NORSKE ABSTRAKTER PRESENTERT I MÜNCHEN

P1823] Persistent increments in proximal arterial stiffness and peripheral resistance following preeclampsia might contribute to the higher cardiovascular risk in future life

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Purpose: Preeclampsia (PE) is pregnancy induced hypertension and proteinuria, occurring after 20 weeks of gestation. We performed a study of arterial properties and ventriculo-arterial coupling (VAC) at term and 6 months post-partum in women with PE and women with normal pregnancy (NP). Postpartum recordings were compared against non-pregnant values from women with previous preeclamptic pregnancy (PPEP).

Methods: 35 women (37±4 years) with PPEP (3.5±1.0 years), 40 (32±6 years) with PE and 65 (32±5 years) with NP. Aortic root flow and pressure obtained by Doppler (transthoracic echocardiography) and calibrated right subclavian artery pulse traces. Arterial compliance (C), characteristic impedance (Z0), and peripheral arterial resistance (R) were estimated by 3-element Windkessel model (WK) and Fourier analysis of pressure and flow. Arterial elastance, Ea, was calculated as end systolic pressure (Pes) over stroke volume (SV). Ventricular function was assessed by ELVI, which represents left ventricular systolic elastance (Pes/ESVI). The Eal/ELVI is an index of ventriculo-arterial coupling.

Results: At term, Z0, Ea, and R were higher and C was lower in PE pregnancy compared to NP, indicating a higher resistance in the arterial tree. Z0, Ea and R remained elevated 6 months follow-up in PE and after 3 years in PPEP.

Conclusions: PE is characterized by increased proximal arterial stiffness and peripheral resistance at term, 6 months post partum, and at 3 years follow up. These results indicate that the cardiovascular disturbances in PE extend beyond pregnancy and might explain the higher risk of hypertension and cardiovascular disease in future life.

Table 1. Results

	At term	6 mo PP	At term	6 mo PP	PPEP
	NP	NP	PE	PE	
MAP (mmHg)	85±7	86±7	115±9*#	98±11#	101±17#
R (mmHg ml^{-1}s^{-1})	0.92±0.23*	1.10±0.29	1.13±0.23#	1.13±0.27#	1.17±0.32
Z_0 WK (10^{-3} mmHg ml^{-1}s^{-1})	65±24	68±22	88±24#	80±30#	90±40#
Z_0 FD (10^{-3} mmHg ml^{-1} s^{-1})	45±23*	55±21	66±34#	58±27#	80±33#
C WK (ml mmHg^{-1})	1.55±0.46*	1.40±0.45	1.34±0.43#	1.40±0.48	1.28±0.42
Pes (mmHg)	87±9*	92±8	122±11*#	105±13#	109±18#
Eal (mmHg kg/m^2/ml)	2.16±0.43	2.34±0.50	3.33±0.73#	3.02±0.84#	3.01±1.04#
E_{LV}I (mmHg kg/m^2/ml)	3.82±1.76*	5.40±1.68	7.13±2.52#	6.18±1.90	4.93±1.68
Eal/E_{LV}I	0.64±0.23*	0.45±0.14	0.51±0.19#	0.53±0.18	0.60±0.17#

**p<0.05 vs 6 months, #p<0.05 vs normal pregnancy.*

[P1739] Palmitoleate is increased in epicardial adopose tissue in heart failure and correlates with parameters of progressing failure

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Purpose: Epicardial adipose tissue (EAT) is a visceral fat depot which location and function are of growing scientific interest in regards to heart disease. The anatomical settings in the junctional area between EAT and the myocardium allows widespread communication between the two tissues as no separating fascia exists and they share the same microcirculation. EAT has been shown to function as an endocrine organ by secreting a wide range of mediators, including factors known to be involved in development of cardiovascular disease in patients with coronary artery disease. However, little is known about a potential role of EAT in development of heart failure (HF). The aim of this study was to characterise EAT as compared to subcutaneous adipose tissue (SAT) in patients with HF.

Methods: Thirty HF patients with ejection fraction <35% and 30 patients without HF undergoing thoracic surgery were included in the study. EAT and SAT were collected during thoracotomy and examined with microarray analysis, RT-PCR of known mediators in HF, and fatty acid (FA) profile.

Results: Unsupervised hierarchical clustering analysis of the microarray analysis in EAT and SAT identified depot-specific transcription patterns, including groups of mediators involved in myocardial inflammation, hypertrophy and apoptosis. Further clustering analyses of EAT in HF and control patients also identified disease specific transcription patterns. Alterations in mRNA expression of genes involved in cardiac remodelling were observed using RT-PCR in both SAT and EAT and in HF compared with control patients. Especially, significantly higher IL-6 mRNA levels were seen in the EAT of HF patients compared to SAT and controls. The FA analysis identified different profiles between EAT and SAT. In addition, several individual FA, like palmitoleate (PAO) which is previously linked to cardiovascular disease and hypertrophy, were significantly increased in the EAT of HF patientsas compared to controls. PAO was also significantly correlated with increasing proBNP levels and left ventricular end-diastolic diameter.

Conclusion: Depot specific transcriptional and FA profiles were observed between EAT and SAT and between HF patients and controls. The FA PAO was increased in the EAT of HF patients and correlated with parameters of progressing HF. Our findings suggest that adipose tissues are phenotypically different in regards to localization and that they may influence the progression of HF.

[3979] Concentric remodelling of the right ventricle in African football players

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Purpose: We have previously shown that male Caucasian athletes have a larger increase of both

Table 1

	RVD2 (mm)	RVD2/BSA (mm/m²)	RVWT (mm)	**RVRWT**
Caucasian controls, n=46	32.9±4.6	16.6±2.3	3.5±0.4	0.21±0.04
Caucasian athletes, n=509	34.6±4.9	17.3±2.5	3.8±0.5*	0.22±0.04
African athletes, n=46	32.4±4.4†	16.5±2.3	3.9±0.5*	0.25±0.04*†
ANOVA	p<0.05	NS p=0.09	p<0.05	p<0.05

**p<0.005 vs. controls, †p<0.005 vs. Caucasian athletes, ‡p<0.005 vs. African athletes. Statistical analysis with post hoc Bonferroni correction (p<0.05).*

LV and RV size than Africans athletes. African athletes, however, had similar LV mass but markedly more concentric remodelled LV than the Caucasian athletes. Thus, the aim of this study was to investigate if a similar remodelling between black and white athletes is present in the RV.

