

NORSKE ABSTRAKTER PRESENTERT I MILANO

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415 Left bundle branch block modifies the relationship between E/e' and left ventricular filling pressure: E/e' lateral is most robust

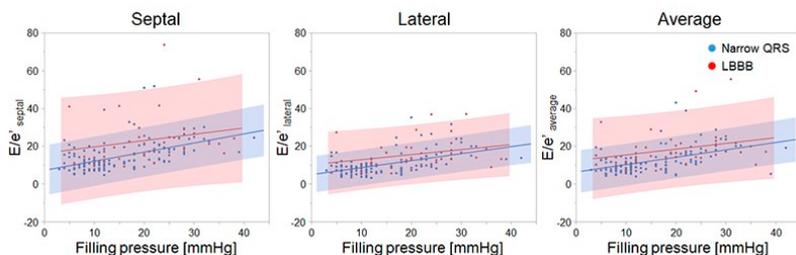
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Introduction: Current guidelines recommend the ratio between early diastolic mitral flow velocity and mitral annular velocity (E/e') as a key parameter for noninvasive estimation of left ventricular filling pressure (LVFP). It is debated, however, if E/e' should be used in patients with left bundle branch block (LBBB).

Purpose: To determine how LBBB modifies the relationship between E/e' and LVFP.

Methods: Heart failure patients with LBBB or LBBB type activation pattern due to right ventricular (RV) pacing (n=39) were compared to heart failure patients with narrow QRS (n=132). Mitral annular velocities were measured at septal (e'septal) and lateral (e'lateral) locations, and average (e'average) was calculated. LV filling pressure was measured as pulmonary capillary wedge or LV preA pressure. In 9 anaesthetized dogs we induced LBBB activation pattern by RF ablation and by RV pacing, measured pressures by micromanometers and E and e' by echocardiography.

Results: In heart failure patients with LBBB, 95% confidence intervals were larger than in heart failure patients with narrow QRS (Figure). In multivariate analysis, LVFP and presence of LBBB were independent predictors for E/e'.



In the dog model, induction of LBBB and RV pacing caused the characteristic abnormal septal motion similar to patients with LBBB. Septal e' decreased from 6 ± 2 to 3 ± 1 cm/s (mean \pm SD) ($p < 0.05$), but e'lateral was unchanged at 6 ± 2 cm/s. Septal E/e' increased from 7 ± 2 to 13 ± 6 ($p < 0.05$), whereas E/e'average showed no significant change (7 ± 2 and 8 ± 3 , respectively). There was a minor nonsignificant change in mean left atrial pressure (7.4 ± 2.9 vs. 9.5 ± 4.3 mmHg, respectively, $p = 0.053$).

Conclusions: Septal dysfunction in LBBB introduces marked variability in the ratio between LV filling pressure and E/e'septal and E/e'average. However, E/e'lateral may be used to estimate LVFP. As suggested by the clinical data and strongly supported by the experimental study, septal E/e' should not be used for estimation of LV filling pressure in patients with LBBB.

536 Lifethreatening ventricular arrhythmias in patients with mitral annulus disjunction are not dependent on mitral valve prolapse

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Background:

Mitral annulus disjunction (MAD) is an abnormal atrial displacement of the mitral valve leaflet hinge point. MAD has been associated with sudden cardiac death in patients with mitral valve prolapse (MVP). Little is known about MAD in the absence of MVP.

Purpose:

To describe the clinical presentation and identify markers of severe ventricular arrhythmias (VA) in patients with MAD.

Methods:

We identified patients with MAD on echocardiogram from two hospitals and performed clinical examination, a new study echocardiogram, a cardiac magnetic resonance study and 24hours ECG.

Aborted cardiac arrest or documented sustained ventricular tachycardia was defined as severe VA. By echocardiography, we measured ejection fraction (EF) and quantified mitral regurgitation. We determined presence of MVP, defined as displacement of any part of the mitral valve =2 mm superior to the mitral annulus (Figure).

By CMR, we determined presence of myocardial fibrosis by late gadolinium enhancement. Results: We included 116 patients with MAD (49±15 years, 60% female). Palpitations were the most common symptom (71%).

Severe VA had occurred in 14 (12%) patients. Patients with severe VA were younger (37±13 years vs. 51±14 years, p=0.001), had lower EF (51±5% vs. 57±7%, p=0.002) and more frequently had papillary muscle fibrosis (4 (36%) vs. 6 (9%), p=0.03) compared to patients without severe VA. Mitral regurgitation did not differ between patients with or without severe VA (Effective Regurgitant Orifice Area: 0.04 [IQR; 0 0.10] cm² vs. 0.05 [IQR; 0 0.20] cm², p=0.38).

MVP was evident in 90 (78%) patients and was less frequent in patients with severe VA compared to patients without severe VA (6 (43%) vs. 84 (82%), p=0.003) (Figure). Absence of MVP (adjusted OR 0.22 [95%CI; 0.06 0.75], p=0.02), lower EF (adjusted OR 0.86 [95%CI; 0.77 0.96], p=0.008), and papillary muscle fibrosis (adjusted OR 7.35 [95%CI; 1.15 47.02], p=0.04) were markers of severe VA independent of age.

Conclusions:

Markers of severe VA were papillary muscle fibrosis, lower EF and younger age. Arrhythmias were frequent irrespective of concomitant MVP, and a significant proportion of patients with MAD did not have MVP.

1019 Prognostic value of mechanical dispersion after transfemoral aortic valve implantation

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Background

An increasing number of patients with severe aortic stenosis (AS) are treated with transfemoral aortic valve implantation (TAVI). Except for paravalvular regurgitation, data on post-procedural echocardiographic parameters with prognostic value are sparse. Pronounced mechanical dispersion by speckle tracking echocardiography has been associated with adverse outcome in several cardiac diseases, but the prognostic value after TAVI is unknown.

Purpose

To assess the prognostic value of postprocedural speckle tracking echocardiography in patients with severe AS undergoing TAVI.

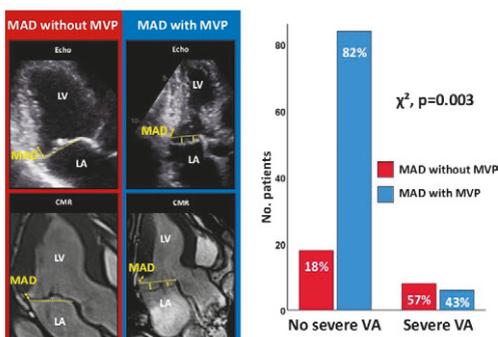
Methods

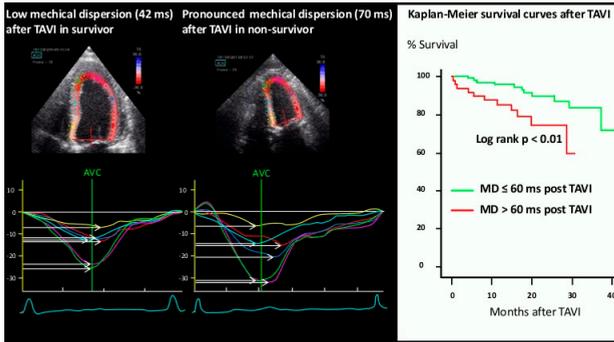
Patients with severe aortic stenosis undergoing transfemoral TAVI were included in a cohort study. In addition to standard echocardiographic parameters, we performed speckle tracking echocardiography on day 1 or 2 after the procedure. Global longitudinal strain (GLS) was calculated as the average of peak longitudinal shortening in 16 left ventricular (LV) segments. Mechanical dispersion was defined as the standard deviation of time from onset of Q/R on ECG to peak longitudinal strain in 16 segments. Allcause mortality was recorded during followup.

Results

We included 140 consecutive patients undergoing TAVI (83±8 years old, 49 % women, logistic Euroscore 16±10) with severe AS (valve area 0.7±0.2 cm², mean transvalvular gradient 54±18 mmHg) and a relatively preserved LV ejection fraction (EF) (52±11%). After TAVI we observed favorable changes in transvalvular gradients (mean aortic gradient 12±5 mmHg). Postprocedural speckle tracking echocardiography showed, however, that patients had abnormal GLS (16.1±3.9%) and pronounced mechanical dispersion (55±18 ms). During 21±9 months of followup 22 patients died. Mechanical dispersion was 53±18 ms in survivors and 60±18 ms in patients who died (p<0.09), while EF was 54±9% and 51±10% (p=0.19) and GLS 16.4±3.6% and 15.6±4.7% (p=0.47), respectively, after TAVI. Mechanical dispersion was the only significant postprocedural echocardiographic marker of mortality in a Cox analysis, independent of TAVI-induced left bundle branch block [Adjusted HR 1.24 (1.011.52), p=0.04, 10

MAD without MVP (n=26) vs. MAD with MVP (n=90)





ms increments]. Kaplan-Meier survival curves illustrate adverse prognosis in patients with post-procedural mechanical dispersion above 60 ms (log rank $p < 0.01$, figure).

