined groups.

Conclusions: Systemic endothelial function defined as brachial artery vasodilatation does not correlate to the risk for PAH in patients with CTDs.

BASICS IN CONGENITAL HEART DISEASE IN THE ADULT

P325 Mitral valve pathology in aortic coarctation
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Purpose: Aortic coarctation (CoA) is a typical left-sided obstructive lesion. Mitral valve pathology has only been described in the context of Shone’scomplex, a severe type of congenital left-sided obstructive lesion of multiple cardiovascular levels, including CoA. However, the prevalence of mitral valve pathology in adults after coarctation repair has never been evaluated. The aim of this study was to describe the mitral valve apparatus in consecutive CoA patients after repair.

Methods: Echocardiograms of 58 consecutive adults after coarctation repair were retrospectively analyzed. The presence of mitral valve stenosis (MS) (gradient > 5 mmHg) and or mitral valve insufficiency (MI) was determined. The mitral valve apparatus was evaluated in end diastole and end systole, in the parasternal long- axis, short-axis-, and apical four- and two-chamber views. Mitral valve parameters were compared with normal values as described in the literature. Additionally the aortic valve morphology was determined.

Results: Fifty-eight adult patients (mean age 35.7 years, range18-82 years; male 61%) were included. Thirty-six patients (62%) had BAIV, Mitral valve prolaps was found in 2 patients. Mitral valve annulus length in the parasternal long axis view as compared to patients with normal values as described in the literature. Additionally the aortic valve morphology was determined.

Conclusion: These findings provide new insights into the mitral valve apparatus in adults after CoA repair, and demonstrate that mitral valve abnormalities are present even in CoA patients without MI or a significant gradient. These findings might suggest that mitral valve abnormalities have a developmental origin in these patients.

P326 Correct identification of mitral valve anomalies of insertion changes the therapeutic approach to the patients affected by misdiagnosed severe left ventricular hypertrophy.
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Purpose: Mitral valve anomalies of insertion are not so rare but often misdiagnosed and confused with other pathologies (HCM, subaortic stenosis, storage diseases). Hypertrophic cardiomyopathy in particular is associated in 5-8% of the cases to mitral valve anomalies: in these patients differential diagnosis is mandatory. Five different types of mitral valve anomalies of insertion have been identified. The most frequent type is associated to left ventricular outflow gradient, significant mitral regurgitation and left ventricular hypertrophy. Medical therapy is not so beneficial and surgical therapy is decisive, hence recognition of such anomalies has a strict relation to prognosis for the patients affected. Our aim was to evaluate the importance of correctly identifying mitral valve anomalies of insertion as a possible cause of left ventricular hypertrophy, in order to decide the appropriate therapeutic approach for these patients.

Methods: From 1990 to 2011 we have found 18 cases of patients with mitral valve anomalies of insertion during the daily routine activity in our Echocardiography Laboratory. These patients were previously diagnosed as affected by congenital hypertrophic cardiomyopathy or severe left ventricular hypertrophy without a clear etiology. All the patients had a significant left ventricular outflow gradient and different degrees of mitral regurgitation.

Results: The specific anomalies in the 18 patients were: anomalous insertion of the mitral valve tissue on the ventricular wall in 13 patients and accessory valvular tissue in 5 patients. There were no other cardiac abnormalities associated. The identification of the specific cause avoided inappropriate therapies such as defibrillator implantation. Three patients underwent surgical repair: the simple disinsertion of the anomalous tissue allowed complete disappearance of the outflow gradient, complete or significant reduction of the mitral regurgitation and progressive reverse remodeling of the left ventricle with regression of the left ventricular hypertrophy, as shown in the post-operative echocardiograms.

Conclusions: Correct identification of mitral valve anomalies as a possible etiology of ventricular hypertrophy is fundamental to address such patients to the correct therapeu tic pathway, including surgical repair as a choice for a definitive solution. Most importantly, the diagnosis of these specific mitral valve abnormalities has a great prognostic relevance towards more severe diseases such as Hypertrophic cardiomyopathy, the latter having a totally different prognostic and therapeutic impact.

MASSES, TUMORS AND SOURCES OF EMBOLISM

P327 Thrombi on the Amplatzer Cardiac Plug after LAA occlusion: evaluation of potential echocardiographic risk factors
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Background: Percutaneous left atrial appendage (LAA) occlusion is a novel approach for stroke prophylaxis in patients with atrial fibrillation and contraindications for oral anticoagulation. The Amplatzer Cardiac Plug (ACP) consists of a lobe anchored in the LAA with a connected disk shielding the LAA ostium. We observed 6 cases with thrombus formation on the device. We analyzed pre interventional echocardiographic parameters to identify potential risk factors.

Methods: LAA occlusion was performed in 34 patients (CHADS2 score ≥ 2) with the ACP under conscious sedation. Post interventional dual antiplatelet therapy was initiated according to manufacturer’s instructions of use. Transthoracic (TTE) and transesopha- geal echo (TEE) were performed pre interventionally as well as pre discharge, 3 and 6 months TEE follow ups. Pre procedural ejection fraction (EF), left atrial volume index (LAVI), LAA velocity, spontaneous echo contrast (SEC, scored 0 to 4) and transmural gradient (TMG) were analyzed.

Results: In 36 procedures 34 ACP were implanted successfully. 2 ACP could not be placed due to an inappropriate anatomy. Mean occluder size was 24.1 ± 3.1 mm. In 3 patients thrombus was detected in the pre discharge TEE, in 3 further patients after 3 months. Mean EF was 50.6 ± 11.4 % in the non-thrombus vs. 39.7 ± 10.6 % in the thrombus group (p = 0.039, significant). LAVI was 46.9 ± 20.8 vs. 56.6 ± 14.2 mm2/m2 (p = 0.285), LAA velocity was 51.3 ± 25.1 vs. 36.6 ± 17.7 cm/s (p = 0.194), SEC was 1.3 ± 0.9 vs. 1.5 ± 0.5 (p = 0.322) and TMG was 1.9 ± 2.0 vs. 1.4 ± 0.5 mmHg (p = 0.568).

Conclusions: Thrombus formation on the ACP device is a serious complication. The EF was significantly lower in the thrombus group and could be therefore identified as a potential risk factor under the current antiplatelet regime.

P328 Carotid Intima-Media Thickness not carotid plaque is an independent predictor of recurrence in the patients with ischemic stroke
HJ. Youn1; KH. Kim1; KY. Ahn1; MH. Jeong1; JG. Cho1; JC. Park1; JC. Kang1; WK. Rha2
1The Heart center of Chonnam National University Hospital, Gwanju, Korea, Republic of; 2Radiology of Christian Hospital, Gwangju, Korea, Republic of

Background: Common carotid artery intima-media thickness (IMT) and carotid plaque are established vascular risk factors and are considered to be an early marker of carotid atherosclerosis. In this study, we explore the potential value of carotid IMT...
and plaques in predicting recurrences in the patients with first-ever ischemic stroke survivors.

**Methods:** During a 40-month period, 584 consecutive patients with first-ever ischemic stroke were recruited. For the definition of recurrent stroke, there had to be either a new neurological deficit or a deterioration of the previous deficit not considered to be due to edema, hemorrhagic transformation or concurrent illness. Most of cases had taken brain imaging repeatedly.

**Results:** We did not found any significant differences of age, gender, body mass index and medical history of atherosclerosis between the stroke patients with and without recurrence. The prevalence of diabetes was higher in the patient with recurrent stroke. Hypertension, dyslipidemia, smoking and infarct size were no significant difference. Patients with recurrent stroke had significantly increased carotid IMT values compared to those who did not (0.873 vs. 0.796 mm, p=0.002 in right, 0.903 mm vs. 0.862 mm, p=0.002 in left). Carotid plaques were also more found in the patient with recurrence than without recurrence. Carotid IMT (HR=1.74, CI=1.13-2.66, p=0.013 in right, HR=1.613, CI=1.003-2.59 p=0.049 in left) and diabetes (HR 1.730, CI=1.077-2.780, p=0.023) were independent predictors for recurrent stroke in multivariate regression analysis.

**Conclusions:** Carotid IMT is significantly increased and carotid plaque is more frequently found in patients with recurrent ischemic stroke. But, carotid IMT and diabetes, not carotid plaque are independent predictors of recurrence in the patients with ischemic stroke.

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**DISEASES OF THE AORTA**

**P329**

**Visualizing the thoracic aorta with modified transoesophageal echocardiography - the A-View technique**

W W. Jansen Klompen1; G. Brandon Bravo Bruinsma2; AWL. Van 'T Hof3; S. Spanjersberg4; AP. Nierich4

1University Medical Center Utrecht - Julius Centre for Health Sciences and Primary Care, Utrecht, Netherlands; 2Isala Hospital, Zwolle, Netherlands

**Introduction.** Recently, the Partner trial showed us that the improvement in prognosis after TAVI comes at the costs of a 30-day incidence of stroke or TIA of 6.7%. In cardiac surgery, the association of the degree of aortic atherosclerosis and post-operative cerebral complications is well known. Therefore, it is of paramount importance to obtain procedural information on aortic atherosclerosis; which is stressed in multiple guidelines. However, sensitivity of TOE in diagnosing atherosclerosis of the distal ascending aorta is only 21% (95% CI 13-32). [1] In regular TOE, the interposition of air in the trachea creates a “blind spot” preventing adequate visualization of the thoracic aorta.

**New Technology.** A modification of regular TOE overcomes this limitation. During general anesthesia, a balloon is positioned in the trachea and inflated with saline, creating an acoustic window to the distal ascending aorta (DAA), aortic arch and its branches; the so called Aortic-View. Multiple studies have proven safety and efficacy of the A-View technique.

**Results:** Compared with epiaortic ultrasound; sensitivity and specificity in detecting severe atherosclerosis of the DAA were 95% and 79% respectively (PPV 67%, NPV 100%). [2] Use of the A-View during cardiac surgery resulted in a trend towards a reduction of 30-day mortality (adjusted OR 0.61, 95% CI 0.36 - 1.03). [3] The kappa for inter and intraobserver variability ranged from 0.11 to 0.61, we hope to reduce variability with a course for future A-View users. Furthermore, the effect of A-View on cerebral ischemic lesion after cardiac surgery is being studied in a randomized trial.

**Indications.** The A-View technique is part of our TAVI protocol, it has been used in the diagnosis of aortic dissection, and is a standard diagnostic in cardiothoracic surgery. Imaging with 3D-TOE is feasible.