Method: As a part of the mandatory heart screening, 555 male elite football players (509 Caucasians and 46 Africans) and 46 Caucasian controls were examined: RV end diastolic middle diameter (RVD2) were measured from a RV focused apical 4 chamber view. Measurements of RV free wall thickness (RVWT) in end diastole were performed by a subcostal view. Relative wall thickness on the right side (RVRWT) was calculated by dividing RVWT with RVD2 multiplied with two. Body mass index (BMI) and body surface area (BSA)were calculated, and all echo measurements were performed blinded.

Results: There were no significant differences in age, BMI, BSA or blood pressure between the groups. See table for other results.

Conclusion: We have for the first time demonstrated that RV free wallthickness in athletes exhibited the same pattern as LV wall thickness. Moreover, and similar to the LV, black athletes had a significantly more pronounced concentric remodelled RV than the white athletes.

[P864] Relationship between plasma choline and betaine levels and risk of acute myocardial infarction in patients with stable coronary heart disease

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Purpose: High plasma choline and its derivative betaine have been associated with cardiovascular disease, and circulating choline levels predict adverse events in patients with acute coronary syndrome. We studied relations of plasma choline and betaine to long-term risk of acute myocardial infarction (AMI) in patients with stable angina pectoris (SAP).

Methods: Samples were obtained from 2568 participants in the Western Norway B-Vitamin Intervention Trial (WENBIT). Hazard ratios (HR) (95% confidence interval) were calculated per quartile increment, using Cox regression analyses adjusted for age, sex, fasting status, smoking, body mass index, diabetes mellitus, left ventricular ejection fraction, estimated glomerular filtration rate, LDL-cholesterol and medication and stratified by study site.

Results: During a mean (SD) follow-up of 4.8 (1.4) years, 8.3% suffered from AMI. Plasma choline was not associated with AMI (HR 0.99 (0.87, 1.14), p=0.91) in the total population. However, the relationship of plasma choline with risk of AMI was significantly modified by smoking (p<0.001), showing increased risk in non-smokers (HR 1.24 (1.02, 1.51), p=0.033)) and decreased risk in smokers (HR 0.77 (0.62, 0.94), p=0.010). Plasma betaine was not associated with AMI (HR 0.99 (0.87, 1.13), p=0.74), and did not interact with smoking.

Conclusion: In SAP patients, high plasma choline is associated with increased risk of AMI in non-smokers, but with decreased risk in smokers. These results motivate further research into the relation between atherosclerosis, smoking and choline metabolism.

[P1758] Different LV systolic function in Norwegian elite football players with large and small left atrial volumes

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Purpose: Previously we have shown that a threefold difference in LA volume did not affect LA global systolic function by 2D strain. Since this enlargement also leads to larger LV volume and thus total volume (LTV) on the left side, we wanted to explore any potential impact on LV systolic function.

Methods: From our database of 595 male Norwegian football players, the 30 football players with respectively the largest and smallest left atrial end systolic volumes (LAESV) were defined. LV end diastolic volume (LVEDV) was measured by 2D echo and LTV was calculated as LAESV + LVEDV. The following measurements of LV systolic function were performed: Biplane LVEF by 2D, maximal systolic velocity of septal and lateral mitral valves attachments by TVI, denoted TVIs, fractional shortening (FS) by M-mode, LV global longitudinal strain (GLS) by automated function imaging. LV myocardial performance index (MPI) was measured as a combined global parameter for LV systolic and diastolic function. All volumes were indexed by body surface area (BSA).

Results: All four echo indices for LV systolic and MPI were improved in athletes with large vs. small LAESV (Table). Moreover, EF, FS, TVI, GLS and MPI, correlated significantly to LTV with r values of 0.3, 0.5, 0.4, 0.3 and -0.3 (all p<0.05), respectively. HR correlated only to FS, r = -0.3, and to MPI, r = 0.4 (both p< 0.05).

	LA_{large}	LA_{small}
LA ESV/BSA (ml/m²)	60.6±5.4*	19.4±2.9
LV EDV/BSA (ml/m²)	85.3±16.6*	60.6±7.6
LTV/BSA (ml/m²)	145±18*	80±8
EF (%)	58.0±3.9*	55.3±3.1
TVIs (cm/s)	7.4±1.2*	6.7±1.2
FS (%)	34.2±6.6*	27.7±3.9
GLS (%)	19.5±1.2*	18.4±1.7
MPI	0.36±0.06*	0.40±0.08
HR (beats/min)	49±7*	58±8

**Significantly different from LA_{small} (p<0.05).*

Conclusions: Athletes with large LA volumes have improved LV systolic function as measured by all four different LV systolic function indices and one global LV function index. These findings may indicate that the Frank Starling mechanism plays a role even in the heart of these young athletes.

[P2367] Effect of four different drug regimens on ventricular rate and quality of life in patients with permanent atrial fibrillation

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Purpose: To compare the effect of 4 different rate-reducing once daily pharmacologic treatments on the ventricular heart rate (HR) and quality of life (QoL) in patients with permanent atrial fibrillation (AF).

Methods: 60 patients (mean age 71±9 years, 42 men and 18 women) with permanent AF were studied in a randomised, investigator-blinded, cross-over design. The following treatment regimens were compared: Metoprolol 100 mg o.d., verapamil 240 mg o.d., diltiazem 360 mg o.d. and carvedilol 25 mg o.d. Each treatment was administered for 3 weeks. At baseline and on the last day of each treatment period, 24-hour HR was measured by Holter-ECG and symptoms and quality of life (QoL) were assessed with Short Form 36 (SF-36) and Symptom Checklist (SCL) questionnaires.