Conclusion

Mechanical dispersion was pronounced in patients after TAVI. Mechanical dispersion was independently associated with mortality and could confer additional risk requiring closer post-procedural followup.

P643 Threedimensional speckle tracking echocardiography may detect acute coronary occlusions in patients with NonSTelevation acute coronary syndrome

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Background: About onethird of patients with nonSTelevation acute coronary syndrome (NSTEMI-ACS) have coronary occlusions that may benefit from acute revascularization therapy similarly to patients with STElevation myocardial infarction. Acute left ventricular (LV) systolic dysfunction following coronary occlusion can be detected by cardiac imaging. Twodimensional (2D) speckle-tracking echocardiography (STE) has previously been shown to be useful, however more recently developed threedimensional (3D) STE has not been studied for this purpose.

Purpose: We aimed to assess the diagnostic accuracy of 3D STE to identify acute coronary occlusions in NSTEMI-ACS patients.

Methods: Fortyfour patients with suspected NSTEMI-ACS underwent 3D STE prior to coronary angiography. LV global longitudinal strain (GLS), global circumferential strain (GCS), area tracking strain (ATS) and 3D strain (3DS) were calculated from a 16 segment LV model. Ejection fraction (EF) was also assessed from the 3D acquisi-

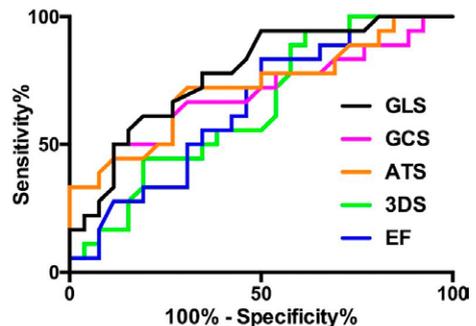
tions. Coronary artery occlusion was defined as occlusion or $>90\%$ stenosis.

Results: There was no difference in 3D EF between patients with ($n=18$) and without coronary occlusion ($n=26$), while all 3D strain parameters including GLS, GCS, ATS and 3DS were worse in patients with occlusion (Table). Receiver operating characteristics curve analysis indicated that 3D GLS was the best parameter to detect coronary occlusion, with an area under the curve of 0.78 (Figure). The optimal cutoff was

observed at 15.8%, which resulted in a sensitivity of 78% and a specificity of 65%.

Conclusions: 3D STE might be a useful tool to detect coronary occlusions in patients with NSTEMI-ACS.

3D Parameter	Coronary occlusion (n=18)	No coronary occlusion (n=26)	Pvalue
EF (%)	52.8±4.4	56.0±6.0	0.063
GLS (%)	14.2±2.3	16.9±3.0	0.003
GCS (%)	26.0±4.2	28.7±4.1	0.044
ATS (%)	36.1±4.3	39.6±4.4	0.011
3DS (%)	34.7±7.0	41.6±12.4	0.039



P752 Impact of right ventricular geometry and left ventricular hypertrophy on right ventricular mechanics in hypoplastic left heart syndrome

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Background: In patients with hypoplastic left heart syndrome (HLHS) right ventricular (RV)

function has a major impact on survival. We investigated RV myocardial mechanics in relation to ventricular geometry.

Methods: We retrospectively examined 48 patients with HLHS aged 2.2 ± 3.2 at different surgical stages. Patients were grouped by the presence ($n=23$) or absence ($n=25$) of RV "apical bulging" which was defined as a sigmoid shaped septum and the RV leftward apical wall aligning with the LV left lateral wall. Regional and global RV strain was measured using speckle tracking and regional strains analyzed for their patterns and peak values. These were compared between different HLHS anatomical subtypes and between patients with versus without apical bulging. Clinical outcome was registered through all stages of surgery including heartfailure, death or transplant.

Results: RV average longitudinal strain (7.3 ± 2.8 vs. $11.2 \pm 4.4\%$), basal septal strain (3.8 ± 3.2 vs. $11.4 \pm 5.8\%$) and apicolateral strain (5.1 ± 3.5 vs. $8.0 \pm 5.8\%$) were significantly lower in patients with versus without apical bulging. 20/22 patients with apical bulging displayed also apicolateral hypertrophy of the LV lateral wall. Apical bulging was equally prevalent in all anatomical variants. The number of patients with RV failure was significantly higher in patients with apical bulging. In this group, death or transplantation was bound to reduced RV function while it was not in other patients.

Conclusion: Apical bulging of the RV with HLHS was present when the residual LV lateral wall and apex were hypertrophied. In the presence of apical bulging, global strain, septal longitudinal strain and RV apicolateral strain were reduced, probably due to the effect of interventricular dependence. Apical bulging seems to predispose

for both, RV heartfailure and transplant or death due to reduced RV function.

P797 Similar disease progression in probands and family members with arrhythmogenic cardiomyopathy Authors:

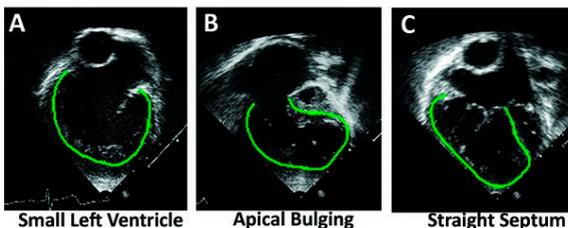
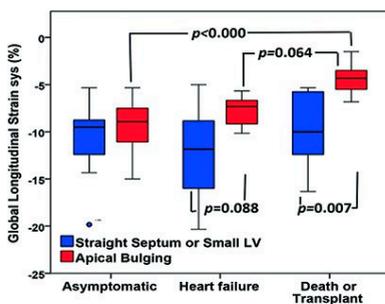
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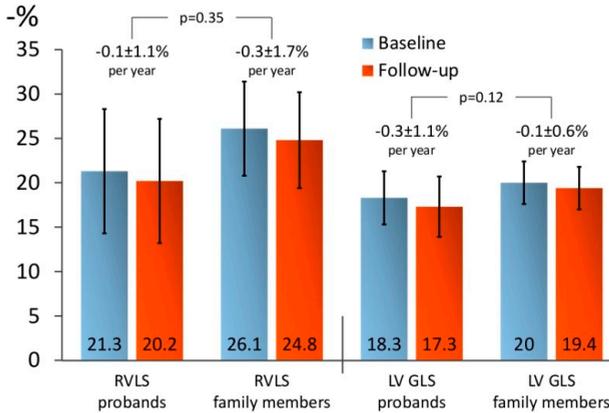
Background: Arrhythmogenic cardiomyopathy (AC) is an inheritable cardiomyopathy with variable penetrance and poorly described disease progression. Probands have more severe disease than family members, but the rate of disease progression is not known.

Purpose: To compare disease progression in AC probands and family members in a longitudinal cohort study.

Methods: We included consecutive AC patients and mutation positive family members. Clinical and echocardiographic parameters were assessed according to the 2010 revised Task Force criteria (TFC) at inclusion and at last clinical followup. In addition, we performed strain analyses of the right ventricle (RV) and the left ventricle (LV). We assessed RV longitudinal strain averaged in 3 freewall segments (RVLS) and LV global longitudinal strain (LVGLS). Progression rates were expressed as the annual changes in echocardiographic parameters during followup.

Results: We included 145 patients (47% female, 47% probands, 39 ± 16 years old). During 6.9 (IQR: 4.6 to 9.3) years of followup, right ventricle outflow tract (RVOT) diameter increased from 34 ± 7 mm to 37 ± 7 mm ($p < 0.001$) with an increase of 0.6 ± 1.3 mm/year, RV fractional area change (RVFAC) decreased from $39 \pm 9\%$ to $36 \pm 10\%$ ($p < 0.001$) with a decrease of $0.3 \pm 3.0\%$ /year. RVLS worsened from $23.9 \pm 6.7\%$ to $22.7 \pm 6.6\%$ ($p = 0.04$) with a worsening of $0.2 \pm 1.5\%$ /year. LVGLS worsened from $19.2 \pm 2.8\%$ to $18.5 \pm 3.1\%$ ($p = 0.01$) with a worsening of $0.2 \pm 0.9\%$ /year. The increase in RVOT diameter was similar in probands (from 37 ± 8 mm to 40 ± 8 mm, $? 3 \pm 0$ mm, $p < 0.001$) and in family members (from 32 ± 5 mm to 36 ± 6 mm, $? 4 \pm 0$ mm, $p < 0.001$). Also RVFAC decreased similarly in probands (from $34 \pm 9\%$ to $31 \pm 10\%$, $? 3 \pm 1\%$, $p = 0.007$) and in family members (from $44 \pm 8\%$ to $41 \pm 7\%$, $? 3 \pm 1\%$, $p = 0.006$). There was no difference in annual progression between probands and family members





in RVOT diameter ($0.5\pm 1.2\text{mm/year}$ vs. $0.6\pm 1.4\text{mm/year}$ $p=0.68$), RVFAC ($0.3\pm 3.8\%/year$ vs. $0.4\pm 2.0\%/year$, $p=0.92$), RVLS (Figure) nor in LVGLS (Figure).