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**STRESS ECHOCARDIOGRAPHY**

**P330**

**The erectile properties of myocardium: a combined assessment of left ventricular elastance and coronary flow reserve during dipyridamole stress echo**

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**Background:** Dipyridamole employed for stress imaging causes a three-to-fourfold increase in coronary blood flow (CFR) in normals, with an increase in left ventricular (LV) function due to the well known “erectile” properties of myocardium linking (non-linearly) increased flow to increased function.

**Aim:** To assess the relationship between LV contractile reserve and coronary flow reserve during dipyridamole stress.

**Methods:** We enrolled 111 patients (82 men; 68±10 years) with normal resting LV function. All underwent dipyridamole (0.84 mg/kg over 6 min) stress echocardiography with CFR evaluation of left anterior descending (LAD) by Doppler. Contractile reserve was calculated as peak stress from Real-Time 3D echocardiography (volumes) and cuff sphygmomanometer (pressure) as: ESP (end-systolic pressure)/ESV (end-systolic volume)- rest ESP/ESV. All patients underwent quantitative coronary angiography within 15 days (significant CAD criterion, ≥50% stenosis). 

**Results:** In the subset of 92 pts with negative stress by standard wall motion criteria, contractile reserve was +3.7±1.93 in the 43 pts without, vs -1.1±3.1 mmHg/LmL2 in the 49 pts with coronary stenosis (p<.01). The relationship between LAD-CFR and changes in ESP/ESV was R = 0.5 in all patients, and R = 0.71 for the 25 patients with LAD single vessel disease (see figure). The combined criterion of reduced CFR (<-2.0) and reduced contractile reserve had an overall accuracy of 74% (79% in those with normal regional wall motion at rest).

**Conclusions:** CFR is positively related to contractile reserve during vasodilator stress. The erectile properties of myocardium can help identify minor forms of CAD mirrored in blunted coronary and/or contractile reserve in presence of normal regional wall motion response.

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**P331**

**Quantitative stress echocardiography as predictor of adverse events after heart transplantation**

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1University Hospitals (UZ) Leuven, Campus Gasthuisberg, Department of Cardiology, Leuven, Belgium; 2University Hospitals (UZ) Leuven, Department of Cardiothoracic Surgery, Leuven, Belgium

**Introduction:** Stress echocardiography can predict major cardiac events after heart transplantation. Stress imaging can detect subclinical anomalies in the myocard before decrease of left ventricular ejection fraction or regional contraction abnormalities are observed. We wanted to investigate whether strain during stress echo is related to adverse events.

**Methods:** We have included 42 HTx patients. (aged 58±14), who underwent stress echocardiography (during check-up at 6-4 yrs after HTx). Apical 2-, 4-, 3-chamber views were recorded in conventional two-dimensional and color tissue Doppler at baseline, each step of stress and during recovery. Longitudinal strain and strain rate (SR) were calculated from color Doppler velocity data. Following adverse points were recorded during 6±2 yrs follow-up: death, need for revascularization and need for retransplantation. Two patients were excluded from the follow-up because after stress echocardiography an indication of surgical revascularization and heart transplantation was directly formed.

**Results:** During follow-up 8 HTx patients died (2 had cardiac related death, 1 secondary to hypoglycemia, 2 related to infections and 4 secondary to neoplasia), Survivors in comparison with non-survivors, presented with higher peak end systolic strain (-1.9±0.34 vs. -1.4±0.42; p=0.002) and higer peak SR (-2.1±0.5 vs. -1.7±0.7; p=0.000). Four cardiac events were noted during follow-up (2 patients needed coronary stenting and 2 patients died of cardiac causes). Patients who had cardiac events in comparison with the rest of the group had lower strain at rest and abnormal strain response to stress (Table 1).

**Conclusions:** Longitudinal strain is a predictor of cardiac events and mortality in HTx patients. Decreased strain at rest, which does not increase at peak exercise, predicts cardiac adverse events.

**Comparison of echocardiographic variables in patients without and with cardiac adverse events**

**Variable**

<table>
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<td>SR (1/10)</td>
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<td>Peak SR (1/10)</td>
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<td>LVET (%)</td>
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</tbody>
</table>

**Comparison of echocardiographic variables in patients without and with cardiac adverse events.**

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P332 Stress echocardiography in older patients with suspected coronary ischaemia. Survival analysis study

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Background and purpose: Prevalence rates of Coronary Heart Disease (CHD) increase with age, with around one in four men and one in five women aged 70 years and over having CHD. Stress Echochardiography has high sensitivity and specificity for coronary ischaemia. In this study we assess the diagnostic impact of stress echocardiography including Dobutamine and treadmill stress tests in older patients in relation to their event free survival.

Methods: A cohort of patients above the age of 70 years who had stress echocardiography was studied retrospectively. A combined end point was defined as cardiac death, non fatal myocardial infarction and hospital admission with acute coronary syn-
drome. Stress echocardiography results were coded as normal, one vessel, two vessel or three vessel disease based on the wall motion score index (WMSI). Survival curves were calculated by the Kaplan-Meier method. The log-rank test was carried out to determine significance of differences in survival times and to compare events occurring at all time points on the survival curves.

Results: 509 cases were studied, 299 (59%) males and 210 (41%) females with mean age 77 years (70-93); and a median follow up period of 42 months. 406 (80%) patients had Dobutamine Stress Echocardiography and 101(20%) patients had Treadmill Stress Echocardiography. There was no evidence of inducible coronary ischaemia in 278 (54.7%) patients with median survival of 74 months. 169 (33.2%) patients had one vessel ischaemia with median survival of 71 months, 47 (9.2%) patients had two vessel ischaemia with median survival of 57 months and 15 (2.9%) patients had three vessel ischaemia with median survival of 44 months. Log Rank test showed the difference in survival times between the different outcome groups to be very significant.

Conclusions: Stress echocardiography findings in older patients correlate well with the Event Free Survival Time. Findings suggestive of multiple vessel coronary ischaemia have worse survival time. This has great implications on risk stratification of older patients with suspected coronary ischaemia with more targeted use of coronary intervention.

P333 Limited exercise capacity after valve replacement for aortic stenosis: the impact of reduced right ventricular systolic function

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Background: Surgical aortic valve replacement (AVR) for aortic stenosis (AS) results in depressed right ventricular (RV) systolic function but the relationship between such dis-
turbances and exercise capacity remains unknown.

Material and methods: Exercise capacity and RV systolic function were assessed in 21 AVR patients (age 61 ± 12 years, 14 male) using conventional semi-supine bicycle exercise together with fully equipped Doppler echocardiographic set-up. Peak oxygen consumption (pVO2) as well as conventional and systolic myocardial velocity (Sm) from RV free wall was measured at rest, suboptimal, peak exercise and 4 min exercise. The data were compared with 21 age and gender matched controls.

Results: At rest, patients had normal left ventricular ejection fraction (LVEF), pVO2 at peak exercise was lower in patients than controls (18.5 ± 4.5 vs 22.1 ± 4.3 minkg/m, p=0.02). RV Sm was depressed at rest in patients (8.4 ± 1.4 vs. 11.4 ± 2.0 cm/s, p<0.001). During exercise, RV Sm failed to increase as controls (suboptimal exercise: 10.7 ± 2.6 vs 15.1 ± 2.3; peak exercise: 11.3 ± 2.6 vs 17.4 ± 2.5 cm/s; 4 minutes after exercise: 9.3 ± 1.9 vs. 13.5 ± 2.8 cm/s, p<0.001 for all). In patients and controls as a whole, pVO2 correlated with RV Sm at rest (r=0.52, p=0.01) and peak exercise (r=0.47, p=0.002).

Conclusion: Exercise capacity is subnormal after AVR for AS, irrespective of normal LVEF and lack of symptoms. RV systolic function is reduced after AVR and failed to increase normally during exercise. Finally, it remains an important correlate with the patients’ exercise capacity.

P334 Imaging of expiratory gas exchange in detection of diastolic dysfunction in patients with hypertension : Combined stress echocardiography cardiopulmonary exercise testing

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Background: Exertional dyspnea and exercise intolerance are a common symptoms in patients with hypertension due to development of hypertensive heart disease and diastolic dysfunction even in patients with preserved LV systolic function. Transmural flow and tissue Doppler improved the diagnosis and stratification of diastolic impairment significantly. Here we report the diagnosis and stratification of patients according to severity of diastolic dysfunction at rest is not accurate without estimation of functional significance of such impairment during cardiopulmonary exercise testing (CPET).

However, relationship between diastolic function and CPET during combine stress echo CPET is still unknown.

Objective: To determine the usefulness of combined Stress echo CPET in evaluation of patients with hypertension, exertional dyspnea and normal baseline systolic and dias-
tolic function.

Methods: We studied 47 pts (28 male, mean age 51±14 years), with the history of essential hypertension, exertional dyspnea and normal baseline systolic and diastolic function.

Results: They all underwent CPET with supine ergometer with incremental ramp protocol, with breath by breath gas analy-
sis, in combination with simultaneous 2D echocardiographic monitoring during exer-
cise. Diastolic function was assessed by analyzing transmural flow pattern using pulse Doppler and tissue Doppler (TDI) of mitral annulus. Mitral E wave / E wave of mitral annulus ≥ 1.8 was cut off for diastolic function.

Results: Worsening of diastolic function was found in 13 (38%) pts during combined CPET stress echo test. Patients with diastolic dysfunction were older (p=0.001), and had lower peak VO2 (p=0.0001), shorter time to VAT (p=0.028) and shorter total exercise time (p=0.017), and higher VE/VCO2 slope (p=0.0001). However multivariate analysis showed that only VE/VCO2 was independant predictor of diastolic dysfunction during CPET (p=0.001; RR 1.68; 95%CI : 1.24 -2.24). We also found the strong corre-
lation between VE/VCO2 slope and E/Em (r=0.70; p=0.0001) which can be also used for stratification of pts with diastolic dysfunction.

Conclusion: Combined CPET stress echocardiography as a new test improves clinical assessment of diastolic function in patients with exertional dyspnea and normal base-
line LV function. It adds more information to echocardiography and to CPET as a single tests. The best predictor of development of diastolic dysfunction during CPET was VE/ VCO2 slope, showing the strong relationship with E/Em as a measure of diastolic function.