Results: The 24-hour mean HR were: Baseline (no treatment) 96±12 bpm, metoprolol 82±11 bpm, verapamil 81±11 bpm, diltiazem 75±10 bpm and carvedilol 84±11 bpm. All drugs reduced the HR compared to baseline (p<0.001 for all). The HR was significantly lower during treatment with diltiazem than all the other drug regimens (p<0.001 for all). Compared to baseline, treatment with diltiazem significantly reduced both symptom frequency (p<0.001) and severity (p=0.005), whereas treatment with verapamil reduced only symptom frequency (p=0.012). Women reported more frequent and more severe symptoms than men, both at baseline and during all drug regimens. None of the treatments significantly influenced general QoL compared with baseline.

Conclusion: In this study, diltiazem 360 mg o.d was the most effective drug regimen for reducing HR in patients with permanent AF. Arrhythmia-related symptoms were reduced by treatment with the calcium channel blockers diltiazem and verapamil, but not by the beta blockers. Women were generally more symptomatic than men.

[P733] Midwall left ventricular systolic function in asymptomatic aortic valve stenosis: is it prognostically important? The SEAS study

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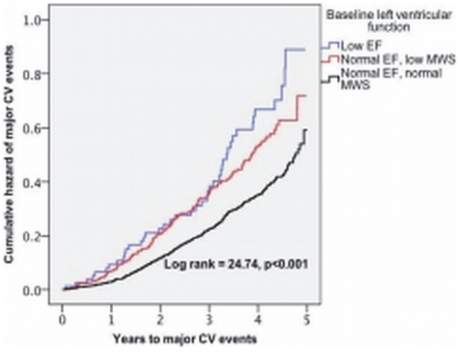
Purpose: Midwall fractional shortening (MWS) is used in hypertension for earlier identification of patients with left ventricular (LV) dysfunction and adverse cardiovascular (CV) outcome. Its performance has not been tested in patients with aortic stenosis (AS). This study aims to assess the relevance of measuring LV systolic function at midwall for CV risk assessment in asymptomatic AS.

Methods: 1720 patients with asymptomatic AS in the Simvastatin Ezetimibe in Aortic Stenosis (SEAS) study were followed-up for 4.3 years. LV systolic function was assessed by biplane ejection fraction (EF) (low if <55%) and MWS (low if <14.2%) at baseline and annual echocardiographic examinations.

Results: Patients with low EF (n=83) and patients with normal EF and low MWS (n=318) at baseline had higher rate of major CV events than patients with both normal EF and MWS (p <0.01, Figure). In Cox analyses including age, gender, study treatment, hypertension, severity of AS, and EF, low baseline MWS predicted a 43% increase in major CV events (95% CI 1.17-1.75) including 66% more CV death (95%CI 1.02-2.73), and 43% higher risk of AS-events (95% CI 1.16-1.76) (all p <0.05). Low MWS over time predicted worse CV outcome with 28% higher hazard of AS-related events (95% CI 1.04-1.57, p <0.05) independent of changes in EF over time, severity of AS, and study treatment.

Conclusions: Combined assessment of EF and



MWS improves risk stratification in asymptomatic AS by identifying patients with normal EF, low MWS and a significant increased CV risk over an average 4 to 5-year follow-up including faster progression of AS.

[P5683] Implementing a European curriculum for clinical expertise in heart failure nursing, an educational initiative from the HFA and CCNAP

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There is an increasing role for heart failure (HF) nurses with extended clinical expertise and delegated responsibilities in many European countries. Further, many nurses seek an academic accreditation for their experience, skills and knowledge.

Objectives: To describe the experiences of implementing a European curriculum for clinical expertise in HF nursing that was developed by the Heart Failure Association and the Council for Cardiovascular Nurses and Allied Professionals of the European Society of Cardiology.

Methods: Data on implementation were collected from 5 educational programmes in 4 countries: Sweden, Norway, Germany (2) and Spain. Data collection included number of attendees, modes and methods of teaching, assessment of clinical and theoretical competencies and course evaluations.

Results: Both in Norway and Sweden 25 nurses underwent the programme. In Germany, 8 courses were held including 74 nurses. In Spain, 84 nurses are currently involved in an online course. The course extent varies between 200-400 hours in total. In Norway the course is part of a post graduate specialization in cardiovascular nursing on a master degree level. In Sweden the course can be part of a master degree. The clinical learning methods were supervised consultations, practical opportunities for skill acquisition, case presentations and multidisciplinary group work. The theory based were tutorials, lectures, seminars and self-tuition. Sweden used a web-based tool for the anatomy/physiology sections. In Spain, the whole course is given online allowing the students to connect to the

platform at their convenience. This also applies to the teachers from different geographical areas in Spain thus allowing to operate on lower cost. In one of the German sites an evidence-based telephone-monitoring is taught as part of post-discharge management. Examinations consist of individual written (often multiple choice) and oral exams, group exams and case presentation. Course evaluations were consistently high, and students perceived that the syllabus sufficiently covered the HF area and was relevant for clinical practice.

Conclusions: The challenges of implementing the curriculum for HF nursing in Europe were met. Entry requirements for the nurses, the organisation of the training, requirements and role of educational supervisor and training centers as well as a regular update on the content are important areas for ongoing improvement. Further, it is important that the specialised HF nurses contribute to health care and that their new education is a career opportunity to more advanced tasks and responsibilities.

[P5599] Secretoneurin, a peptide from the chromogranin-secretogranin family, regulates cardiomyocyte calcium homeostasis

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Purpose: To assess the functional role of secretoneurin (SN), a peptide from the chromogranin-secretogranin family, that is increased in the left ventricle in heart failure (HF) with production confined to cardiomyocytes. As circulating levels of SN appear to be associated with mortality in HF, we hypothesized that SN may directly affect the pathophysiology of HF.