Conclusion: As expected, probands had worse cardiac function and dimensions compared to family members. Importantly, progression of AC disease was similar in probands and family members, highlighting the importance of close follow up of AC family members.

P799 Physical activity is associated with impaired left ventricular function in patients with Lamin A/C mutations.

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Background

Lamin A/C dilated cardiomyopathy (DCM) is a malignant and highly penetrant inheritable cardiomyopathy. Participation in competitive sports has been associated with adverse events in lamin A/C genotype positive patients, but data on daily life exercise are sparse.

Purpose

To explore associations between physical activity and adverse outcome in lamin A/C genotype positive patients.

Methods

Consecutive lamin A/C genotype positive patients answered a questionnaire on physical activity habits from age 7 years until genetic diagnosis. We recorded all physical activity >3 metabolic equivalents (METs) and assessed the duration (hours per week) and calculated lifetime activity. Patients were grouped in "high exercisers" or "low exer-

cisers" based on lifetime duration of physical activity above or below the population median. We performed echocardiography, 12lead ECG, Holter monitoring, and blood sampling, including NTproBNP. We defined $EF < 45\%$ as a clinically significant reduction in systolic function.

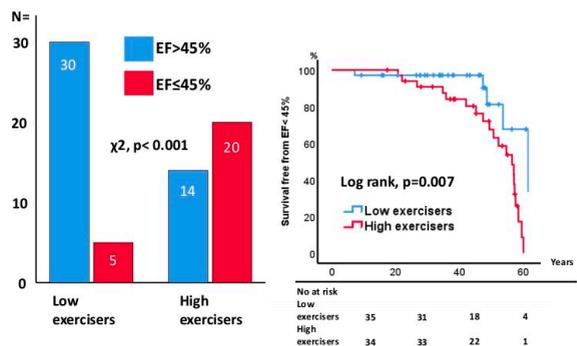
Results

We included 69 patients (age 43 ± 15 years, 40% probands, 46% female). Median exercise duration was 4160 hours. There was no difference in age between the high and low exercisers (45 ± 13 years vs. 40 ± 16 years, $p=0.16$). Compared to low exercisers, high exercisers were more frequently probands (52% vs. 29%, $p=0.04$), had more frequently atrial fibrillation (68% vs. 37%, $p=0.01$), had lower EF ($43\pm 13\%$ vs. $51\pm 11\%$, $p=0.006$) (Figure), and higher NTproBNP (78pmol/l [IQR32219] vs. 30pmol/l [IQR1364], $p=0.03$). $EF < 45\%$ was diagnosed at younger age in high exercisers compared to low exercisers (Figure). Exercise was a predictor for $EF < 45\%$ in multivariate analyses also when adjusted for age and sex (OR 7.9 [95%CI;2.426.0], $p=0.001$). The prevalence of sustained ventricular tachycardia (15% vs. 6%, $p=0.26$), nonsustained ventricular tachycardia (56% vs. 34%, $p=0.07$), and AVblock (74% vs. 51%, $p=0.08$) did not differ significantly between high and low exercisers.

Conclusions

Longer duration of physical activity was a marker of impaired systolic function by echocardiography and by biomarkers, and was associated with atrial fibrillation in Lamin A/C patients. This implicates restrictions in exercise in patients with Lamin A/C.

69 lamin A/C genotype positive patients – exercise duration and ejection fraction



P861 Initial diastolic vortex formation in the left ventricle relates to the atrioventricular plane motion of the outflow tract

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Background/Introduction:

Studies using Cardiovascular Magnetic Resonance Imaging (CMR) have shown a complex vortex formation during diastole. While Doppler technology only shows unidimensional flow, vector flow imaging is a new method based on blood flow speckle tracking that can visualize this 2 and 3 dimensionally.

Purpose:

The purpose of the study was to investigate the flow pattern and vortex formation in the left ventricle, especially in the left ventricular outflow tract (LVOT), and some of the mechanisms for this formation.

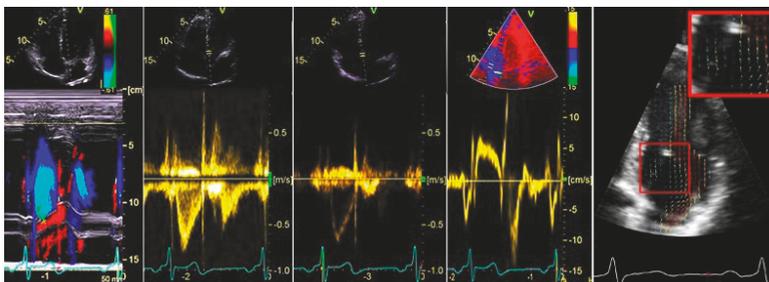
Material and methods:

13 healthy volunteers were examined with a GE E95 ultrasound scanner. An experimental setup was developed to achieve continuous data acquisition by utilizing plane waves in combination with ECGgating over multiple (5

6) heart cycles. This setup allows vector flow imaging. The scanners clinical mode was also used to obtain images.

Results:

Colour MMode (CMM) showed early diastolic movement of the AV plane away from the apex followed by a low velocity column of blood. This was simultaneous with early diastolic inflow, generating a redirection of inflowing blood into the LVOT, towards the basis. This phenomenon is visualized in the CMM images and with vector flow imaging, showing propagation of higher velocities from mid ventricle towards the aortic valve. This is also visible in PW Doppler as peak early velocity (ELVOT) slightly delayed in relation to the mitral inflow (E), which was nearly simultaneous with the peak annular velocity (e'). Time intervals are given in table 1.



Conclusion(s):

The space within the LVOT, through the motion of the AV plane, is important in creating the vortex diverging from the mitral E wave towards the septum. The experimental setup allows flexible retrospective analysis of both flow and tissue movement, including vector flow imaging as an important supplement for better visualization of these vortices.

	Mean	Standard deviation
Mitral E (m/s)	0,7715	0,21832
LVOT E (m/s)	0,5585	0,15550
Mitral e' (m/s)	0,1323	0,02651
Time difference between E mitral and e' (ms)	21,92	19,956
Time difference between E LVOT and E mitral (ms)	93,69	20,690
Time difference with CMM (ms)	71,54	18,640

* All timing is done measuring from the R in the preceding QRS complex

P873 Firstphase ejection fraction is a powerful predictor of adverse events in asymptomatic patients with aortic stenosis and preserved total ejection fraction

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Objectives Firstphase ejection fraction (EF1), the ejection fraction up to the time of maximal ventricular contraction may be more sensitive than existing markers in detecting early systolic dysfunction. We examined the prognostic value of EF1 in patients with aortic stenosis (AS), a condition in which left ventricular dysfunction as measured by conventional indices is an indication for valve replacement.

Methods The predictive value of EF1 compared to conventional echocardiographic indices for outcomes was assessed in 218 asymptomatic

patients with at least moderate AS, including 73 with moderate, 50 with severe and 96 with "discordant" (aortic area < 1.0 cm² and gradient < 40 mmHg) AS, all with preserved EF, followed for at least 2 years. EF1 was

measured retrospectively from archived echocardiographic images by wall tracking of the endocardium. The primary outcome was a combined event of aortic valve intervention, hospitalisation for cardiac causes and death from any cause.

Results EF1 was the most powerful predictor of events in the total population (table 1) and all subgroups. A cutoff value of 25% gave hazard ratios (for EF1<25% compared to =25%) of 27.7, (95% confidence interval 13.158.7, P<0.001) unadjusted, and 24.4 (11.352.7, P<0.001) adjusted for other echocardiographic measures including global longitudinal strain, for events at 2years in all patients with asymptomatic AS. Corresponding hazard ratios for allcause mortality in the total population were 17.5 (5.753.3) and 17.4 (5.5 55.2) unadjusted and adjusted respectively.

Conclusion EF1 may be potentially valuable in the clinical management of patients with AS and other conditions in which there is progression from early to late systolic dysfunction.

	HR	CI (95%)	P value
Multivariate Model			
Age	1.016	1.003 1.029	0.019
Gender	0.836	0.562 1.243	0.376
SVi	0.991	0.991 0.975	0.299
MPG	1.014	1.002 1.027	0.011
GLS	1.025	0.975 1.077	0.341
EF	1.021	0.994 1.049	0.126
EF1	0.879	0.857 0.902	<0.001

Multivariate cox regression analysis of predictors of events in total population

P1345 Impact of cumulative dose of cisplatin on cardiac function in testicular cancer survivors assessed by traditional and novel echocardiographic methods: a 30-year followup

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On behalf: Center for Cardiac Innovation

Background: Cisplatin-based chemotherapy (CBCT) is essential in the treatment of testicular cancer (TC).