P335 Utility of stress echocardiography in selecting the optimal mitral valve procedure in patients with moderate ischemic mitral regurgitation undergoing coronary artery bypass grafting

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Optimal surgical management of moderate chronic ischemic mitral regurgitation (IMR) in patients (pts) qualified for coronary artery bypass grafting (CABG) is still controver-
sial. This study aimed to prospectively assess the proposed diagnostic algorithm based on stress echo (ExE and dobutamine stress echo-DSE) for the appropriate sur-
gicalprocedure: CABG alone or CABG + mitral annuloplasty (CABG + P) in pts with moderate IMR.

Methods: A total of 100 pts aged 18-75, with a history of myocardial infarction and moderate IMR, eligible for CABG were included in a prospective study. Patients were referred for CABG(n=74) or CABG + P(n=26) based on clinical assessment, 2D echo at rest and exercise as well as myocardial viability analysis (low dose DSE). Effective regurgitation orifice area (EROA) was used for quantitative IMR assessment (moderate EROA ≥ 10 and < 20 mm²). Prior to surgery target area (TA) and coap-
tation height (CH) were assessed. One year after the surgery each pts underwent the evaluation of cardiovascular events.

Results: In both groups (CABG vs CABG + P) no significant differences were observed in:30-day (1% vs 8%; p=0.103) and 12-month mortality (3% vs 12%; p=0.075), hospi-
talizations due to the heart failure (HF) exacerbation (5% vs 15%;p=0.107), and inci-
dence of stroke (1% vs 8%; p=0.103). Receiver-operating characteristics (ROC) curves demonstrated that in both groups preoperative TA was strong independent pre-
dictor of adverse outcomes (NYHA III/IV symptoms and HF hospitalizations) in 12 months follow-up. The best cut-off value for TA was 2 cm² (sensitivity 83%, specificity 68%, AUC 0.72) in CABG group and 2.6 cm² (sensitivity 100%, specificity 63%, AUC 0.76) in CABG + P group. The analysis of the complex end-point (deaths/CV hosp/ stroke) revealed a statistically significant difference between CABG and CABG + P groups (9% vs 35pts; p=0.003). The most important predicting factors for the complex endpoint were:presence of atrial fibrillation (AF) before surgery (p=0.035) and the size of tenting area (TA) of the mitral valve (p=0.005).

Conclusions:

1. The strategy of the preoperative pts qualification (ExE, DSE), allows obtaining similar results with reference to 30-day and 12-month survival rates, incidence of HF hospital-
izations and strokes, regardless of the surgical procedure performed.

2. AF before the surgery and TA were strong predictors of cardiovascular events in 12-month follow-up.

3. The application of proposed diagnostic algorithm may improve qualification of patients with moderate FIMR for a suitable type of surgical procedure.

TRANSESOPHAGEAL ECHOCARDIOGRAPHY

P336 Transesophageal echocardiography in the diagnosis of lost silicone tubes after transvenous lead extraction.

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Purpose: Lead breakage is known but serious complication of transvenous lead extraction (TLE). This study stresses the role of transesophageal echocardiography (TEE) in detection and management of this rare complication of TLE.

Methods: TLE procedures were performed in 758 patients, aged 5-91y (av. 64.7 ± 16.9y). The TLE interventions were accomplished with the use of mechanical system of telescopic polypropylene Cook’s and Byrd dilators. The TLE was done routinely before and after TLE.

Results: The analysis included 758 TLE procedures with 1113 lead extraction. In this group we found 37 lead breakage in 35 patients. In 32 patients the following TLE intervention managed to remove the broken leads with use of basket or lasso catheters. Only 3 patients were scheduled for planned cardiac surgery. During broken lead extraction the external lead silicone tube was lost in 7 patients. The broken internal metal conductor was removed transvenously but the silicone tube remained in the heart cavities. The lack of silicone tube was discovered intraoperatorically (n=4) and confirmed by TEE. In 3 patients it was diagnosed by TEE only. In TEE silicone tube has lead appearance but different movement (elastic and gentle in the contrary to the rigid lead). Despite impossibility of X-ray visualization silicone tubes were removed transvenously in all 7 patients via jugular or femoral approach.

Conclusions: 1. TEE is the excellent method in the diagnosis and management of lost silicone tubes after TLE.
2. Lead breakage appears in 4.6% among TLE procedures and in 3.3% among extracted leads. The remnants may be usually removed transvenously.
3. Broken lead fragment extraction can be complicated by lead silicone tube loss. It may be suspected intraoperatorically and confirmed by TEE. It occurs in 0.5% TLE procedures but in 20% of lead fragment extraction interventions.

P339 Incremental value of contrast enhanced ultrasound (CEUS) for detection of cardiac atherosclerosis.

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Purpose: Atherosclerotic plaques on cardiac ultrasound are associated with cardiovascular events and may be considered for cardiovascular risk prediction. The sensitivity of contrast atherosclerosis ultrasound for detection of atherosclerosis is suboptimal. Contrast enhanced ultrasound (CEUS) provides an accurate delineation of the carotid lumen and may improve detection of atherosclerotic plaques.

Methods: Fifty patients from the outpatient clinic, with ≥ 1 risk factor were included. B-Mode contrast B-Mode ultrasound and CEUS were performed using a Philips iE32 ultrasound system (Bothell, USA), with a L9-3 probe. CEUS was performed by invasive administration of Sonovue (Bracco, Milan, Italy). The ultrasound clips were digitally stored and reviewed by 2 independent observers. Atherosclerotic plaque was defined as a structure with a thickness > 1.5 mm, encroaching the lumen for > 0.5 mm or encroaching the lumen for > 50% of the intima-media thickness. McNemar testing was used for comparison between the groups.

Results: Using B-Mode ultrasound the observers detected plaques in 65 (65%) and 69 (69%) carotid arteries respectively. Combining B-Mode ultrasound with CEUS both observers detected plaques in 83 (83%) carotid arteries. Using B-Mode ultrasound observer 1 detected carotid atherosclerosis in 38 patients and with CEUS in 9 (18%) additional patients (p <.01). Observer 2 detected carotid atherosclerosis in 39 patients using B-Mode ultrasound and in 7 (14%) additional patients with CEUS (p <.05). The figure shows an atherosclerotic plaque visualized with CEUS (left panel) and was not detected on B-mode ultrasound (right panel).

Conclusion: CEUS has a significant incremental value for detection of cardiac atherosclerosis, and can be easily incorporated into a standard carotid ultrasound examination.
had a history of cerebral stroke (p=0.04). There was no relation between the history of ischemic heart disease, previous myocardial infarction, the presence and the progression of atherosclerotic changes in coronary angiography and the degree of calcification of atherosclerotic plaques. Massive calcifications of atherosclerotic plaques correlated with a previous MI (p=0.03), but not with a previous cerebral stroke. Contrast flow through the atherosclerotic plaque significantly positively correlated with ROI values, as an index of density (p<0.0001, r=0.69). In patients with preserved contrast flow the mean value of ROI was 22.24 ± 3.55 dB as compared with 12.37 ± 7.67 dB a value present in patients without preserved contrast flow. No significant relation was found for the degree of calcifications and the value of ROI index.

Conclusions: The assessment of ROI index is a simple and automatic method to estimate the degree of contrast flow through the carotid plaque. The values of ROI correlate with the contrast flow through the atherosclerotic plaque, but not with its calcification.

REAL-TIME THREE-DIMENSIONAL ECHOCARDIOGRAPHY

**P342**

Assessment of left ventricular mass in hypertrophic cardiomyopathy patients by real-time 3D echocardiography: single-beat capture image; validation with cardiac MRI

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Background: Left ventricular (LV) mass is an important prognostic factor in hypertrophic cardiomyopathy (HCM). LV mass can be accurately assessed by M-mode or 2D echocardiography; however it includes assumption and might be incorrect in LV with asymmetry. Real time three-dimensional echocardiography (RT3DE) has been introduced as an accurate method to assess the LV mass and recently, RT3DE by single beat capture technique has been introduced. We validated LV mass using new RT3DE technique compared to cardiac magnetic resonance (CMR). Method: Thirty six HCM patients were consecutively enrolled and 3 patients was excluded due to poor RT3D image. All the patients underwent CMR and RT3DE in a day. LV mass was derived from following method; LV mass calculated from ASE formula (M-mode mass), LV mass from truncated ellipsoid method by 2D echocardiography; however it includes assumption and might be incorrect in LV with asymmetry. Real time three-dimensional echocardiography (RT3DE) has been introduced as an accurate method to assess the LV mass and recently, RT3DE by single beat capture technique has been introduced. We validated LV mass using new RT3DE technique compared to cardiac magnetic resonance (CMR). Results: Mean frame rate of RT3DE was 13.1 ± 2.3 frame/second. Pearson’s interclass correlation coefficient (ICC) showed close correlation of RT3DE mass and CMR mass (r=0.92 and p < 0.0001). However, M-mode mass and CMR mass had smaller ICC when compared with CMR (r=0.50, p=0.01 and r=0.78, p=0.001). Bland-Altman analysis showed reasonable limits of agreement with small positive bias (15.1). Bias was greater in M-mode LV mass and 2D LV mass (9.1 and 21.2).

Conclusion: LV mass measured by single-beat captured RT3DE is feasible and correct method in HCM patients. Because LV shape is asymmetrical in HCM, LV mass derived from 2D or M-mode is more much incorrect than symmetrical LV. Correct assessment of LV mass using single-beat captured RT3DE will be useful in HCM patients in real clinical practice.

**P343**

Utility of three-dimensional echocardiography for assessment of mitral paravalvular regurgitation: Comparison to surgical findings

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Purpose: Paravalvular leaks (PVLs) are potential complications of mitral valve replace ment. Although most PVLs are asymptomatic and benign, some may cause severe regurgitation leading to reoperation. Evaluation of PVLs by two-dimensional echocardiography is limited. We performed real-time three-dimensional echocardiography (RT3D TEE) to observe the en face view of mitral PVLs to localize the defect, and we compared the results to surgical findings.

Methods: The study comprised of 137 patients with paravalvular regurgitation. RT3D TEE was performed using 3D matrix-array TEE transducer immediately after detection of PVL on 2D TEE examination. The RT 3D TEE showed the the valvular anatomic appearance as seen from the atrial (surgeon’s view) and we used the clock-wise format. Clinically ill patients with moderate to severe mitral paravalvular regurgitation underwent reoperation.