Methods: We explored functional aspects of SN in isolated cardiomyocytes by immunoblotting, real-time PCR, confocal microscopy, and Ca^{2+}-dependent fluorescence.

Results: We found endogenous SN to be distributed throughout the cytoplasm of cardiomyocytes and labeled SN to be taken up from the suspension to cardiomyocytes by confocal microscopy. Uptake of SN was also verified by immunoblotting, where we found intracellular SN levels to increase in proportion to SN concentration in the cell suspension. SN increased cardiomyocyte contraction by 53% versus control cells (p=0.01) and reduced time to peak by 16% (p=0.01). Ca^{2+} transient amplitude was increased by 21% (p=0.002) and the time to half decay decreased by 14% (p=0.02). The sarcoplasmic reticulum Ca^{2+} content was increased by 21% after SN stimulation (p<0.001), but we did not observe altered Ca^{2+} reuptake into the SR or extrusion from the cell. SN stimulation reduced Ca^{2+} spark magnitude by 4% (p=0.05), with a corresponding reduction in width (12%), and duration (16%) of Ca^{2+} sparks (p<0.001 for both), indicating reduced ryanodine receptor opening. Bioinformatics identified a calmodulin (CaM) binding motif for SN. Treatment of isolated cardiomyocytes with SN reduced autophosphorylation of Ca^{2+}/CaM-dependent protein kinase II (CaMKII) at T286, which may account for observed effects of SN on ryanodine receptor function. There was no effect of SN on cardiomyocyte hypertrophy as assessed by transcriptional alterations in genes involved in this process.

Conclusions: SN is robustly taken up and distributed throughout the cytoplasm of cardiomyocytes, and regulates cardiomyocyte Ca^{2+} homeostasis. This action may be mediated via CaM and downstream effects on the ryanodine receptor. The effect of SN on Ca^{2+} homeostasis could be clinically important as patients with HF and elevated SN levels seem to have a poor prognosis.

[P5066] Early strain echocardiography may exclude high-grade coronary artery stenosis in suspected non-ST-elevation acute coronary syndrome

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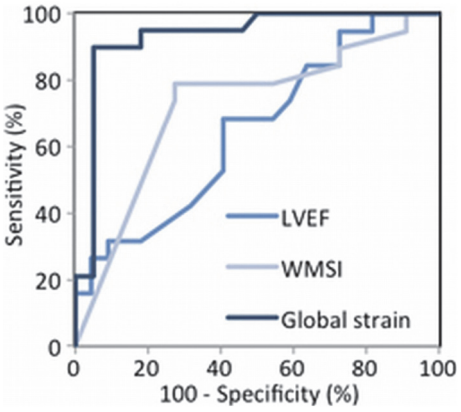
Purpose: Many patients with suspected non-ST-elevation acute coronary syndrome (NSTE-ACS) do not have significant coronary artery disease. Current diagnostic approach with repeated ECG and cardiac biomarkers requires observation for >6-12 hours. The aim of this study was to investigate whether global strain by echocardiography measured at admission may exclude high-grade (≥75%) coronary artery stenosis in patients presenting with inconclusive ECG and normal cardiac biomarkers.

Methods: Patients with suspected NSTE-ACS were consecutively enrolled. 12-lead ECG, Troponin T assay and echocardiography were performed on admission. Patients underwent coronary angiography after 27±18 hours. Conclusive ECG was >1 mm ST-segment change in any

lead and Troponin T >0.03µg/L was considered abnormal. Global peak systolic longitudinal strain (GLS) was measured using speckle tracking echocardiography in the 3 apical image planes and calculated from a 16 segment model.

Results: Out of 134 patients admitted with suspected NSTE-ACS, 41 patients presented without known coronary artery disease, inconclusive ECG and Troponin T <0.03µg/L. GLS was -18±3% in those with high-grade stenosis (n=22) and -22±2%in those without high-grade stenosis (n=19). In a receiver operatorcharacteristic curve analysis, GLS (AUC=0.93) was significantly better than both WMSI (AUC=0.72) and EF (AUC=0.65) at discriminating between no high-grade and high-grade coronary artery stenosis (p<0.01). A GLS of <-20% excluded high-grade coronary arterystenosis with 90% sensitivity and 96% specificity.

Figure 1. Reciver operator characteristic curve



Conclusions: Myocardial strain by echocardiography is an accurate and easily available tool to exclude high-grade coronary artery stenosis among patients with suspected NSTE-ACS with inconclusive ECG and normal initial cardiac biomarkers.

[P1569] Long Pentraxin 3 (PTX3), Activated Factor XII type A (XIIaA) and B-type Natriuretic Peptide (BNP) did not independently predict stroke during seven years follow-up in patients admitted with chest pain

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Background: The aim of this analysis was to assess if elevated levels of novel biomarkers for vascular inflammation (PTX 3), coagulation (XIIaA) and BNP as a marker for myocardial dysfunction, are associated with increased risk for stroke in long-term follow-up in a population of unselected patients admitted with suspected acute coronary syndrome (ACS).

Methods: Blood samples for the determination of XIIaA, PTX 3 and BNP were drawn immediately following admission in 871 patients admitted with suspected ACS.

The patients were divided into quartiles for each of the measured biomarkers. Multivariable analysis was performed using a Cox Proportional Hazard Ratio model. Variables included in the model were XIIaA or PTX 3 or BNP and 18 conventional risk factors for coronary heart disease.

Results: At admission, 385 of 870 patients presented with a TnT above 0.05 ng/mL. After 7 years follow-up, 55 patients (6.3%) had suffered from an incident of stroke. Admission levels of PTX 3 and XIIaA were not associated with increased risk for developing stroke (HR 1.33; 95% CI 0.56-3.13 and HR 0.79; 95% CI 0.33-1.92, respectively; Q4 vs Q1). In contrast, admission levels of BNP in the highest quartile were significantly associated with increased risk of stroke (HR 3.62; 95% CI 1.54-8.50).