CBCT has been implicated in increased cardiovascular morbidity and mortality decades after treatment. However, it is not known if CBCT, similarly to anthracyclines, causes direct myocardial dysfunction.

Purpose: Our study aimed to assess myocardial function in TC survivors 30 years after CBCT using traditional and modern echocardiographic methods.

Methods: Ninetyfour TC survivors diagnosed and treated with CBCT between 1980 and 1994 were recruited from the longitudinal Norwegian Cancer Study in Testicular Cancer Survivors. Echocardiography was performed in all subjects, including speckletracking strain analyses and 3D echocardiographic measurements. Patients were divided into three groups according to their cumulative cisplatin dose.

Results: The participants were on average 60±9 years old. There was no correlation between the cumulative cisplatin dose and cardiac function. Six (7%) participants had reduced EF (<52%), all in the intermediate dose group. Sixteen (21%) participants had reduced LV GLS (> 18.0%), three in the lowcisplatin group (15%), seven in the intermediate group (13%) and six in the high dose group (27%); however, the intergroup differences were not significant.

Conclusion: While earlier, smaller studies, with shorter followup have suggested possible links between CBCT and longterm myocardial dysfunction, our study did not replicate these findings. Therefore, our results do not support the suspected relationship between myocardial dysfunction and an increase in cardiovascular morbidity and mortality in patients treated with CBCT.

	Low dose <600 mg/m ² (n=20)	Intermediate dose 600 800 mg/m ² (n=52)	High dose >800 mg/m ² (n=22)	pvalue
Cumulative cisplatin dose, mg/m ²	414±136	740±72	1084±220	<0.001
3D LV enddiastolic volume, ml/m ²	140±35	131±32	126±21	0.42
3D LV endsystolic volume, ml/m ²	57±19	57±26	51±11	0.69
3D ejection fraction, %	60±5	58±8	60±5	0.49
LV global longitudinal strain, %	- 20.3±2.2	- 19.9±2.9	- 19.3±2.1	0.54
LV global circumferential strain, %	- 21.5±2.5	- 21.6±3.6	- 21.7±2.0	0.98
E/e'	9.1±1.9	10.4±3.8	9.1±2.1	0.15
TAPSE, mm	2.3±0.4	2.2±0.4	2.3±0.4	0.32
RV fractional area change, %	41±7	40±7	41±6	0.82

Data are presented as mean±SD. The Pvalues were derived from analysis of variance. LV, left ventricle; MV, mitral valve; RV, right ventricle; TAPSE, tricuspid annular plane systolic excursion.

P1452 Changes in cardiac morphology and function after normalization of plasma volume in untrained individuals exposed to 10 weeks of supervised endurance training

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On behalf: Center for Cardiac Innovation

Background: Cardiac changes occur in response to endurance exercise. However, due to training induced blood volume expansion, it has been difficult to examine the heart under identical loading conditions after a period of endurance training.

Purpose: We aimed to assess how high intensity endurance training affects cardiac morphology and function when controlled for physiological increase in blood volume.

Methods: Eleven healthy participants underwent 10 weeks of supervised, high intensity endurance training. Blood volume was assessed by the COrebreathing method at baseline and post-exercise, allowing for normalization of blood volume by phlebotomy. Echocardiography and cardiopulmonary exercise testing were performed and blood pressure, as a surrogate for afterload, was assessed at baseline and post-exercise and phlebotomy.

Results: Participants had increased indexed VO₂ max, blood volume and LV mass after the training period. There were no differences in LV volumes,

LV function and blood pressure before and after the training period and phlebotomy (Table).

Conclusion: After ten weeks of intensive training, and after normalizing preload by phlebotomy while afterload was unchanged, our subjects had unchanged LV volumes and function but increased LV mass, supporting the hypothesis of an initial concentric remodelling as a response to endurance training.

P1464 Incremental value of myocardial work over global longitudinal strain for the diagnosis of oncotherapy related cardiotoxicity

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Longitudinal myocardial deformation outperforms conventional echocardiographic measures, including ejection fraction (EF), in the identification of left ventricular (LV) dysfunction during chemotherapy. However, global longitudinal strain (GLS) is afterload dependent. The estimation of myocardial work allows correction of GLS for changes in systolic blood pressure (SBP).

Aim: To compare the utility of myocardial work parameters and GLS in the detection of chemotherapy induced cardiotoxicity.

Methods: 36 asymptomatic pts undergoing anthracycline therapy in combination with other cardiotoxins or heart failure risk factors [age >65 years, diabetes, hypertension, previous cardiac injury e.g.: postinfarct]) participating in the SUCCOUR trial underwent echocardiography before anticancer treatment and after 312 months followup (FU). Cardiotoxicity was evidenced by reduction of 3D LVEF. In addition to GLS, the following parameters of myocardial work were assessed: global work index (GWI),

	Baseline (n=11)	Post training (n=11)	pvalue
VO ₂ max indexed, mL/kg/min	44±6	50±6	<0.001
Blood volume before phlebotomy, L	4.97±0.98	5.16±1.00	<0.05
Systolic blood pressure, mmHg	121±10	119±12	0.55
IVSd, mm	7.5±0.7	8.4±1.1	<0.05
LVPWd, mm	7.4±0.8	7.9±0.9	0.17
LV Mass, g	123±37	142±45	<0.05
3D LV enddiastolic volume, ml	124±35	117±39	0.10
3D LV endsystolic volume, ml	49±15	46±17	0.10
3D LV ejection fraction, %	61±3	61±4	0.91
LV global longitudinal strain, %	22.3±1.4	21.3±1.7	0.12
LV global circumferential strain, %	23.8±1.7	23.0±2.4	0.24

Data expressed as mean±SD. Right column shows Pvalues for the paired samples ttest. All parameters in «post training» were measured after phlebotomy, except «blood volume» which is reported prephlebotomy. IVSd, interventricular septum in diastole; LV, left ventricle; LVPWd, left ventricular posterior wall in diastole; RV, right ventricle.

Parameter	CTX+ BP- (A) n=10	CTX- BP+ (B) n=11	CTX- BP- (C) n=15	P A-B	P A-C	P B-C
delta GLS, %	-3.45±2.78	-1.40±2.16	-1.81±3.14	0.11	0.16	0.71
delta GWI, mmHg%	-434±497	349±252	-127±292	<0.001	0.04	0.001
delta GCW, mmHg%	-467±546	333±190	-246±300	<0.001	0.15	<0.001
delta GWW, mmHg%	27.3±41.2	25.7±42.2	-14.2±87.5	0.95	0.12	0.13
delta GWE, %	-1.90±2.76	-0.73±1.62	-0.27±3.03	0.31	0.13	0.65
delta SBP, mmHg	-3.6±25.0	31.6±5.4	-1.9±4.4	<0.001	0.75	<0.001

global constructive work (GCW), global wasted work (GWW), global work efficiency (GWE).

Results: Pts were divided into 3 subsets: (CTX+ BP) with cardiotoxicity and no changes in LV afterload (n=10); (CTX BP+) no cardiotoxicity, but with an elevation of LV afterload, as evidenced by increase in SBP >20 mmHg (n=11), and (CTX BP) no cardiotoxicity or afterload changes (n=15). No significant between group differences were noted for change in GLS at FU. Larger increases in GWI and GCW at FU were found in CTX BP+ than in the other 2 groups. CTX+ BP demonstrated a significantly larger decrease in GWI than CTX BP (Table). ROC analysis revealed no significant differences between GLS and myocardial work parameters in the detection of chemotherapy-related cardiotoxicity (AUC for GLS 0.72, for GWI 0.81, for GCW 0.77, for GWW 0.61, for GWE 0.64, all p=NS). However in multivariable logistic regression analysis, the only significant predictor of cardiotoxicity was GWI (OR 0.99; p<0.02). GWI and GCW were more useful for identification of LV functional changes in response to increased afterload with no true cardiotoxicity (defined as the CTX BP+ group membership; AUC 0.93 and 0.97, respectively) than GLS, GWW and GWE (AUC 0.61, 0.60 and 0.50, respectively, all p values <0.001).

Conclusions: Measurement of myocardial work might be helpful in cardiooncology. Given the load dependence of LV deformation, myocardial work outperforms GLS in the serial assessment of cardiac function.

The increase in GWI and GCW, even with decreased GLS, indicates the impact of elevated afterload on LV performance in the absence of actual myocardial impairment. On the other hand, a profound decrease especially in GWI may suggest the presence of cardiotoxicity.