Results: Mitral and aortic prosthesis included 107 and 30 patients, respectively. Mitral paravalvular leak was mild, moderate and severe in 18, 32, 57 patients, respectively. Twelve patients (11%) with moderate to severe mitral PVLs underwent reoperation. In preoperative evaluation with RT3D TEE, 3 patients had PVLs localized anteriorly (11-01), 3 patients laterally (08-10), 3 patients posteriorly (05-07), and one patient medi ally (00-04). In 2 patients, 2 sites of PVLs (totally,12 patients with 14 PVLs) were noted. The site of PVLs were all (100%) confirmed at the time of surgery in each patient; 8 of them underwent surgical repair whereas the remaining 4 underwent replacement surgery with successful outcomes.

Conclusion: RT3D TEE has emerged recently as an essential guide for surgeons, especially in delineating localization and correcting paravalvular leaks.

**P344**

Comprehensive assessment of left ventricular geometry and function in healthy subjects using three-dimensional echocardiography

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Recent research has identified significant inconsistency for 2D and 3D strain measure ments among vendors, reflecting differences in myocardial tracking, strain computation and display. This study is the first to report reference values for 3D LV parameters, including strain, using a recently developed commercially available platform for 3D LV volumetry.

Methods: Eighty healthy volunteers (i.e. no cardiovascular risk factors, symptoms, signs or medication), aged 37 ± 11 (range 18-65 years) with good acoustic window were prospectively enrolled. 3 subjects were excluded due to previously unknown echo abnormalities or unsuccessful global strain analysis. 4 beat LV full-volume data sets (31 ± 2 vps) were acquired with Vivid E9 scanner equipped with 4v probe and analyzed offline with EchoPac BT 11 software (GE Healthcare, NJ). Peak global LV strain components (longitudinal-Ls, circumferential-CS, radial-R, and area strain-AS), as well as LV volumes, ejection fraction, mass and sphericity were obtained from a single 3D LV full-volume acquisition. Reproducibility of LV parameters was assessed in 20 subjects.

Results: A 3D LV data set required <1 min for acquisition and <4 min for analysis. The values of LV parameters obtained from 77 healthy subjects and their reproducibility are listed in Table.

Conclusion. 3D STE is a time-saving and highly reproducible tool for LV quantitation in clinical settings. This study provides the normal ranges and variability of LV parameters pertaining to the specific 3D speckle-tracking platform used in our population.

**P345**

Assessment of right ventricular volumes three-dimensional echocardiography in patients with acute heart failure: a comparison of 4D RV function by using volume 4-D RV Tom Tec and 4-D LV Echo PAC Imag

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Objectives: This study was designed to compare two analytical methods for quantifying right ventricular (RV) size, function and geometry from real-time three-dimensional echocardiographic (4D) data in patients with acute decompensate heart failure (ADHF).

Background: Fast and accurate quantification of RV size and function is critical to managing patients in a variety of clinical settings. RV quantification remains difficult even using 4DE data due to the complex geometry of the ventricle.

Methods: 53 patients (age/sex/EF%) admitted to a heart failure intensive care unit with ADHF and suitable baseline echocardiograms were included to the study. 4DE RV volume data sets were obtained in the apical 4-chamber and subcostal views (Vingmed, System 7, General Electric Healthcare, USA). These were analyzed using 1) software designed specifically for the RV (4-D RV Tom Tec, Germany) and 2) more generic software usually used for LV quantitation (4-D LV Echo PAC, GE Healthcare).

Results: RV end-diastolic and end-systolic volumes (EDV and ESV), stroke volumes (SV), and ejection fractions (EF) were determined by both methods and compared with each other for all 53 patients. Linear regression and analysis of agreement were performed for RV patients. Linear regression and analysis of agreement were performed for RV patients, EDV, ESV, SV, and EF.

Results: RV EDV and SV were slightly lower on RT 4-D LV Echo PAC imaging when compared to 4-D RV Tom Tec (186.79 ± 53.86 vs. 195.86 ± 53.07 mL, p < 0.005; 62.35 ± 21.42 mL vs. 68.07 ± 26.48mL, p < 0.001), while there was no significant differ ence observed for ESV and EF (124.43 ± 41.01 mL vs. 127.79 ± 37.26 mL, p = 0.16; 33.8 ± 8.14% vs. 34.66 ± 8.52%, p = 0.17). RV analysis by RT 4D software did not significantly depend on the shape of RV or the overall quality of the images.

Linear regression and Bland-Altman analysis comparing Tom-Tec 4D RV and Echo-PAC 4D LV showed close correlation and agreement between all RV volumes and EF (EDV: r = 0.82, mean difference (TomTec minus EchoPAC) = 9.1 ± 22.9, 95% confidence interval [CI], -36.6 to 54.9 mL; ESV: r = 0.82, mean difference = 3.5 ± 17.3, 95%
TISSUE DOPPLER AND SPECKLE TRACKING

P346
A novel mathematical based software for modeling the left ventricular myocardium
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Purpose: Currently, an echocardiogram presents the left ventricle (LV) based on images obtained from ultrasound methods. Utilizing mathematical equations, specific echocardiographic data may provide more detailed, valuable and practical information for physicians. In our project using appropriate mathematically based softwares, we have attempted to create a novel software capable of demonstrating LV model in normal hearts.

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

Results: LV Myocardial modeling: Our study shows that in normal cases myocardial strains (both longitudinal and circumferential) of all 16 LV myocardial segments. Using these data, strain rate, both circumferentially and radially in parasternal short axis and longitudinal in apical 4-chamber.

Conclusions: Systolic strain and rotation were not significantly increased (cfr Table). Change in heart rate or blood pressure did not correlate with and could not explain changes in any of the deformation variables.

P348
Coupling heart vessels in patients with systemic sclerosis: a 2D longitudinal strain and arterial stiffness study
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Purpose: Systemic sclerosis (SSc) is an autoimmune disease with fibrosis involving heart and vessels. Impairment of longitudinal left ventricular (LV) function represents an early stage of LV systolic dysfunction occurring in SSc. Coupling between LV and vessels, particularly in the early stage of LV dysfunction, has not been properly investigated. In our study we evaluated the relationship between LV longitudinal systolic function and arterial stiffness in patients with SSc.

Methods: We studied twenty-nine patients (28 female, mean age 65 ± 4 years) affected by SSc. A standard echocardiographic study with analysis of LV longitudinal deformation, assessed by 2D strain, was performed; therefore, stiffness parameters (Pulse wave velocity - PWV, stiffness - Beta, Arterial compliance - AC) were evaluated through the study of carotid arteries using the echo-tracking technique, provided by Aloka, Japan. All patients were subdivided in two subgroups according to the median value of longitudinal strain (LS). The Student’s T test and Spearman’s coefficient were used to compare variables between subgroups and to evaluate correlations between variables, respectively. A p value < 0.05 was considered statistically significant.

Results: All patients showed normal values of LV ejection fraction (EF) and end-diastolic/systolic volumes (EDV and ESV) [EF: 64 ± 6%, EDV: 83 ± 15 mL, ESV: 30 ± 14 mL]. LS was -13.1 ± 4.8% (median value -13.5%), whereas beta, PWV and AC were, respectively, 6.5 ± 1.5, 9.5 ± 4.2 m/sec and 0.77 ± 0.41 mmHg/KPa. Patients with lower LS (< 13.5%), showed a significantly increased beta (11.1 ± 3.9 vs 8.1 ± 4.1, p = 0.04) when compared with subjects with greater LS (> 13.5%); no significant differences were found between the two subgroups regarding the other stiffness parameters (PWV: 6.9 ± 1.5 vs 6.1 ± 1.3 m/sec; AC: 0.7 ± 0.2 vs 0.9 ± 0.5 mmHg/KPa, p = 0.05 for both). Furthermore a significant correlation was found between beta and LS (r = 0.41, p = 0.03).

Conclusions: Impaired LS may be an early sign of abnormal LV/vessels coupling related to arterial stiffness in preclinical patients with SSc. Two-dimensional strain and echo-tracking allow, non invasively, a quantitative assessment of LV function and arterial stiffness. These techniques can be considered sensitive diagnostic tools for the early identification of abnormal LV-arterial coupling.

Abstract 50510 Table

<table>
<thead>
<tr>
<th>3D LV parameters</th>
<th>Mean ± SD (95% CI)</th>
<th>Intra-observer reproducibility ICC (95% CI)</th>
<th>Inter-observer reproducibility ICC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>End-diastolic volume (mL/m²)</td>
<td>56 ± 8 (54–58)</td>
<td>0.99 (0.98–1.00)</td>
<td>0.95 (0.88–0.99)</td>
</tr>
<tr>
<td>End-systolic volume (mL/m²)</td>
<td>22 ± 4 (21–23)</td>
<td>0.99 (0.98–1.00)</td>
<td>0.97 (0.93–0.98)</td>
</tr>
<tr>
<td>Ejection fraction (%)</td>
<td>61.3 ± 8 (61–62)</td>
<td>0.98 (0.95–0.99)</td>
<td>0.96 (0.88–0.98)</td>
</tr>
<tr>
<td>Mass (g/m²)</td>
<td>72 ± 7 (70–73)</td>
<td>0.92 (0.81–0.96)</td>
<td>0.87 (0.71–0.94)</td>
</tr>
<tr>
<td>End-diastolic sphericity index (%)</td>
<td>3.33 (3.23–3.35)</td>
<td>0.83 (0.83–0.97)</td>
<td>0.86 (0.64–0.95)</td>
</tr>
<tr>
<td>Longitudinal strain (%)</td>
<td>-19.9 ± 2.2 (19.4 ± 20.1)</td>
<td>0.87 (0.87–0.99)</td>
<td>0.81 (0.74–0.88)</td>
</tr>
<tr>
<td>Circumferential strain (%)</td>
<td>19.4 ± 2.1 (19.1 ± 19.8)</td>
<td>0.94 (0.89–0.97)</td>
<td>0.93 (0.85–0.97)</td>
</tr>
<tr>
<td>Radial strain (%)</td>
<td>57.3 ± 6.8 (55.7± 58.1)</td>
<td>0.93 (0.93–0.99)</td>
<td>0.94 (0.96–0.99)</td>
</tr>
<tr>
<td>Area strain (%)</td>
<td>-34.6 ± 2.7 (33.9 ± 35.2)</td>
<td>0.97 (0.92–0.98)</td>
<td>0.94 (0.87–0.98)</td>
</tr>
</tbody>
</table>

CI, confidence interval; ICC, intraclass correlation coefficient; LV, left ventricle; SD, standard deviation.