However, following adjustment in the multivariate analysis, BNP also failed to predict stroke during 7 years follow-up (HR 1.05, 95% CI 0.41-2.65; Q4 vs Q1; p = 0.922).

Conclusion: Admission levels of the novel biomarkers PTX 3, XIIaA and BNP did not independently predict stroke during long-term follow-up of patients admitted with suspected acute coronary syndrome.

[P4973] 7-year reduction of exercise max heart rate predicts new onset diabetes

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Purpose: An elevated resting heart rate has previously been reported to predict new onset diabetes (NOD). Pre-diabetic autonomic nervous system dysfunction has been suggested to be the mediating mechanism. We tested if change

Hazard ratios

Quartiles (ΔMHR)	Q1 (-15 to -69)	Q2 (-7 to -14)	Q3 (1 to -6)	Q4 (61 to 2)
	N=340	N=335	N=361	N=351
Δ MHR (median)	-22	-10	-3	8
NOD, n (%)	40 (11.8)	28 (8.4)	31 (8.6)	25 (7.1)
Multipple adjusted	1.82 (1.07-3.17)	1.21 (0.68-2.15)	1.33 (0.78-2.32)	1.0

in maximum heart rate (ΔMHR) through seven years predicts NOD over 28 years.

Methods: Exercise MHR was measured among 1,387 healthy men at two separate examinations, in 1972 and in 1979. The men were divided into quartiles (Q1-Q4) by ΔMHR. NOD events were registered in a nationwide survey of all participants› hospital charts through 2008. Relative risk of NOD in the quartiles was calculated using Cox proportional hazard regression adjusting for baseline MHR, maternal diabetes, smoking status, systolic blood pressure, fasting triglycerides, fasting blood glucose, age, BMI, physical fitness and change in physical fitness.

Results: A total of 124 NOD events were registered. Median MHR at baseline was 165 and 160 seven years later. The incidence of NOD was the highest among the men who decreased their MHR the most (Q1) and lowest among those who increased their MHR (Q4). Q1 was associated with an 82% increased NOD-risk compared with Q4.

Conclusions: These findings indicate that a reduction of MHR of more than 15 BPM over seven years is independently associated with a significantly increased long-term risk of new onset diabetes. We suggest that a marked fall in maximum heart rate could be associated with autonomic nervous system dysfunction. This observation could be helpful when identifying individuals at high risk of developing diabetes.

[P2345] Resting and exercise heart rate as predictors of incident atrial fibrillation in healthy middle-aged men

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There is sparse evidence about the importance of heart rate (HR) as a potential long-term predictor of atrial fibrillation (AF). We aimed to study the impact of resting and exercise HR on incident AF in a cohort of initially healthy men.

In 1972-1975, 2014 healthy Norwegian men aged 40-60 years participated in a prospective cardiovascular survey that included a standardized bicycle exercise ECG- test. During up to 35 years follow-up, 270 men had documented AF by scrutiny of health files in all Norwegian hospitals. Risk estimation was analyzed with Cox proportional hazard models.

Resting HR was not a significant predictor of AF, except among men with hypertensive blood pressure (BP) measurements at baseline (n=852) where HR < 50 beats per minute (bpm) compared with HR ≥ 70 bpm showed increased AF risk (hazard ratio 2.66; 95%CI 1.10-5.96). Maximum exercise HR < 150 bpm compared to ≥ 180 bpm demonstrated increased AF risk in univariate analyses. HR at the end of 100W, after 6 minutes exercise, (HR100W) was the strongest predictor of incident AF in our cohort. HR100W < 100 bpm (n=257) compared to ≥ 100 bpm showed an unadjusted increase in AF risk of 40%, despite better physical fitness in the first group. The risk increased to 52% when adjusting for age, systolic BP, physical fitness, body mass index, left ventricular hypertrophy, first-degree AV block, relative heart volume and the difference between maximum and resting HR. Among the 43% of the participants with hypertensive BP measurements at baseline, hazard ratio for AF was 2.06 (Table).

Table 1. Relative risk of AF in hazard ratios according to HR at 100W exercise

Heart rate 100W (bpm)	Unadjusted	Multivariate adjusted	Baseline BP≥140/90
<100 (n=257)	1.40 (1.00-1.92)	1.52 (1.05-2.16)	2.06 (1.18-3.44)
≥100 (n=1740) (ref.)	1	1	1

Thus, inability to increase HR above 100 bpm after 6 minutes exercise on 100W is an independent long-term predictor of incident AF in initially healthy middle-aged men. The present results might suggest an association between increased vagal activity as reflected by a low resting HR and a limited chronotropic response to exercise in fit men, and an increased risk of future AF.

[P3057] Plasma dimethylglycine is an independent risk factor of acute myocardial infarction in patients with stable angina pectoris

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Purpose: Dimethylglycine (DMG) is produced during the remethylation of homocysteine from betaine. This reaction is catalyzed by the enzyme betaine-homocysteine methyl transferase (BHMT), the regulation of which seems to be connected to both carbohydrate and lipid metabolism. DMG is catabolized inside the mitochondrion, and mitochondrial dysfunction is associated with cardiovascular disease (CVD). The BHMT 742 G->A polymorphism predicts circulating DMG levels and has been related to the extent of coronary artery disease. We sought to investigate the association of plasma DMG levels to incident cardiac events.

Methods: In 4154 patients with suspected stable angina pectoris (SAP), we evaluated the associations between plasma DMG levels and clinical baseline characteristics and explored the predictive role of plasma DMG for subsequent acute myocardial infarction (AMI) during extended follow-up.