P1469 Subclinical left ventricular systolic dysfunction in patients with morbid obesity referred to bariatric surgery in Western Norway the FatWest study

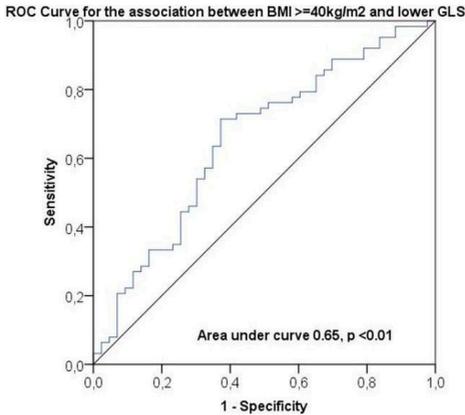
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Background: Obesity increases the risk of heart failure being responsible for 1015% of clinical heart failure. However, obese subjects often maintain normal ejection fraction (EF).

Purpose: We sought to evaluate changes in left ventricular (LV) systolic function and geometry in morbidly obese patients without known heart disease.

Methods: Clinic and echocardiographic data were recorded at baseline in 110 obese subjects (mean 42±11years, 74% women, mean BMI 41.9±4.8kg/m², 33% hypertension, 15% diabetes) recruited in the FatWest (Bariatric Surgery on the West Coast of Norway) study, a prospective study on the 5years impact of bariatric surgery on weight loss and quality of life (primary) as well as on cardiopulmonary function and hormonal changes (secondary endpoints). Patients were grouped according to median weight (118.5kg). LV function was assessed by EF by Simpson's biplane method, stresscorrected midwall function (scMWS) and endocardial global longitudinal strain (GLS) by 2D vector velocity imaging using a 16segment model.

Results: The heavyweight group (=118.5kg) included a higher proportion of men and patients with hypertension (p<0.05), had larger left atrial systolic volumes, more LV concentric remodelling, and larger right ventricular end-diastolic diameter and wall thickness. EF did not differ between groups, while scMWS (89.5% vs. 94.8%) and GLS (14.32% vs. 16.94%) were lower in heavyweight subjects (both p <0.05, Figure). In multivariate regression analyses, heavy weight was associated with lower scMWS (Beta 0.22, p =0.04) and lower GLS (Beta 0.22,

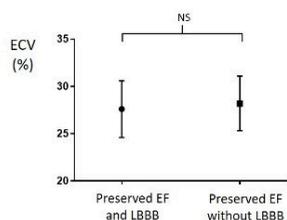
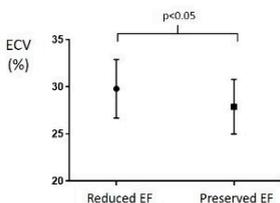
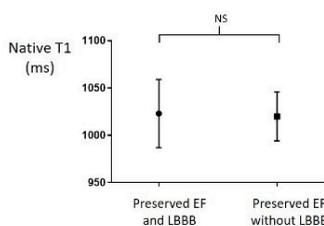
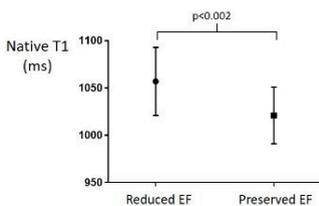


$p=0.03$) independent of gender, hypertension, heart rate, left atrial volume, stroke volume, mitral peak early inflow/annular velocity ratio, LV mass, concentric geometry, and presence of mitral or aortic regurgitation.

Conclusion: Among subjects with morbid obesity and free of clinical heart disease, LV systolic function assessed by midwall function and GLS becomes impaired with increasing weight, despite normal ejection fraction and independent of clinical and echocardiographic confounders.

P1559 Diffuse myocardial fibrosis is associated with reduced ventricular function, but not with left bundle branch block

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Background: Myocardial focal fibrosis (scar) has been associated with adverse outcomes in nonischemic cardiomyopathy and poor response to cardiac resynchronization therapy (CRT). In addition, septal focal fibrosis has been correlated with the presence of left bundle branch block (LBBB). The clinical significance of diffuse fibrosis of the myocardium, however, is less well known.

Purpose: We aimed to investigate the association of diffuse fibrosis to myocardial function and LBBB.

Methods: We studied 21 patients with non-ischemic cardiomyopathy and LBBB, and 22 controls with preserved ejection fraction (EF) with ($n=10$) or without ($n=12$) LBBB, and otherwise no cardiac disease. Cardiac magnetic resonance (CMR) was performed with T1mapping before and after contrast agent injection and late gadolinium enhancement (LGE). Native T1 and myocardial extracellular volume fraction (ECV) were used as estimates of diffuse fibrosis, and calculated as the average of the two midventricular septal segments. Ventricular volumes and EF were calculated by the biplane Simpson's method from echocardiography.

Results: The groups were similar in terms of age, sex, and had no scar by LGECMR. EF was 31 ± 6 and $57 \pm 6\%$ in the two groups, respectively ($p < 0.001$). Both native T1 and ECV were higher in the group with reduced EF compared to the group with preserved EF; 1057 ± 36 vs 1021 ± 30 ms ($p < 0.002$) and 29.8 ± 3.1 vs $27.9 \pm 2.9\%$ ($p < 0.05$) (left part of the figure). Further subgroup analyses of the patients with preserved EF, however, revealed no difference in either native T1 or ECV in the LBBBpatients compared to the patients without LBBB (right part of the figure).

Conclusions: Diffuse fibrosis of the myocardium is associated with reduced myocardial function, but not with LBBB. Future studies should investigate if diffuse fibrosis could be predictive of CRTresponse.

P1713 Systolic ventricular function in Fontan patients before transition to adult care

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Background / introduction Limited data is available about systolic ventricular function in patients with univentricular

heart defects at different stages after the Fontan operation.

Purpose

The aim of this study was to assess systolic ventricular function in a single centre cohort of Fontan patients at the time of their last echocardiogram before transition to adult care. The relationship of important clinical factors with ventricular function was investigated.

Methods

We retrospectively analysed the last available echocardiogram of Fontan patient in our hospital database before transition. We assessed systolic ventricular function by visual impression, fractional area change (FAC) and longitudinal strain (LS), and we graded regurgitation of the atrioventricular and semilunar valves. From the ECG we analysed rhythm origin (atrial, nonatrial), QRSduration and presence of conduction delay.

Results

We identified 100 patients (born June 1987 - April 1998, median age 17.6 years, 11.5 - 18.7) with offline analysable echocardiograms. Male/female ratio was 58/42. Fiftynine patients had a predominant LV morphology, 36 had RV, and 5 indifferent or common morphology. Surgical modifications comprised extra cardiac (N=55), lateral tunnel (N=35), classic RAPA (N=7) and Kawashima (N=3) type of palliation. We found a normal distribution of functional parameters (FAC 38.3 ± 6.85 %, LS 18.3 ± 4.7 %) and no association between FAC / LS and any of the anatomical, valvular, surgical, or electrophysiological factors (figure 1). Ventricular function by visual impression was lower with RV morphology, but the visual assessment was less reliable in terms of intra/interobserver agreement compared to FAC and strain analysis.

Conclusion

Systolic ventricular function in our study group was mainly preserved at the time of transition to adult care. There was no negative association between anatomical, valvular, surgical or electrophysiological factors and systolic function.

P1804 Echocardiographic deformation imaging in arrhythmogenic cardiomyopathy: combining strain pattern recognition with mechanical dispersion for optimal risk stratification

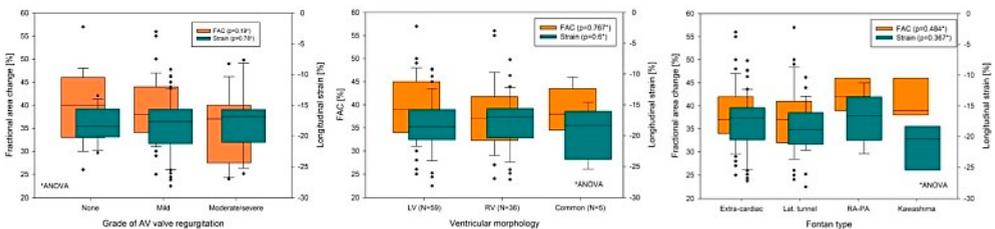
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Background: Echocardiographic strain pattern recognition and right ventricular mechanical dispersion (RVMD) are valuable indices in risk assessment of patients with arrhythmogenic cardiomyopathy (AC), but have never been externally validated and compared.