Conclusions: Abrupt relief of severe aortic stenosis was followed by increased systolic strain rate both, circumferentially and radially in parasternal short axis and longitudinally in apical 4-chamber.

Results: Increased systolic strain rate early after transcatheter aortic valve implantation
In patients with hypertrophic cardiomyopathy myocardial fibrosis is associated with both left ventricular and left atrial dysfunction.

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Aims: To assess left (LV) and right ventricular (RV) function by two-dimensional speckle tracking echocardiography and its relation to myocardial fibrosis in hypertrophic cardiomyopathy (HCM).

Methods: We enrolled 50 HCM patients (30 male; 47.3 ± 9.9 years) in our study. Each patient received echocardiography with modern high-end scanners (GE Medical Systems, Vivid 7, Horten, Norway). For speckle-tracking analysis of LV and RV function the dedicated software (EchoPac PC, same vendor) was used. The presence of myo-cardial fibrosis was detected by cardiac magnetic resonance imaging (MRI).

Results: We found a correlation of r=0.89 (p<0.001) for intra-observer variability of RV global longitudinal strain with a minor bias of 4.9±2.9%. With cardiac MRI 30 patients (60%) demonstrated late gadolinium-enhancement (LGE) of the LV. Of these patients only 7% had LGE of the RV. HCM patients with myocardial fibrosis had less global longitudinal LV strain in comparison to patients without myocardial fibrosis (-12.6±2.2 vs. -21.1±2.6, p<0.001), thicker interventricular septums (23.7±4.0 vs. 19.2±5.1, p<0.001), larger left atria (34.9±7.1 vs. 23.9±5.1, p<0.001) and impaired diastolic function (E/A-ratio: 1.02 ± 0.22 vs. 1.15 ± 0.18, p<0.01). Comparable results were found for RV function. LV and RV strain correlated with r=0.85 (p<0.001).

Conclusions: HCM is not only a disease of the LV. LGE in HCM is associated with both LV and RV dysfunction. Fibrosis seems to have a negative impact on disease progression. Although RV LGE occurs only in a minority of patients with HCM and LV fibrosis, speckle-tracking echocardiography is feasible for evaluating LV and RV remodeling in these patients.

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**P350**

2D longitudinal strain: does it match conventional echocardiographic parameters of left ventricle performance in acute myocardial infarction?

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Longitudinal strain is an useful echocardiographic parameter of regional and global LV performance, being described as independent from loading conditions.

Aim: To assess the correlation between conventional echocardiographic parameters of LV function and longitudinal deformation in patients with acute myocardial infarction (AMI).

Methods: Retrospective study of 77 patients (pts) without known coronary disease, 60 men, =56.6 ± 12.8y, with STElevation anterior myocardial infarction, subjected to primary percutaneous coronary intervention (PCI). A complete transthoracic echocardiogram was performed 3.7 ± 1.9 days after the PCI. LV global longitudinal strain (GLS) was obtained from apical views and left anterior descending (LAD) coronary artery flow was also assessed. By Pearson’s index, we correlated with GLS: LV ejection fraction (EF), volumes, wall motion score index (WMSI), E wave deceleration time, E/E’ and left atrium indexed volume, pulmonary artery systolic pressure, LAD flow characteristics (peak velocity and deceleration time).

Results: The mean values of the analyzed parameters were: LV EF 47.8 ± 8.9%, and systolic volume 61.1 ± 38.9mL, wall motion score index (WMSI) 1.7 ± 0.3, E wave deceleration time (DT) 177.0 ± 47.7ms, E/E’ 9.4 ± 3.8, indexed left atrium volume 29.2 ± 9.5mL/m2, LAD flow peak velocity 38.4 ± 20.5cm/s and deceleration time 444.4 ± 316.8ms. Mean 2D LV GLS was -11.0 ± 2.6%. Significant correlation was found between GLS and LVEF (r=0.717, p<0.001), WMSI (r=0.663, p<0.001), E’SV (r=0.389, p=0.011), E’SE (r=0.346, p=0.025) and LAD flow DT (r=0.392, p=0.014). LV GLS was strongly correlated with LV EF (graphic).

Conclusion: LV performance after AMI assessed by longitudinal deformation follows not only LV EF and WMSI but also a filling pattern parameter (E/E’) and a coronary perfusion index.

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**P351**

Predictors of early improvement of right ventricular function assessed by bidimensional speckle tracking echocardiography after transcatheter aortic valve implantation

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Introduction and objectives: Our purpose was to evaluate the predictors of improvement in right systolic ventricular (RV) function in high-risk patients with severe aortic valvular stenosis after transcatheter aortic valve implantation (TAVI).

Methods: From June 2009 to December 2010, we selected consecutive patients with severe aortic stenosis and high surgical risk who were treated with the CoreValve percutaneous aortic prosthesis and had a basal and discharge echocardiographic study with valid data for RV strain analysis by means of bidimensional speckle tracking echocardiography (2DSTE). RV function was assessed by transthoracic echocardiographic (TTE) with quantitative conventional parameters: tricuspid annular plane systolic excursion by M-mode (TAPSE) and tricuspid annular systolic velocity by pulsed tissue doppler imaging (TAs TDi) as well as emerging echocardiographic techniques as 2DSTE: longitudinal strain in basal RV free wall (RV strain) and TAPSE by 2DSTE (data obtained in the apical four-chambers view, with a specific software –iE33, Qlab-Philips–). Pulmonary artery systolic pressure (PASP) was also measured. TTE studies were performed before TAVI and at discharge. The improvement of RV function was defined as an increase in RV strain greater than the mean of paired differences between baseline and discharge TTE after TAVI. Univariate clinical and echocardiographic potential predictors for the improvement of RV function were analyzed.

Results: 36 patients were included (mean age 76 ± 7 years, 18 male). All parameters of RV function increased significantly after TAVI (TAPSE 17.1 ± 2.5 mm vs 17.5 ± 2.3, p<0.01, TAs TDi 12.2 ± 1.7 cm/seg vs 12.9 ± 1.7, p<0.001, TAPSE by 2DSTE 15.7 ± 4.6 mm vs 17.6 ± 4.3, p<0.001, RV strain -29.2 ± 6 vs -34 ± 5, p=0.001). The improvement in the RV function (increase in RV strain > 4.5) was related to a greater basal PASP (41 ± 12 vs 31 ± 10 mmHg, p=0.017), a worse basal RV strain (-27 ± 6 vs -34 ± 3, p<0.001) and a functional class II-IV (74% vs 31%, p<0.012), but not to left ventricular ejection fraction, severity of stenosis or other parameters of RV function.

Conclusions: In this study, the improvement of RV function after TAVI with the CoreValve prosthesis in high risk patients with severe aortic valvular stenosis was associated with a worse basal functional class, worse RV function and higher PASP in the baseline echocardiogram.

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**P352**

Determination of the subclinical systolic dysfunction with the speckle echocardiography method in obstructive sleep apnea syndrome patients with normal ejection fraction

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Purpose: We aim to determine the subclinical systolic dysfunction in obstructive sleep apnea syndrome (OSAS) patients with normal EF (ejection fraction). Method: 21 controls (G0) and 58 patients with normal EF (ejection fraction); according to the apnea-hypopnea index (AHI); mild (AHI=5-15/G1), moderate (AHI=15-30/G2), severe (AHI=30/G3) were included.Standard echocardiography and STE (speckle tracking echocardiography) performed.The average values of all segments were calculated and expressed as the global values.

Results: The global longitudinal strain (GLS) impairment begins in the G2, the global radial (GRS) and circumferential (GCS) impairment starts in the G3. When compared with the G0, the GRS values are increased in the group 1 and 2 without statistical significance. The global systolic strain rates of the longitudinal fibers (GLS-SR) and circumferential fibers (GC-SR) were began to decrease in the G2. The global radial systolic strain rate (GR-SR) was higher in G2 than the G0 but it was decreased in G3 (Table-1).

Conclusion: In early stages of OSAS, the global systolic dysfunction is compensated with the aggravated radial fiber function.However in this stage, the circumferential systolic function does not change. In severe OSAS patients, besides the diastolic dysfunction the all myocardial fibers have also systolic function impairment; the longitudinal and circumferential mechanics are influenced more than the radial function.
P353
Is possible to determine early stage of right ventricle dysfunction in the patients with acquired immunodeficiency syndrome?

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The patient with acquired immunodeficiency syndrome (AIDS) often present the signs and symptoms of impaired left (LV) and right ventricle (RV) function. The aim of this study was to determine RV morphology and function during AIDS and analyze of relation with the time of infection and initiation of retroviral therapy. Materials and method: We studied 41 patients HIV-positive (study was to determine RV morphology and function during AIDS and analyze of relation with the time of infection and initiation of retroviral therapy. The patients had any signs and symptoms of heart failure. We analyze two groups of patients: I without antiviral therapy (19), II was treated with antiviral drugs (22). Mean age was significantly lower in I group (p=0.002) and significantly more of men in group I (p=0.002). Time of viremia was similar in both groups. Control group was 20 healthy subjects (average age 40.2±10.2y). M-mode,2D-PW, and CW-doppler and TDI examination were performed. Results: RV diastolic area was significantly higher in I comparing with II and control groups. FAC was normal in both groups, but somewhat not significantly lower in I. TPAPSE was normal in both groups, without difference. We found no difference in right atrium area, ST was normal and similar in both groups, without difference with control group. E1 was slightly reduced in I comparing with control group and A1 was higher in II. We observed significantly lower e of RV in I group. SR was significantly higher in the II comparing with I group, but lower that in the control group (NS). This is gentle difference in diastolic regional right ventricle function between these groups. Significant difference we found analysing of stage of disease (CD4<1) E1 was significantly lower and A1 was significantly higher in subgroup with CD4<250. Same difference we state for subgroup with longer time of viremia:lower E1 and higher A1 with E1/A1<1, mean time of viremia 108.8 months vs E1/A1<1, mean time of viremia 58.9months (p=0.007). We not found significantly differences of e and SR between these subgroups. Conclusions: 1. Right ventricular diastolic function is slightly reduced during HIV-viremia in the patients without signs and symptoms of heart failure. 2. Tissue Doppler Imaging (TDI) is simple and sensitive tool to assess impaired RV function in patients with acquired immunodeficiency syndrome.