Results: 343 (8.3%) patients experienced an AMI during a median (5th, 95th percentile) follow-up time of 4.6 (1.6, 6.8) years. In a Cox model adjusted for age, gender and time since last meal, plasma DMG predicted future AMI [HR (95% confidence interval (CI)): 1.97 (1.43, 2.72), p<0.001 for the 4th vs. the 1st quartile]. Adjustment for established CVD risk factors (diabetes mellitus, hypertension, smoking, serum apolipoprotein B (apo B) and apolipoprotein A-I) in an intermediate multivariate model only slightly attenuated the estimate [HR (95% CI): 1.84 (1.33, 2.54), p<0.001 for the 4th vs. the 1st quartile]. In an extended model, also including serum C-reactive protein, estimated glomerular filtration rate, left ventricular ejection fraction and baseline treatment, plasma DMG was still rendered a predictor of AMI [HR (95% CI): 1.60 (1.14, 2.24), p<0.01 for the 4th vs. the 1st quartile). The predictive ability of plasma DMG was not present in smokers or in subjects with serum triglycerides (TG) > median (p for interaction = 0.003 and 0.002, respectively). Adding plasma DMG to the intermediate multivariate model led to significant increases in C-statistics in the total population, males, ex-/non-smokers, non-diabetics and subjects with either serum apo B or TG below median value.

Conclusions: Plasma DMG predicts subsequent AMI in patients with SAP and the effect seems particularly strong in several subgroups at presumably lower risk. Our findings prompt further investigation into possible mechanisms between DMG, mitochondrial function and atherosclerosis.

[P3357] Responde to Cardiac Resynchronization Therapy (CRT) in patients with moderate to severe heatfailure is associated with segmental myocardial viability on Dobutamine Stress Echocardiography (DSE)

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Background: Cardiac resynchronization therapy (CRT) in patients with heart failure and conduction abnormalities improves symptoms, mortality and morbidity in only 60-70% of patients. The aim of this study was to test to what extent echocardiographic indices of regional myocardial viability could improve prediction of response to CRT.

Methods: 76 patients eligible for CRT were included after the following criteria: 1) New York Heart Association (NYHA) class ≥III, 2) left ventricular ejection fraction (LV EF) ≤35%, 3) QRS width ≥120 ms, and 4) optimal medical treatment. All underwent dobutamine stress echocardiography (DSE) to evaluate myocardial viability.

Results: Patients had severely depressed LV function and reduced functional capacity. After 12 months there was a significant reduction in LV end-diastolic diameter (LVEDd) (76±11 mm versus 67±13 mm, p< 0.05) and volume (258±112 mL vs 208±118 mL, p< 0.05), and improvement in EF% by 7 percent points (p<0.0001).

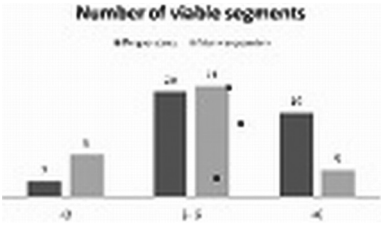

Figure 1. Number of viable segments by DSE

Multivariate regression analysis revealed that viability in ≥6 myocardial segments on DSE was a significant positive predictor for response to CRT (p=0.03) together with long interventricular motion delay (IVMD, p=0.03) and wide LVEDd (p=0.01).

Conclusions: Independent baseline predictors to response to CRT are more than >6 viable LV segments, wide LVEDd and long IVMD.

[P5152] Levosimendan improves contractility in post ischemic myocardium in patients with acutely revascularised infarction complicated by decompensated heart failure

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Background: Reduced calcium sensitivity of the myofilaments is believed to be part of the injury seen after reperfusion of ischemic myocardium. The role of the calcium sensitizer levosimendan in patients with acute ST-elevation myocardial infarction (STEMI) is unresolved.

We hypothesised that levosimendan will improve myocardial regional contractility without harmful side effects in acute PCI treated STEMI patients complicated by decompensated heart failure.

Method: Patients developing clinical signs of heart failure (including cardiogenic shock) within 48 hours after a primary PCI treated STEMI, with decreased wall-motion in ≥ 3 of 16 segments evaluated by echocardiography, were randomised to a 25 hours levosimendan infusion or matching placebo in a double blind design. Primary endpoint was change in wall-motion score index (WMSI) from baseline to day 5. Infarct size was measured by single photon emission computed tomography (gated SPECT) at 6 weeks.

Results: (mean ±SD): A total of 61 patients were included. Age (64±13 years), peak cardiac troponin T (13083±6996 ng/l), BP (104/66 mmHg) and left ventricular EF (42±9%) at inclusion, were not significantly different between groups. Infarct size at 6 weeks (42%±16) was similar in both groups. There was significantly larger improvement in WMSI from baseline to day 5 in the levosimendan group compared to placebo (from 1.94±0.20 to 1.66±0.31 vs. 2.02±0.26 to 1.83±0.26 respectively, p=0.03). There were no significant between-group-differences from baseline to day 5 in changes in NT-proBNP levels, a clinical composite score, frequency of atrial fibrillation or ventricular arrhythmia, new ischemic episodes or use of inotropy as rescue therapy. There were significantly more episodes of hypotension during study drug infusion in the levosimendan group (63% vs 36%, p=0.03), but no difference in blood pressure at the end of infusion or in use of vasopressors. One patient died in the levosimendan group and 4 patients in the placebo group during 6 months follow-up. No significant between-group-differences at 6 months in MACE (death, nonfatal myocardial infarction or revascularisation of the infarct related artery) or in rehospitalisation for heart failure, were present.

Conclusion: Levosimendan treatment improved regional contractility measured by WMSI in patients with acute PCI treated STEMI complicated by heart failure, but did not affect NT-proBNP levels or clinical symptom score. The treatment was well tolerated without any increase in atrial fibrillation or ventricular arrhythmias.

[P1663] Impaired right ventricular contractile reserve late after surgical closure of isolated ventricular septal defect

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Purpose: Reduced aerobic exercise capacity and abnormally elevated right ventricular systolic pressure during exercise have previously been demonstrated in asymptomatic adolescents after surgical closure of isolated ventricular septal defect early in life. We studied right ventricular contractile reserve during incremental exercise in this patient group.