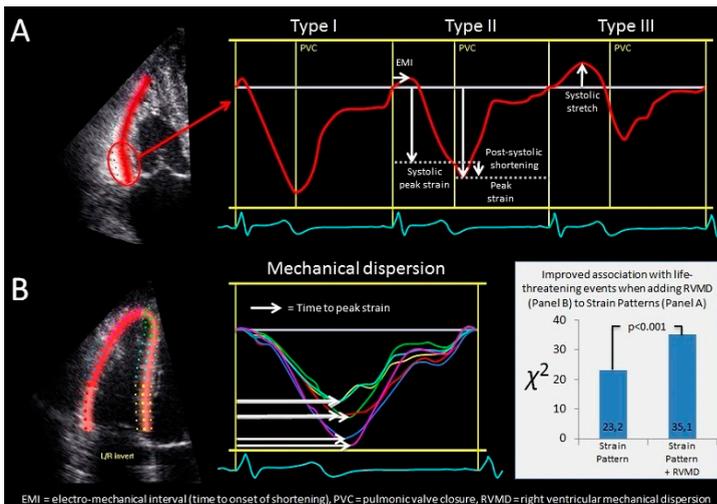
Objectives: To validate, compare and combine strain pattern recognition and RVMD as markers of life threatening ventricular arrhythmias (VA) in AC.

Methods: AC probands and mutationpositive family members from two large referral centers were included in a retrospective study. Speckle tracking echocardiography was performed in all patients. Deformation patterns of the subtricuspid area were scored as normal (type I) or abnormal (type II: delayed contraction onset, decreased systolic peak strain and little post-systolic shortening; type III: systolic stretching and large post systolic shortening, Figure panel A). RVMD was expressed as the standard deviation of the time from onset Q/R on ECG to peak negative strain in 6 segments (Figure panel B). VA was defined as sustained ventricular tachycardia, appropriate therapy from an implantable cardioverterdefibrillator, or aborted cardiac arrest.

Results: 160 subjects (80 matched patients from each center) were included (43% probands, 55% female, age 41 ± 17 years). VA had occurred in 60 (38%) subjects. Patients with VA had higher prevalence of abnormal strain patterns (80% vs. 42%, p < 0.001) and greater RVMD (51 ± 32



Systolic ventricular function assessed by FAC and LS in association with AV valve regurgitation, ventricular morphology and Fontan modification.



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Introduction:

Growing evidence supports the notion that left bundle branch block (LBBB) itself may cause heart failure in otherwise healthy individuals. We hypothesized that septal dysfunction is the driver for development of dilated cardiomyopathy with reduced left ventricular (LV) systolic function in patients with LBBB.

Purpose:

To test the hypothesis that loss of septal work is a key player in LBBB-induced cardiomyopathy.

Methods:

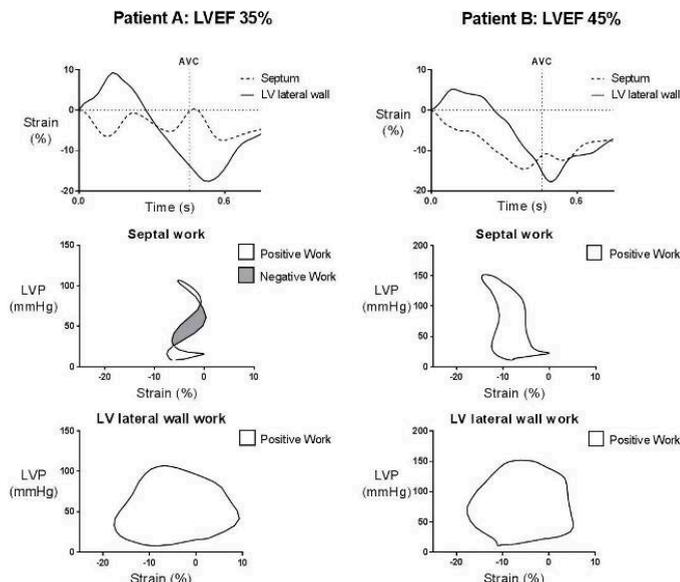
25 nonischaemic patients with typical ECG features of LBBB and normal to mildly reduced LV ejection fraction (EF) (35.6%) were included and examined by speckletracking echocardiography. Using a previously validated method for noninvasive estimation of LV pressure (LVP), septal and LV lateral wall work was calculated by pressure-strain analysis. In addition to simple regression analyses, multiple linear regression

vs. 28 ± 18 ms, $p < 0.001$) than those without lifethreatening events. Abnormal strain patterns and RVMD were markers of VA independently of each other (adjusted OR 2.7, 95% CI [1.1 6.4], $p = 0.02$, and 1.3, 95% CI [1.1 1.6], $p = 0.002$ by 10 ms increments, respectively), and the association with VA improved when combining the two methods (Figure, lower right panel). Incremental value was found when adding RVMD to pattern recognition (net reclassification index 0.57, $p < 0.001$ and integrated discrimination index 0.04, $p = 0.01$). By using the optimal cutoff for RVMD of 24 ms to detect VA, the twostep approach gave a negative predictive value of 0.90, 95% CI [0.78 - 0.95].

Conclusions: Strain pattern recognition and RVMD are both useful in risk stratification in AC patients. Combining the methods improved risk stratification in high risk individuals for VA. Furthermore, a twostep approach, by calculating RVMD in cases with normal strain patterns, accurately identified low risk individuals.

424 Septal dysfunction is driving development of heart failure in left bundle branch block Authors:

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analysis was performed to further explore the relationship between LVEF, septal and LV lateral wall work.

Results:

As illustrated by representative examples in the figure, there was loss of septal, but not LV lateral wall work in patients with reduced LV function. This was supported by a strong correlation between LVEF and septal work ($r=0.61$, $p<0.002$) and LVEF and peak septal shortening ($r=0.77$, $p<0.001$). For the LV lateral wall, however, there were no significant correlations ($r=0.04$, NS, for work and $r=0.26$, NS, for peak shortening), indicating that differences in LV lateral wall function did not explain reduction in global LV function. Multiple regression analysis revealed that septal work was a significant determinant of LVEF also when including LV lateral wall work.

Conclusions: In LBBB, it seems that reduction of septal contractile function is a main mechanism in heart failure development. This supports the notion that recovery of septal function is an important target for cardiac resynchronization therapy.

1134 Contractile reserve in patients with highgradient aortic stenosis scheduled for transcatheter aortic valve implantation

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Introduction: Lowdose dobutamine stress echocardiography (DSE) is recommended to assess contractile reserve in lowflow, lowgradient aortic stenosis (AS) and reduced ejection fraction (EF). No data exist on myocardial contractile reserve in highgradient AS scheduled for transcatheter aortic valve implantation (TAVI).

Purpose: To investigate myocardial contractile reserve in patients with highgradient AS scheduled for TAVI, and the association between reduced contractile reserve and preoperative scoring systems.

Methods: 28 patients (17 males) with highgradient AS, accepted for TAVI with sinus rhythm and no significant coronary artery stenosis were included. Preoperative evaluation included NYHA classification, questionnaire SF36, EuroScore II assessment, 6minute walk test (6MWT) and clinical examination with echocardiography. Contractile reserve was defined =20% increase in stroke volume (SV) from baseline by DSE.

Results: Median age was 81 (range 6992) years, and all patients were in NYHA II or III (table).

13 (46%) patients had no contractile reserve during DSE with change in SV 8% (3719%) vs. 34% (2250%) in the 15 patients with contractile reserve. Baseline echocardiographic characteristics, peak heart rate, peak systolic blood pressure and max dose of dobutamine during DSE were similar between groups. There were no significant differences in NYHA class, EuroScore II, SF36 or 6MWT.

Conclusion: Almost half of the patients with highgradient AS scheduled for TAVI did not have contractile reserve with DSE. Preoperative scoring systems failed to identify them. The impact of our findings on outcomes needs further investigation.

	No contractile reserve n=13	Contractile reserve n=15	pvalue
NYHAclass (IIV)	II:8 III:5	II:9 III:6	0.93
EuroScore2	3.7 (1.320.1)	2.6 (1.17.1)	0.39
6MWT (m)	415 (232471)	364 (143611)	0.20
EF baseline (%)	66 (4378)	66 (5676)	0.86
Mean gradient (mmHg)	56 (3586)	52 (3074)	0.25
AVA (cm ²)	0.7 (0.41.2)	0.8 (0.51.3)	0.47
SF36 Physical Component score	41.9 (24.656.8)	34.0 (23.957.0)	0.25
SV baseline (ml)	80 (59109)	68 (50120)	0.10
Peak SV (ml)	86 (60113)	86 (63162)	0.41
Change in SV (%)	8 (3719)	34 (2250)	<0.01
SBP max dose dobutamine (mmHg)	118 (86184)	115 (61156)	0.47

P717 Pre and postoperative echocardiography in endstage rheumatic heart disease during development of cardiac surgery in subSaharan Africa

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Background: Rheumatic heart disease (RHD) is endemic in subSaharan Africa, with a global mortality estimated to 0.5 million per year. Many

lowincome countries do not have cardiac surgery service (CSS). Through a bidirectional program of training and research between Ethiopia and Norway we aim to develop CSS at a university hospital.

Purpose: Data from detailed echocardiographic assessment and longterm results in endstage RHD is scarce. We aimed to evaluate the baseline echocardiography versus outcome of valvular surgery in endstage RHD.