P354
Speckle tracking study in dilated ischemic and idiopathic cardiomyopathy with low ejection fraction: different ventricular and atrial impairment

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Purpose: Heart failure patients (pts) with same ejection fraction have different symptoms, morbidity and mortality. Speckle tracking echocardiography was used to recognize ventricular and atrial myocardial function differences between ischemic and idiopathic cardiomyopathy. Methods: 100 subjects (mean age 62 years) pts with ischemic cardiomyopathy (group A), 25 with idiopathic cardiomyopathy (negative coronary angiography) (group B) and 50 healthy controls (group C) were studied. All pts underwent coronary angiography except controls and all had left ventricular (LV) ejection fraction (EF)<35%. By System Seven GE with TDI, atrial and ventricular diameters, volumes, EF, propagation velocity (Vp), and Vp ratio were measured. Pulmonary wedge capillary pressure (PCWP) was calculated by E/Em. Bidimensional acquisitions were analyzed to measure longitudinal peak systolic ventricular (all segments), atrial (global) S and SR in apical 4 and 2-chambers views and circumferential and radial systolic and SR in middle short axis view. Results: Group A and B pts showed impaired function by PW Doppler, TDI, Vp and Vp ratio (Group A=3.61±0.66; group B=2.24±0.7); they had high PCWP (group A=20.1±3.66; group B=14.4±5.3). Group A (S=7.6±4.6%) (SR=0.57±0.16S-1) and B (S=14.27±5.2%; SR=0.82±0.48S-1) pts had lower longitudinal systolic S and SR than controls (S=33±7%; SR=2.37±0.63 S-1). Pts showed lower ventricular radial systolic S (group A=11.69±8.5%; group B=14.88±9.36) and SR (group A=0.94±0.33; group B=1.25±0.68) than in controls (S=46.3±9.49; SR=1.58±0.515-1). Ventricular 2D longitudinal systolic S and SR, for each segment, were impaired in group A (average S=6.21±5.33; SR=0.61±0.34S-1) and B (average S=10.69±6.17%;SR=0.8±0.48S-1). Ventricular circumferential S and SR were impaired in group A (S=7.9±6.24%;SR=0.74±0.26S-1) and group B pts (S=9.96±6.27%;SR=0.87±0.44S-1). An inverse correlation (r = 0.78) was found between PCWP and atrial S. Significant differences were found between group A and B pts for atrial longitudinal S and SR, ventricular longitudinal S and SR, circumferential SR, with lower values in group A and for PWCP higher in group A. Conclusions: Myocardial deformation properties are impaired in both ischemic and non ischemic heart failure pts. Ischemic pts have significant lower atrial longitudinal S and SR values and higher PCWP values. Higher PWCP values are associated with greater atrial S impairment.

P355
Comparison of two-dimensional speckle based strain in patients with atrial fibrillation

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Background: Speckle tracking measurement of left atrial (LA) strain (ε) allows evaluation of contractile, reservoir, and conduit function. We sought to compare LA ε with velocity vector imaging (VVI) and two-dimensional strain (2DS). Methods: LA ε and strain rate (SR) were compared in 141 patients (62±10 years) using both VVI and 2DS. Peak negative, peak positive, and total ε (corresponding to LA contractile, conduit, and reservoir function) were measured during sinus rhythm. Late negative SR (LA contraction), peak positive SR (LV systole), and early negative SR (LV early diastole) were identified during sinus rhythm. Results: LA ε measurement was highly feasible with both VVI (93%) and 2DS (93%). Peak negative, positive and total ε correlated well (r=0.78, 0.75, 0.79), with low mean differences (Figure and Table). LA contraction, peak positive and negative SR correlated less well (r=0.74, 0.7, 0.67) with higher mean differences (Table). Conclusion: Left atrial ε measurement is feasible with both VVI and 2DS in clinical practice. LA ε and SR measurements using VVI showed quite similar results with 2DS.

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was associated with poor outcome. Conclusion: Our results validate the potential clinical applicability of TDI-obtained pre-ejection myocardial velocity and Tei-index in assessment of right ventricular function in fetuses with CHF. Further prospective studies in a clinical setting are needed to take advantage of this approach to practice.

P357 Myocardial deformation: a new tool to diagnose acute rejection after heart transplantation

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Heart transplantation (HT) is a standard therapy for end-stage heart failure. Acute allo- graft rejection (AAR) is a common problem in the first year after HT and it should be diagnosed as soon as possible (preferably at a subacute level). At present, the most sensitive and specific test for AAR is left ventricular endomyocardial biopsy. However, its limitations are known. Therefore, new methods have been developed to detect early rejection and predict its outcome.

Objective: To assess the potential role of strain measured by speckle tracking to identify AAR proven by endomyocardial biopsy (EMB).

Methods: We included 14 consecutive patients who were transplanted during the last year in our centre. Ten echocardiograms per patient were done during the same day of EMB. We recorded images of the 4 and 2-chamber apical views as well as short axis views. We analyzed 16 myocardial segments for the assessment of longitudinal (long S), circumferential (circ S) and radial (rad S) strain and strain rate (SR).

Results: We analyzed 3024 segments, 5% of the segments were non-interpretable. According to the International Society of Heart and Lung Transplantation criteria, 84 biopsies had grade 0-4 AAR. 21 IR, and 4 IIR. Strain results are shown in the table. The only independent predictor of AAR among strain values was long R. A cut-off value of long S lower than 14% resulted in a sensitivity of 71.0%, a specificity of 70.0%, a predictive positive value of 50% and a negative predictive value of 84.4% for AAR diagnosis (AUC 0.70 CI 95%: 0.54-0.80. RR 3.2, 95% CI 1.5-6.9, p = 0.01).

Conclusion: All rotational parameters of global strain were decreased in AAR group. Longitudinal global strain is the best parameter for the diagnosis probably because longitudinal fibers may be more affected at initial phases of AAR. Strain 2D imaging could be of clinical value in monitoring and diagnosing AAR and could improve patient management by reducing the number of biopsies performed.

P358 The effect of myocardial fibrosis on left ventricular torsion / twist in patients with non-ischemic dilated cardiomyopathy: a cardiovascular magnetic resonance imaging and echocardiography study

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Purpose: LV rotation, twist, and torsion are important aspects of the cardiac performance. Rotation of the LV apex relative to the base is related to the myocardial contractility. Moreover, the potential energy stored by LV twist during the systolic phase is rapidly released during LV untwisting and constitutes an important determinant of diastolic suction and diastolic function. Myocardial fibrosis can be also be identified as left gadolinium enhancement (LGE) areas with cardiac magnetic resonance (CMR) studies. However, there is limited information about the association of myocardial fibro- sis and left ventricular rotational parameters.

Methods and Results: Twenty-two patients with nonischemic DC (NDC) and sinus rhythm and LV EF < 40% were enrolled. LV regional deformation, twist and untwist rate were measured using two-dimensional speckle tracking imaging (2D-STI) method. Myocardial fibrosis identified as late gadolinium enhancement (LGE) areas were used with non-ischemic dilated cardiomyopathy (NDC) patients with LV fibrosis have impaired LV systolic function and normal basal segments. Two-dimensional speckle tracking and cardiac magnetic resonance imaging were performed. The LV basal and apical rotation and LV twist were assessed. Thirty-six subjects were enrolled (24 patients with first episode of ST-segment elevation AAMI, and 12 age-matched control). AMI patients were selected prospectively who had successful primary PCI on the LAD only and showed akinetic apical segments and normal basal segments. Two-dimensional speckle tracking and cardiac magnetic resonance imaging were performed. The LV basal and apical rotation and LV twist were obtained. The presence of LGE of LV apex was determined. Quantification of transmural extent of delayed enhancement (DE) was assessed by <50% and ≥50% DE.

P359 Dysrhythmia assessment with tissue doppler imaging does not predict long-term response to cardiac resynchronization therapy: a prospective single-center study

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Purpose: The aim of the present study was to assess long-term effects of CRT and to value the role of pre-CRT left ventricular (LV) dyssynchrony by tissue Doppler imaging (TDI) in predicting response.

Methods: We enrolled 51 patients undergoing CRT between December 2009 and April 2011. All patients were investigated with Minnesota Living with Heart Failure Questionnaire (MLHFQ), ECG, echocardiography including TDI and implant control. We collected pre-implantation instrumental and clinical data for all patients, 34 of which were subsequently recalled for a follow-up 3 months later and 16 patients for a follow-up 1 year later. Interventricular dyssynchrony was considered as an aorto- pulmonary pre-ejection delay (P<0.040). The tissue Doppler imaging was measured by TDI velocity curves and defined as septal-lateral wall delay >60ms. An increase of LVEF >10% defined an echo response whereas the improvement of at least 1 NYHA class defined clinical response.

Results: In the whole population, the short-term significant effects at 3 months follow-up were:

- An improvement in mean EF (from 25.5 ± 3.3% to 34.3 ± 7.3%; p < 0.001)
- A reduced width of spontaneous QRS (p = 0.007)
- An improvement in clinical performance, as assessed by a reduction of mean NYHA class (p = 0.001) and a decrease in QRS time (p = 0.009)
- An inverse left ventricular remodeling, as shown by reduced diastolic (from 72 ± 8 mm to 67 ± 10 mm; p = 0.019) and systolic diameters (from 62 ± 10 mm to 55 ± 11; p = 0.041)
- An improvement in Holter monitoring parameters, as denoted by a slower mean 24 hours heart rate (p = 0.003) and better SDNN (p = 0.0029) and footprint (from 27 ± 9% to 36 ± 8%; p = 0.034).

At 1 year follow-up, main benefits remained significant:

- EF improvement (>7.8% from baseline; p < 0.001)
- Spontaneous QRS width shortening (19.2 ms from baseline; p = 0.048)
- NYHA class reduction (p = 0.001) and MLHFQ improvement (22.5 from baseline; p = 0.006).

Among the whole population, 17% were full non-responders, 29% were only clinical responders and 54% were both echo and clinical responders. Both clinical and echo- cardiographical responses were not significantly associated with interventricular dysynchrony and intraventricular dysynchrony (p = ns).

Conclusions: After only 3 months, CRT was associated with an improvement in quality of life and left ventricular function and was able to significantly modify the sympathetic-parasympathetic interaction to the heart. After 1 year, most of these benefits persisted; however, pre-implantation dysynchrony assessment did not predict long-term clinical or echo response.