Methods: Eleven asymptomatic patients (age 12 – 24 years, 5 females, median age at defect closure 61 months) and 22 healthy age- and gender-matched control subjects were studied by echocardiography at rest and during recumbent bicycle exercise until a target heart rate of 160 bpm.

Results: Patients had lower tricuspid annular peak systolic excursion (TAPSE) (17.3±3.9mm) at rest as compared to controls (22.3±2.9, p=0.002). Correspondingly, the maximal TAPSE during exercise was reduced in the patient group (22.9±3.8 versus 31.4±4.1, p<0.001). Peak systolic tricuspid annular velocity (S') was similar at rest in both groups (patients 8.9±2.7, controls 9.7±1.6, p=0.305), whereas the patient group had lower maximum S' during exercise (12.4±2.6 versus 15.3±2.7, p=0.009). Isovolumetric right

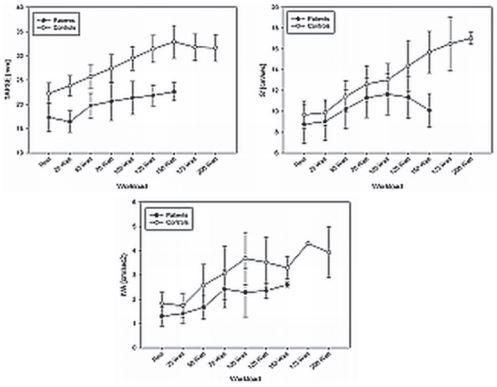

Figure 1. TAPSE, S' and IVA during exercise

ventricular acceleration (IVA), measured in the tricuspid annulus, was reduced in the patient group both at pre-exercise (median 1.3 versus 1.9cm/sec2, p=0.022, heart rate 92.6±14.1) and during the highest evaluable exercise stage (median 2.9 versus 4cm/sec2, p=0.014, heart rate 147.1±9.5).

Conclusion: Asymptomatic adolescent patients with surgically closed isolated ventricular septal defect have impaired right ventricular contractile reserve.

[P2348] Effect on plasma d-dimer levels of angiotensin receptor blockade and maintained sinus rhythm after electrical cardioversion for persistent atrial fibrillation

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Purpose: Stroke risk in atrial fibrillation (AF) is related to plasma D-dimer levels. We studied the effect of maintained sinus rhythm after electrical cardioversion (ECV) for persistent AF and the effect of the angiotensin receptor blocker candesartan on D-dimer levels.

Methods: In a double blind, placebo-controlled study (Candesartan in the Prevention of Relapsing Atrial Fibrillation, CAPRAF), 171 patients with persistent AF were randomized to receive candesartan 8 mg once daily or placebo for 3–6 weeks before and candesartan 16 mg once daily or placebo for 6 months after ECV. Plasma levels of D-dimer were measured at baseline and at the end of the study.

Results: Despite all patients being on warfarin at baseline, D-dimer levels were still correlated with age (Spearmans rho; rs 0.421; p<0.001) and CHA(2)DS(2)VASc score (rs=0.258; P<0.001). Baseline D-dimer levels were not predictive of AF recurrence after ECV, and did not change during the course of the study in patients with a recurrence of AF. In 26 patients still in sinus rhythm 6 months after ECV and still on warfarin treatment, there was no change in D-dimer levels from baseline to end of study. However, in 13 patients still in sinus rhythm 6 months after ECV who had discontinued warfarin after ECV, D-dimer levels increased significantly from baseline (median 304 ng/mL (25th, 75th quartile 183, 468)) to the end of study (456 ng/mL (300, 704); p<0.001). Treatment with candesartan did not affect plasma D-dimer levels.

Conclusions: D-dimer levels were correlated to age and CHA(2)DS(2)VASc score. Restoration and maintenance of sinus rhythm for 6 months did not reduce plasma D-dimer levels. However, discontinuation of warfarin in patients with maintained sinus rhythm was followed by a significant increase in D-dimer levels. Our findings support the notion that individual stroke risk is maintained despite successful ECV for persistent AF, suggesting that anticoagulant treatment should be continued indefinitely in high-risk patients even after successful cardioversion.

[P3668] Prognostic impact of high-sensitive troponin T assessment in chronic heart failure and interaction with statin therapy. Results from CORONA

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Background: Circulating levels of cardiac troponins are elevated in chronic heart failure (HF) and related to adverse prognosis. However, the prognostic value of elevated troponin levels in addition to CRP and BNP/NT-proBNP is still debated. We examined the prognostic value of high-sensitive troponin T (hs-cTnT) in a sub-study involving approximately 30% of

participants in the CORONA study (Controlled Rosuvastatin Multinational Trial in HF).

Methods: hs-cTnT as a risk factor for the primary endpoint (cardiovascular [CV] death,non-fatal myocardial infarction, non-fatal stroke; n=356), as well as all-cause mortality (n=366), CV mortality (n=299), death from CHF (n=92) or sudden death (n=170), total- (n=696) or CHF hospitalizations (n=285) was investigated in 1245 patients (≥ 60 years, New York Heart Association [NYHA] class II-IV, ischemic systolic HF, optimal pharmacological therapy) in the CORONA population, randomly assigned to 10 mg rosuvastatin or placebo.

Results: In multi-variable analyses, adjusting for left ventricular ejection fraction, NYHA class, age, body mass index, diabetes, sex, intermittent claudication, heart rate and ApoB/ApoA-1-ratio, hs-TnT (continuous variable, adjusted by the standard deviation of hs-TnT) was significantly associated with both the primary end-point (HR 1,95, p<0.001), and all other end-points (HR from 1.47 to 2.28). When NT-proBNP, CRP and estimated glomerular filtration rate was added to the model, hs-TnT still provided independent predictive information for all end-points (HR 1.51 for the primary end-point, p<0.001; HR 1.24 to 1.74 for other end-points). There were no interactions between hs-cTnT levels and the effect of rosuvastatin treatment on outcomes.