Methods: Observational design; numbers given as mean (SD). Comprehensive echocardiography by experienced cardiologists using highend scanners was performed transthoracic at screening, discharge and followup, and by transesophageal approach perioperatively.

Results: In total, 28 patients (68% women) with age 32 (10) years underwent open heart surgery for endstage RHD. Preoperatively all patients were in NYHA class II or III with a very long history of symptoms (mean (SD) 11 (5) years). Severe valvular disease was present in all, with severe mitral valve pathology in 27 (96%) individuals and severe aortic valve pathology in 20 (71%). Moderate or severe tricuspid valve disease was found in 19 (68%). Three (11%) patients had large thrombus in the left atrium. Three patients had previous percutaneous balloon valvuloplasty. Wilkins score was median 12. Left atrial volume was =500 ml in 5 (18%). Preoperative ejection fraction, mean mitral inflow gradient and systolic pulmonary pressure was 60 (6.5) %, 13 (5) mmHg and 59 (18) mmHg, respectively. Preoperatively three (11%) patients had cerebral (2) or peripheral (1) arterial embolization.

Multivalvular surgery was performed in 20 (71%), with mean (SD) 1.9 (0.7) procedures per patient. In total, 21 valves were repaired, and 30 valves were replaced. One patient had redo-surgery for mitral valve thrombosis, two patients had pacemaker implanted due to atrioventricular block. Postoperative echocardiography showed good results in all. 30day survival rate was 89%. Followup was mean (SD) 1.2 (0.7) years. None were lost to followup, no additional mortality was seen. One patient had disabling stroke and one were treated due to late occurring pericardial effusion with tamponade. Four (14%) patients had moderate heart failure medically treated. Minor complications were rare (one had a minor bleeding). None had valvular prosthesis dysfunction, and the midterm results of the repaired valves were acceptable in all.

Conclusions: Echocardiography is mandatory pre, peri and postoperatively for successful selection and treatment of patients with endstage RHD with open heart surgery in a subSaharan lowincome country. The collaboration between professionals and highquality assessment from screening through followup is essential to avoid

premature mortality of young people in cardiac surgery due to endstage of RHD.

P1246 Total coronary artery plaque volume is associated with myocardial ischemia in non-obstructive coronary artery disease (the MicroCAD study)

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Background: Nonobstructive coronary artery disease (CAD) is common and associated with an impaired prognosis, in particular when myocardial ischemia is present.

Purpose: To evaluate whether assessment of total coronary artery plaque volume by coronary computed tomography angiography (CCTA) in patients with nonobstructive CAD could identify those with myocardial ischemia.

Methods: We studied 129 patients (mean age 62 ± 8 years, 56% women) with angina pectoris and non obstructive CAD (stenosis <50%) by CCTA included in the Myocardial ischemia in non-obstructive coronary artery disease (MicroCAD) study. Presence of myocardial ischemia was detected by myocardial contrast stress echocardiography. Total plaque volume was determined as the difference between vessel and lumen volume in all coronary arteries using a semiautomatic CCTA quantification software.

Results: Patients with higher than median plaque volume (=1197 mm³) were older, had lower body mass index, higher calcium score and higher prevalence of myocardial ischemia (all p<0.05), while sex, prevalence of hypertension, diabetes or hypercholesterolemia did not differ. Total coronary artery plaque volume was higher in the 67 (52%) patients with ischemia (1264±308 mm³ vs. 1122±382 mm³, p=0.021) compared to nonischemic patients. In univariate analysis, one standard deviation (SD) higher total coronary plaque volume was associated with presence of myocardial ischemia (OR 1.54 pr. mm³/SD [95% CI 1.062.23], p=0.024). The association remained significant even after adjusting for age, sex and calcium score (OR 1.51 pr. mm³/SD [95% CI 1.00 2.26], p=0.048).

Conclusion: In patients with stable angina and nonobstructive CAD, total coronary artery plaque volume was associated with presence of myocardial ischemia. Our results suggest that assessment of total coronary artery plaque volume may become a valuable diagnostic tool in nonobstructive CAD.

PI324 Can resting segmental strain be used as an indicator for stable coronary artery disease?

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Background: The number of patients with chest pain undergoing screening for coronary artery disease is high. Currently used screening methods are either invasive or expose patients to radiation or they hamper test accuracies or availability. Strainrate imaging (SRI) is a promising technique being able to show discrete changes in myocardial function. We hypothesized that echocardiography with SRI at rest might reveal subtly decreased myocardial function in patients with stable coronary artery disease (CAD).

Methods: In a retrospective study, 61 patients with stable CAD assigned to coronary artery bypass grafting (CABG) and 61 age and gender matched healthy control subjects from a population based study (HUNT) from Trondheim were investigated with tissue Doppler imaging (TDI) strain and speckle tracking (2D) segmental SRI. The CABG patients displayed low scar load, including 78% of patients without any myocardial scar in MRI. Segmental strain was expressed as the maximal positive or negative strainvalue during systole. TDI and 2D strain analyses were performed by independent observers.

Results: At a segmental cutoff for hypokinetic strain at >8%, AUC was 0.95 (CI 0.911,00) for TDI and 0.79 (CI 0.700,87) for 2D strain. For this cutoff, TDI strain with >1/16 hypokinetic segments identified CAD with a sensitivity of 95%and specificity of 86%, while using 2D strain, >2 hypokinetic segments indicated presence of CAD with 90% sensitivity and 62% specificity. In the patient cohort, feasibility of 2D strain was higher with 23% discarded segments, while segments with TDI strain in the same dataset were discarded in 8%.

Conclusion: Segmental strain identified regions with significantly reduced strain in the majority of

patients with stable CAD. TDI strain showed significantly higher testaccuracies compared to 2D strain but lower feasibility. The study indicates that segmental systolic strain at rest might have the potential for screening chestpain patients. These promising results need to be evaluated in larger prospective studies.

PI410 Feasibility, accuracy and clinical influence of pocketsized imaging of the carotid arteries performed by nonexperts in patients with ischemic stroke or transitory ischemic attack

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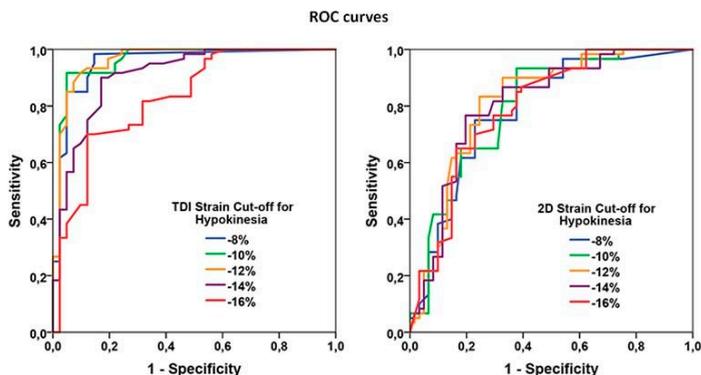
Feasibility, accuracy and clinical influence of pocketsized imaging of the carotid arteries performed by non experts in patients with ischemic stroke or transitory ischemic attack

Background/Introduction: Patients with ischemic stroke or transitory ischemic attack (TIA) require carotid stenosis evaluation due to availability of treatment by endarterectomy.

Purpose: We present the preliminary results of an ongoing study of the accuracy and clinical influence of a pocketsized imaging device (PSID) for the evaluation of carotid stenosis by non-expert users in patients admitted with suspected ischemic stroke or TIA.

Methods: Two resident doctors in a community hospital and one in a university hospital stroke unit, without experience in ultrasound of the carotid arteries, received focused training in the use of PSID including a minimum of 30 patients examined prior to inclusion. 60 patients admitted with ischemic stroke or TIA, were first examined by one the residents. Reference method was highend carotid ultrasound performed by an expert (HIGH), blinded to PSID findings.

Results: 4 patients had >50% stenosis on HIGH. Three of these were found on PSID, one 50% stenosis was overlooked by PSID. In this case the plaque was hypoechogenic and only visualised by colour Doppler. In 67% (40/60) stenosis



was considered ruled out by the resident. In the remaining patient's, evaluation was either inconclusive or a stenosis was suspected. In total, sensitivity and specificity for >50% internal carotid stenosis were 75% and 70% respectively. Sensitivity for >70% stenosis was 100%.

Conclusions: Pointofcare examinations of the carotid arteries by nonexperts using PSID after a focused training was feasible, and able to exclude significant stenosis in the majority of patients. It had a moderate sensitivity and specificity for stenosis >50%, but was able to exclude all stenoses requiring surgery. This may have major impact on stroke department workflow and logistics.

1019 Prognostic value of mechanical dispersion after transfemoral aortic valve implantation Authors:

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Background

An increasing number of patients with severe aortic stenosis (AS) are treated with transfemoral aortic valve implantation (TAVI). Except for paravalvular regurgitation, data on post-procedural echocardiographic parameters with prognostic value are sparse. Pronounced mechanical dispersion by speckle tracking echocardiography has been associated with adverse outcome in several cardiac diseases, but the prognostic value after TAVI is unknown.