P360 Assessment of left ventricular rotation during isovolumic contraction phase in acute myocardial infarction in relation to myocardial transmurality and functional recovery

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Backgrounds: During isovolumic contraction (IVC) phase, transitional counterclock- ional deformations occur. This is because IVC starts along the subendocardial myocardium. Our purpose was to test the hypothesis that the presence of initial clockwise rotation of LV apex during IVC phase (RotICV) is associated with myocardial transmurality and functional recovery in patients with acute anterior myocardial infarction (AMI). Methods: Thirty-six subjects were enrolled (24 patients with first episode of ST-segment elevation AMI, and 12 age-matched controls). AMI patients were selected prospectively who had successful primary PCI on the LAD only and showed akinetic apical segments and normal basal segments. Two-dimensional speckle tracking and cardiac magnetic resonance imaging were performed. The LV basal and apical rotation and LV twist were obtained. The presence of RotICV of LV apex was determined. Quantification of transmural extent of delayed enhancement (DE) was assessed by <50% and ≥50% DE.
myocardial wall thickness. Myocardial functional recovery was defined as improved wall motion at 6-month follow-up.

Results: Thirteen patients showed recovery and 11 patients showed no recovery. There was no significant difference of LV rotation and twist between patients with recovery and patients with no recovery. All controls showed RotIVC. Eleven of 13 patients with recovery, but none of 11 patients with no recovery showed RotIVC. Eleven of 12 patients with DE ≥50% and one of 12 patients with DE <50% showed RotIVC. For prediction of myocardial functional recovery, the presence of RotIVC had sensitivity and specificity of 92% and 83%, respectively.

Conclusion: The presence of RotIVC is related to the myocardial transmurality and thus can provide information regarding functional recovery in patients with AMI.

P361

Intra- and interatrial dyssynchrony enhanced by right atrial appendage pacing

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Purpose: Right atrial (RA) appendage pacing may prolong atrial conduction time (ACT). The present study aimed to investigate if cumulative percentage of RA appendage pacing (Cum%AP) can enhance intra- and interatrial dyssynchrony in patients with normal ejection fraction after one year pacing.

Methods: Patients who are undergoing dual chamber pacemaker implantation due to symptomatic bradycardia were enrolled. Patients with left ventricular ejection fraction (LVEF) ≤45% and permanent atrial fibrillation were excluded. Cumulative percentage of RA appendage pacing (Cum%AP) and Cum%VP at one-year follow was measured in EA (58 ± 9 ml/beat) than SA (48 ± 7 ml/beat) and controls (49 ± 6 ml/beat) p < 0.001. No significant differences were identified between SA and controls. Also, ESV was larger in EA and SA (48 ± 9 ml/m² vs 44 ± 6 ml/m² respectively) versus control (36 ± 8 ml/m²; p < 0.05). No significant differences were identified between EA and SA in EDV. Greater SV was measured in EA (58 ± 9 ml/beat) than SA (48 ± 7 ml/beat) and controls (49 ± 6 ml/beat) p < 0.001. No significant differences were identified between controls and SA in SV. EF was lower in SA than controls (59 ± 5% vs p<0.001). No significant differences were seen between EA (55 ± 5%) and SA (52 ± 6%) in EF: Conclusion: This is the first study that analyzes RV of Canarian Wrestling (SA) with CMR. In our study EA showed greater RV remodeling as assessed by CMR than SA and controls. However, EF remained within normal limits in all groups.

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Feasibility of dynamic assessment of 3D tricuspid annulus morphology by magnetic resonance imaging

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Purpose: Cardiac magnetic resonance (CMR) is considered the reference technique for the evaluation of right ventricular function. Nevertheless, the assessment of tricuspid valve morphology using CMR is intrinsically limited due to its 2D nature. Our purpose was to test the feasibility of a new approach to study the evolution of tricuspid annulus (TA) morphology through the cardiac cycle.

Methods: Ten healthy subjects (age 31 ± 10 yrs) were enrolled in the study. CMR imaging (1.5 T, spatial resolution 0.74 mm, slice thickness 6 mm) of 18 long-axis planes, evenly rotated of 10° along the axis ideally passing through the center of TA (Figure, left), was performed using SSFP sequences (20 frames per cardiac cycle). Custom software was developed to track each plane, TA points were manually identified at end-systole and end-diastole, and then automatically tracked based on the normalized cross-correlation between subsequent frames. As a result, a 3D model of TA in each frame and several parameters considered: area, height, minimum and maximum diameters, and the peak systolic excursion along the TA perimeter. Results: Feasibility of both acquisition and post-processing was 100%. CMR acquisition took about 3 minutes, while TA analysis 10 minutes including manual correction when needed. The position of the automatically tracked TA points was visually judged by an expert cardiologist, resulting accurate in 87% of the cases. A representative example of the obtained parameter is shown in the figure.

Conclusions: We demonstrated analysis of TA morphology through the cardiac cycle is feasible and accurate, requiring minimal manual interaction. This approach could serve as a starting point for studying the physiologic dynamic of TA, with potential benefits in patient evaluation and surgical planning.
objectives of this study were: 1) to examine the relationship between hemodynamic AS severity and the extent of Ca measured by 128-slice dual-source CT (DSCT) within aortic valve cusps, annulus, and root, 2) to determine cut-off values of valve Ca to identify severe AS and 3) to determine whether and how the valve phenotype (i.e. bicuspid vs. tricuspid) affects this relationship.

Methods: 80 consecutive patients with AS underwent: 1) Doppler echocardiography to measure peak aortic jet velocity, transvalvular gradient, aortic valve area (AVA), and systolic arterial compliance (SAC=stroke volume index/pulse pressure) and 2) DSCT to measure Ca volumetric score (CVS) at the level of: i) cusps, ii) annulus and iii) aortic root adjacent to annulus. A global CVS was calculated by adding these 3 regional scores. Receiver operator characteristic (ROC) analysis was performed to determine optimal cut-off values to identify severe AS defined by an AVA<1.0 cm² and an aortic valve root Ca score>4.0 cm²/m².

Results: There was good correlation between mean gradient and aortic cusps CVS (r=0.68, p<0.0001), a weak correlation between gradient and aortic annulus CVS (r=0.22, p=0.05) and no correlation with aortic root CVS. Correlation with gradient was not improved when using the sum of aortic cusps and aortic annulus CVSS (r=0.67) or global CVS (r=0.66). Aortic root CVS correlated only with SAC (r=-0.34, p=0.008). Correlation between gradient and aortic valve cusps CVS or global CVS were much stronger in patients with tricuspid valve (r=0.81 and r=0.75) than in those with bicuspid valve (r=0.48 and r=0.53). Area under the ROC curve for identification of severe AS was 0.76 in whole cohort, 0.82 in patients with tricuspid valve and 0.55 in patients with bicuspid valve. Cut-off value of aortic cusps CVS providing the best percentage of correct classification (81%) in whole cohort was 1.37 cm², which corresponded to 1440 Agatston units.

Conclusion: Theses findings suggest that the main determinant of the hemodynamic severity of AS is Ca deposit within aortic valve cusps and that calcium deposit in aortic annulus or root have negligible impact on valve hemodynamics. Valve Ca volumetric scoring by DSCT may be helpful to corroborate stenosis severity in AS patients, particularly in those with low flow, low gradient. However, the performance of DSCT was inferior in patients with bicuspid valve.

P365 Pulmonary edema evaluation by lung ultrasound in intensive care: comparison with computed tomography.

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Purpose: For many years the lung has been considered off-limits for ultrasound. However, it has been recently shown that lung ultrasound (LUS) may represent a useful tool for the semiquantification of pulmonary edema, by the evaluation of lung ultrasound B-lines (also called ultrasound lung comets). Our aim was to compare the ability of LUS to quantify the degree of pulmonary edema in critically ill patients, compared to the gold standard chest computed tomography (CT).

Methods: Eighteen patients admitted to the Intensive Care Unit (4 females, mean age 69 ± 7 years), who underwent a clinically-driven chest CT, were evaluated by LUS within a few hours. Semi-quantitative LUS assessment of pulmonary edema was performed by determining the number of B-lines with a linear 10 MHz probe, scanning on both right and left hemithoraxes, as previously described. Lung weight (LW), lung volume (LV) and lung physical density (LD) were calculated from CT scans using an ad hoc software.

Results: A significant, good correlation was found between the number of B-lines and LW (R=0.67, p<.05). A stronger correlation was found between the number of B-lines and LD (R=0.82, p<.01, see figure), that further increases if the LD of only the first 7 mm of subpleural lung tissue is considered (R=0.85, p<.01).

Conclusions: Lung ultrasound is a reliable tool for the evaluation and quantification of pulmonary edema in critically ill patients. Compared to chest CT, it is less expensive, can be easily performed and repeated at bedside, and does not employ ionizing radiation.

P367 Does selective LV lead placement during mini-thoracotomy CRT device implantation optimize response rate compared to the transvenous approach? An echocardiographic study of LV reverse remodelling

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Background: Cardiac resynchronization therapy has become a ratified and established therapy for heart failure to reduce both the morbidity and mortality of the condition, but with a high rate of non-responders which rises up to 30%. In the majority of patients transvenous CRT device placement is preferred, however in some cases mini-thoracotomy is used as an alternative approach. In this study we followed up and compared patients with CRT devices placed by the transvenous or mini-thoracotomy approach.

Methods: Following current CRT guidelines criteria patients were selected and further qualified for device implantation based on the presence of markers of intraventricular (the septal flash) and/or atio- and/or inter-ventricular dysynchrony. Based on the CRT device implantation approach, patients were divided in two groups: 18 patients implanted transvenously (VENOUS: 58±10 years) and 15 patients implanted via mini-thoracotomy (MINI: 56±14 years). In the second group, echocardiographically guided LV lead placement was performed, seeking for the optimal lead position. Echocardiographic assessment including Doppler myocardial imaging was preformed post-CRT implantation as well as 6-months after the procedure. Furthermore, electro guided CRT-optimization was performed in the second month post-implantation. Clinical response was defined as a reduction in NYHA class ≥1, while a reduction of LV end-systolic volume (LVESV) ≥10% defined volume response.

Results: Clinical response was noted in all patients at 6-months follow-up. Echocardiographic data revealed volume response in all MINI patients, which was absent in 33% of the VENOUS group and in 24% of all overall patients. A significant reduction in LVESV was measured in the MINI group (MINI pre/post: 202/139 ml, p=0.01; VENOUS pre/post: 226/189 ml, p=NS). The average change in LVEF was 18% and 33% in the VENOUS and MINI groups, respectively. In both groups EF increased significantly (MINI: p<0.005; VENOUS: p<0.01).