Purpose

To assess the prognostic value of postprocedural speckle tracking echocardiography in patients with severe AS undergoing TAVI.

Methods

Patients with severe aortic stenosis undergoing transfemoral TAVI were included in a cohort

study. In addition to standard echocardiographic parameters, we performed speckle tracking echocardiography on day 1 or 2 after the procedure. Global longitudinal strain (GLS) was calculated as the average of peak longitudinal shortening in 16 left ventricular (LV) segments. Mechanical dispersion was defined as the standard deviation of time from onset of Q/R on ECG to peak longitudinal strain in 16 segments. Allcause mortality was recorded during followup.

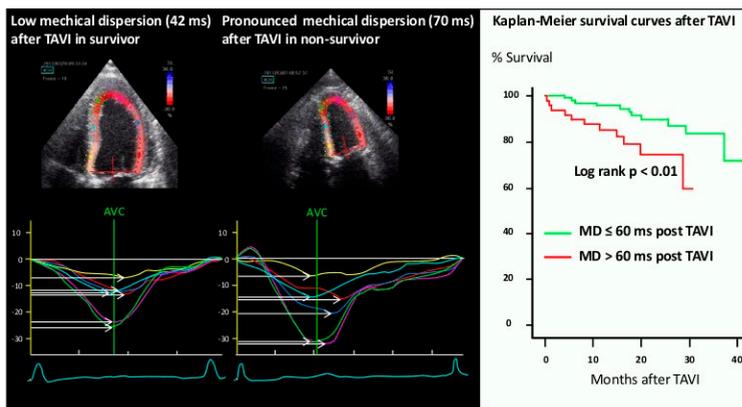
Results

We included 140 consecutive patients undergoing TAVI (83±8 years old, 49 % women, logistic Euroscore 16±10) with severe AS (valve area 0.7±0.2 cm², mean transvalvular gradient 54±18 mmHg) and a relatively preserved LV ejection fraction (EF) (52±11%). After TAVI we observed favorable changes in transvalvular gradients (mean aortic gradient 12±5 mmHg). Postprocedural speckle tracking echocardiography showed, however, that patients had abnormal GLS (16.1±3.9%) and pronounced mechanical dispersion (55±18 ms). During 21±9 months of followup 22 patients died. Mechanical dispersion was 53±18 ms in survivors and 60±18 ms in patients who died (p<0.09), while EF was 54±9% and 51±10% (p=0.19) and GLS 16.4±3.6% and

15.6±4.7% (p=0.47), respectively, after TAVI. Mechanical dispersion was the only significant postprocedural echocardiographic marker of mortality in a Cox analysis, independent of TAVI-induced left bundle branch block [Adjusted HR 1.24 (1.011.52), p=0.04, 10 ms increments]. KaplanMeier survival curves illustrate adverse prognosis in patients with postprocedural mechanical dispersion above 60 ms (log rank p<0.01, figure).

Conclusion

Mechanical dispersion was pronounced in patients after TAVI. Mechanical dispersion was independently associated with mortality and could confer additional risk requiring closer post-procedural followup.



PI706 Cardiac resynchronisation therapy leaving the right ventricle as a lonely rider

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Background: Right ventricular (RV) function affects prognosis in patients with left ventricular (LV) heart failure and left bundle branch block (LBBB). Thus, the ventricular interaction may be of great importance in this clinical situation.

Purpose: To investigate the effect of LBBB and CRT on RV function and how it relates to LV function.

Methods: 14 patients with LBBB and non-ischaemic cardiomyopathy (QRS 169±17ms) were studied with echocardiography shortly before and after CRT implantation. Ventricular function was assessed as left ventricular (LV) ejection fraction (EF) and RV fractional area change (FAC), respectively. RV and septal longitudinal strain was measured by speckle tracking echocardiography.

Results: During LBBB, there was typical septal contraction pattern with a preejection shortening of 6±2% coinciding with an early systolic contraction of 6±4% (figure, A, arrow) in the RV free wall ($r=0.77$, $p<0.01$). CRT removed ($n=8$) or reduced ($n=3$) the RV free wall early systolic shortening (Figure, A, right panel). CRT increased

LVEF to 35±9 from 31±7% during LBBB ($p<0.05$), while RVFAC tended to decrease (49±8 vs 52±12% in LBBB, NS). During CRT there was weaker correlation and a flatter slope in the relationship between LVEF and RVFAC (Figure, B).

Conclusions: During LBBB there was abnormal RV free wall early systolic shortening which was an equivalent to septal preejection shortening. The coupling between the RV and LV function which was a feature of LBBB, was markedly attenuated with CRT. This could imply that CRT removes the supportive role that the LV provides to the RV in LBBB and could be a challenge for a failing RV

PI812 Cardiac remodeling and ventricular arrhythmias in exerciseinduced arrhythmogenic cardiomyopathy

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Background:

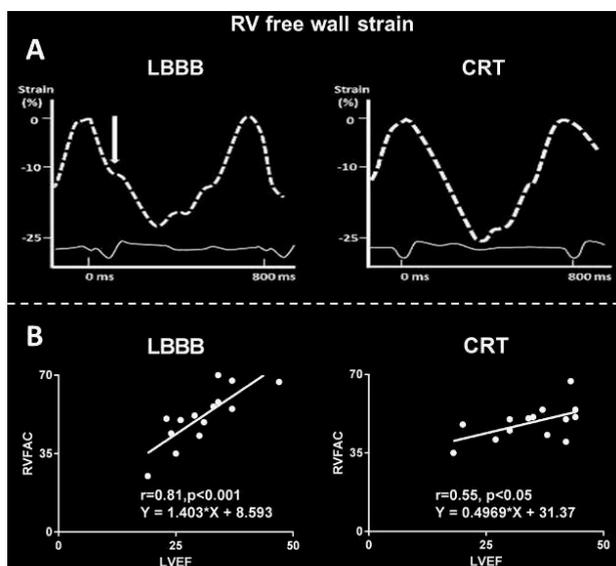
Little is known about differentiation and risk stratification of competitive athletes with ventricular arrhythmias without any other discernable etiology than high exercise doses.

Purpose:

To report the phenotype and markers of adverse outcome in otherwise healthy competitive athletes with ventricular arrhythmias.

Methods:

We included competitive athletes with ventricular arrhythmias and no other discernable etiology than high exercise doses. Ventricular arrhythmias were defined as frequent premature ventricular contractions, cardiac syncope, nonsustained or sustained ventricular tachycardia (VT), appropriate implantable cardioverter defibrillator (ICD) therapy or aborted cardiac arrest. Life-threatening arrhythmic events were defined as documented sustained VT, appropriate ICD therapy or aborted cardiac arrest. We included healthy competitive athletes for comparison by clinical examinations, electrocardiogram, echocardiography and cardiac magnetic resonance



imaging (CMR). Echocardiography included assessment of dimensions, volumes and EF, in addition to RV and LV longitudinal strain (RVLS and GLS, respectively). LV mechanical dispersion was defined as the standard deviation of time to peak strain in 16 LV segments. By CMR, we assessed ventricular volumes, EF and presence of late gadolinium enhancement (LGE).

Results:

We included 43 competitive athletes with ventricular arrhythmias (45±14 years old, 16% female, 10 [IQR 4-20] thousand hours of exercise) of which 23 (53%) had lifethreatening events. None had family history of known or suspected AC. We recruited 30 healthy competitive athletes (41±9 years old, 7% female, 10 [IQR 8-16] thousand hours of exercise) for comparison. Athletes with ventricular arrhythmias had worse RV function than healthy athletes by RVLS (22.9±4.8% vs. 26.6±3.3%, p<0.001, Figure) and by CMR (RVEF 48±7% vs. 52±6%, p=0.04) and had more LGE (24% vs. 3%, p=0.03). RV

was enlarged in both athletes with ventricular arrhythmia and healthy athletes (enddiastolic volume by CMR; 123±26 ml/m² vs. 120±18 ml/m², p=0.57). Athletes with lifethreatening events had impaired LV function compared to those with less severe ventricular arrhythmias (GLS 17.1±3.0% vs. 18.8±2.0%, p=0.04). Greater LV mechanical dispersion was an independent marker of lifethreatening events (Adjusted OR 2.8, 95%CI 1.3 to 5.8, p=0.008, by 10 ms increments, Figure).

Conclusion:

Athletes with ventricular arrhythmias had impaired RV function and more myocardial fibrosis, and those with lifethreatening arrhythmic events had additional LV contraction abnormalities. These findings indicate that high exercise doses can induce an acquired arrhythmogenic cardiomyopathy in susceptible individuals, and that biventricular assessment is important in risk stratification.