Conclusions: In our study group, clinical response was noted in all patients while volume response was considerably superior after CRT implantation via mini-thoracotomy.
Thoracotomy. Notably, the overall rate of non-responders was smaller compared to previous studies. Thus, a detailed preoperative assessment of CRT candidates should lead to a better response rate. With the shortcomings of a more invasive approach, mini thoracotomy CRT implantation with selective LV lead placement provides significantly better LV reverse remodelling compared to the standard venous approach.

P368
Quantitative echocardiographic assessment of preventive therapy for aortic valve calcification in a rat model of renal failure
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Background: valve calcification is an independent prognostic factor in patients with aortic valve disease. End-stage renal disease (ESRD) and secondary hyperparathyroidism increase the risk of cardiac and vascular calcifications. Since calciﬁcants inhibit parathyroid hormone (PTH) secretion and may decrease these calcifications, we studied the preventive effects of the research calcimimetic R-568 on aortic valve calciﬁcations in an in vivo rat model of progressive ESRD with secondary hyperparathyroidism, by means of aortic histologic and radiographic calibrated integrated backscatter (iIB)

Methods: 36 male Wistar rats were prospectively divided in four groups: 1 group (n=10) and 2 (n=10) received a 0.5% adenine diet to induce renal failure. Groups 3 (n=8) and 4 (n=8) received a normal diet. Groups 2 and 4 received daily R-568 (50 mg/kg) during 8 weeks, while groups 1 and 3 received the vehicle. Blood parameters (calcium (Ca), phosphorus (P), PTH) and iIB values were measured at baseline and after 8 weeks. Ex-vivo micro-CT was used to confirm the calciﬁcations.

Results: There were no signiﬁcant diﬀerences between baseline values. At week 8, we observed a signiﬁcant decrease of iIB values of the aortic valve in the treated group 2 (15.1 ± 0.5) compared to group 1 (18.0 ± 1.0, P < 0.05). This was conﬁrmed by a decreased calciﬁcation volume on ex-vivo micro-CT. In group 2, we found a signiﬁcant decrease of plasma Ca x P (group 1: 200 ± 10 mg2/dl2; group 2: 122 ± 21 mg2/ dl2; P < 0.05) and PTH (group 1: 2724 ± 361 pg/ml; group 2: 348 ± 130 pg/ml; P < 0.05).

Conclusion: Calibrated integrated backscatter is a promising, non-ionising and non-invasive technique for the quantitative echo assessment of aortic valve calcifications in vivo. With this technique, it was shown that the calcimimetic R-568 was able to reduce aortic valve calcifications in a rat model of progressive ESRD with secondary hyperparathyroidism.

P369
Elevated systolic blood pressure from the age of 36 years onwards can predict left ventricular mass at ages 60-64 years independent of sex and treatment for hypertension (The MRC NSHD)
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Introduction: left ventricular mass at ages 60-64 years independent of sex and treatment for hypertension may vary by sex as men and women have different SBP trends across the life course.

Methods: This was a birth cohort study following all singleton men and women born in Britain in the first week of March 1946. 1700 participants underwent echocardiography (Vivid I, GE) in the current round of data collection (2006-2011) aged 60-64 years and were matched for sex and age. Regression coefficient (g/m2 per 10 mg2/dl2) was calculated for men and women and for each time point of SBP measurement.

Results: Increasing SBP at all ages was associated with increasing LVMi (see table). The strongest relationship between LVMi and SBP was with SBP at 53 years in both men and women. There was no evidence of a sex-diﬀerence between LVMi and SBP at any age, and the ﬁndings did not change when hypertension treatment was included in the model (not shown).

Conclusions: Higher SBP measured from 36 years onwards predicts a greater LVMi, independent of sex and hypertension treatment. Individuals with high SBP in early adulthood should be identiﬁed and appropriate antihypertensive treatment initiated to prevent subsequent increased LVMi and its complications.

P370
Cardiac dimensions and function in female elite team game handball players A. Malmgren; M. Dencker; M. Stagmo; P. Gudmundsson
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Purpose: Intense endurance training leads to increased left ventricular mass, left ventricular end-diastolic and left atrial end-systolic diameters. The sport speciﬁc attributes have not been fully investigated in female athletes. The purpose of the present study was to investigate if diﬀerences in cardiac dimensions and function could be observed in female elite handball players compared with sedentary controls.

Methods: Cross-sectional study of 16 female elite handball players compared with 16 matched sedentary controls. The subjects underwent a 2- and 3-dimensional echocardiography examination. Cardiac dimensions were quantified with M-mode and 2- and 3- dimensional echocardiography volume measurements. Systolic and diastolic left ventricular functions were also evaluated.

Results: Mean age was 21 ± 3 years. When adjusted for BSA all cardiac dimensions, except for posterior wall thickness and left ventricular end-systolic dimensions, were signiﬁcantly (p<0.05) larger in female handball players compared with sedentary controls. No diﬀerences between the both groups were seen in systolic function and most of the diastolic parameters.

Conclusions: The present investigation suggests that similar cardiac remodeling takes place in female elite handball players as in athletes pursuing endurance sports. Systolic and diastolic functions remain unaltered.

P371
Visualization of neovascularization in carotid plaques by B-ﬂow imaging Y. Sato; T. Ishizu; K. Aonuma
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Background: Intraplaque neovascularization is critical in promoting atherosclerotic lesion instability. B-Flow imaging (BFI) has been introduced, extending B-mode imaging capabilities to ﬁne blood ﬂow. Aim: The aim of this study was to assess capabilities of BFI to visualize carotid plaque neovascularization

Methods: In 74 patients, carotid plaques were imaged by B-mode, color Doppler imaging (CDI), and BFI. Plaque echogenicity was assessed as a maker of high risk lesions by gray-scale medium (GSM) values. In 10 patients who underwent carotid endarterectomy, the surgical specimens were available for histological studies.

Results: Intraplaque signals were visualized with BFI in 29 of 50 plaques, in which no intraplaque signal flow were observed with CDI. They were found more frequently in echoluent plaques with GSM<50 (echoluent plaque 89% vs echoluent plaques 11%, P=0.001). In the surgical subgroup, 3 of 7 plaques with intraplaque flow signal predominantly consisted of lipid and small amount of hemorrhage with neovessels, and other 4 plaques were composed consisting of lipid, ﬁbrocalcification and hemorrhage with neovessels. In 3 plaques without intraplaque flow signal, 2 plaques predominantly consisted of massive hemorrhage, and another one consisted of ﬁbrocalcification with few neovessels.

Conclusions: Historical calcified, non-echoluent BFI could visualize carotid plaque neovascularization. BFI may provide additional information for plaque characterization in high risk plaques by standard ultrasound imaging.

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The treatment effect may need time to emerge in this ongoing study.

Conclusion:

improved at three months follow up for treated patients, no improvement was seen
group and were decreased in the untreated group. Whereas QoL mental axis scores
unchanged. NT-pro-BNP levels were not significantly increased in the treatment

Results:

were assigned to six months bosentan treatment or three months without treatment fol-
cing the PVR.

Methods: The study is a prospective, multicenter randomized open label trial. Patients

Purpose: Low pulmonary vascular resistance (PVR) is crucial to patients with a Fontan
circulation. Increase of the PVR will result in a decrease of lung flow and cardiac output.

P372

The role of bosentan in Fontan patients: increase of cardiac output?

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Elastic properties of aorta in b-thalassemia major patients.

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Purpose: Elastic properties of the aorta in b-thalassemia(B-T) major patients, plays role
in development of cardiac dysfunction by affecting afterload. Few studies exist about
that issue. We assessed the aorta distensibility, aortic stiffness and pulse wave velocity
using echo applications in pts with B-T.

Methods: We studied 28 pts (33.5±8.39 years) and 18 age matched controls (31.5±8.19 years) Exclusion criteria were age >45, rhythm other than sinus, smoking, mean hemoglobin < 8.5 g/dl, systolic left ventricle dysfunction, systemic and pulmonary hypertension, diabetes mellitus and thyroid disease. Blood pressure
was measured. Aortic systolic (AoS), diastolic (AoD) diameters were calculated by M-Mode. Aortic distensibility and stiffness index were calculated by 2x(AoS-AoD)/( SAP-
DAP)(AoD). PW-D (PWD) tracings of ascending and descending aortas recorded. From R of QRS to onset of PWD aortic flow, time 1 (T1) in ascending aorta and time 2 (T2) in descending aorta were measured accordingly. Aortic length (AOI) was measured from Two-D and defined as distance from PWD sample volume in descending aorta to ascending aorta adjacent to right pulmonary
artery. The following calculations were used: transit time (TT)=t2-t1 and PWV=AOI/ TT (m/s). Standard M-mode, PWD and TD I mean septal-lateral mitral annulus velocities
measurements were also obtained (EF, LVEDD, LVESD, IVS and PW thickness, Left
atrial diameter, Emax, Amax, DT, IVRT, IVCT,PASP and Sm, Em, Am).

Results: Differences between classic echo indices were observed between pts and
controls for EF(64.35 ± 7.4 vs 69 ± 2.2 respectively, p=0.48). Left atrial diameter
(37.5 ± 4 vs 34.6 ± 2.5 respectively, p=0.004), PASP (25 ± 7 vs 13 ± 7.1 respectively,
p=0.000), Emax (99.6±15.3 vs 88.7±15.2 respectively, p=0.028) and Em (11.7±3.8
vs 14.2±3.2 respectively, p=0.032). Indices of aorta properties in table.

Conclusions: Pts with B-T, except from differences in classic echo indices which are
known from previous studies, have altered elastic properties of the aorta like distensi-
bility maybe as a result of iron load of the aorta wall.

Elastic properties of aorta

<table>
<thead>
<tr>
<th>Patients(n=28)</th>
<th>Controls(n=18)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distensibility</td>
<td>2.33±1.7</td>
<td>3.43±1.8</td>
</tr>
<tr>
<td>Aortic Stiffness</td>
<td>3.6±0.51</td>
<td>3.3±0.56</td>
</tr>
<tr>
<td>PWVr</td>
<td>7.4±5.21</td>
<td>6.34±4.7</td>
</tr>
</tbody>
</table>