Conclusion: Assessment of hs-cTnT in patients with chronic ischemic CHF provides strong and independent prognostic information, beyond that of established risk factors.

[P5411] Remote monitoring in heart failure patients with implantable defibrillator: reduces healthcare utilization and improves quality of care

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Introduction: Heart failure patients with implantable defibrillators (ICD) often visit the hospital for unscheduled examinations, placing a great burden on healthcare providers. Internet-based remote interrogation systems are being proposed in order to reduce these visits, as well as to promptly detect and notify alert conditions. We hypothesized that remote monitoring could reduce emergency admissions in heart failure patients implanted with ICD endowed with diagnostic features for heart failure.

Methods: The EVOLVO trial involved 200 patients followed until 16 months visit. This multicenter, randomized trial compared remote monitoring with standard patient management, consisting of scheduled visits and patient response to audible device alerts.

Results: The rate of cardiac or device related unplanned emergency department or in-hospital visits (primary endpoint) was reduced by 36% in remote arm (75 versus 117; Incidence density: 0.59 versus 0.93 events/year; p=0.001). There was a 23% reduction in the rates of all hospital admissions (planned and unplanned) for cardiac or device-related events (4.40 versus 5.74 events/year; p<0.001). The time from an ICD alert condition to the data review was 1.4 days in the remote arm and 24.8 days in the standard arm (p<0.001). The patient's clinical status, measured by the Clinical Composite Score, was similar in the two groups, while a more favorable change in quality of life (Minnesota Living with Hearth Failure Questionnaire) was observed from the baseline to the 16-month in the remote arm (p=0.026).

Conclusions: As compared to standard follow-up with in-office visits and audible ICD alerts, remote monitoring results in increased efficiency for healthcare providers and improved quality of care for the patients. In addition remote monitoring reduced unplanned hospital admissions and in general total healthcare utilization in patients with ICD.

[5204] BNP, PTX3, and D-dimer are predictors of death, but only BNP is also a predictor of troponin-T positive cardiac events at long-term follow-up after hospitalization with acute chest pain

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Purpose: The aim of this analysis was to evaluate if elevated levels of the novel biomarkers for left ventricular dysfunction and heart failure [B-type natriuretic peptide (BNP)], vascular inflammation [the long Pentraxin 3 (PTX3)], and activated

coagulation [D-dimer], are associated with increased mortality and risk of troponin-T (TnT) positive cardiac events at extended long-term follow-up after hospitalization with acute chest pain.

Methods: 871 patients with chest pain and potential acute coronary syndrome were consecutively admitted to the emergency department, Stavanger University Hospital, Stavanger, Norway from November 2002 to September 2003. The patients were divided into quartiles for each biomarker and separate stepwise multivariable analyses were performed using the Cox Proportional Hazard Ratio (HR) model. Variables included in the model were BNP or PTX3 or D-dimer and conventional risk factors for coronary heart disease. The samples were harvested immediately following admission. EDTA plasma were analyzed for BNP and PTX3 using the Abbott AxSYM® BNP assay, and the high-sensitive ELISA method (PPMX, Tokyo, Japan), respectively. D-dimer was measured in citrated plasma by applying an immunoturbidimetric method on a coagulation analyzer with assay reagents from Biopool, Sweden.

Results: At 7 years follow-up, 332 patients had died and 203 had suffered an adverse TnT positive cardiac event (defined as TnT >0.05ng/ml and a typical myocardial infarction pattern). For the participants with biomarker concentrations in the highest quartile (Q4) as compared to those with concentrations in the lowest quartile (Q1), BNP, PTX3, and D-dimer were found to be independent mortality risk predictors [HR 2.15; 95% confidence interval (CI) 1.36-3.40; p=0.001, HR=1.62; 95% CI 1.11-2.37; p=0.013, HR=1.82; 95% CI 1.20-2.77; p=0.005, respectively]. Interestingly, only BNP was shown to predict future cardiac events [HR=1.912; 95% CI 1.104-3.312; p=0.021].

Conclusions: BNP strongly predicts the risk of death or troponin-T positive cardiac events at very long-term follow-up after hospitalization with acute chest pain. Clearly, BNP is also a strong predictor of future cardiac events, and not only a predictor of death.

[P5070] Mitral annular excursion in patients with suspected non-ST-elevation acute coronary syndrome can identify coronary occlusion and predict mortality

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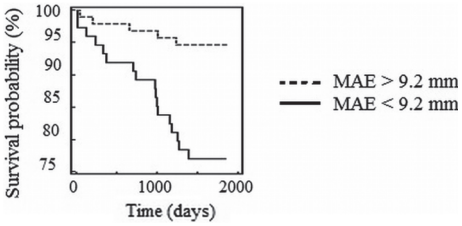
Background: Many non-ST-elevation acute coronary syndrome (NSTE-ACS) patients have coronary occlusions but do not receive acute reperfusion therapy as the occlusion is not readily identified. Identification and closer follow up of high risk patients may reduce mortality. Mitral annular excursion (MAE) reflects the global longitudinal shortening deformation of the left ventricle (LV). We therefore hypothesized that MAE may differentiate between coronary occlusion and non-occlusion in NSTE-ACS patients, and predict mortality.

Methods: 167 patients were examined in relation to NSTE-ACS at two Scandinavian centers. 47 healthy individuals were used as controls. Tissue Doppler by echocardiography was done at the mitral level of the LV in three apical planes and a mean MAE value was acquired from a newly developed software (Gripping Heart AB, Stockholm, Sweden). Mortality data was collected over a mean period of 1477 days.

Results: MAE was significantly reduced in NSTE-ACS patients as compared to healthy individuals (9.5±2.1mm vs. 13.1±2.0mm, p<0.001), and at 10.9 mm identified the NSTE-ACS diagnosis with a sensitivity and specificity of 89% and 71%, respectively, area under curve (AUC) 0.89. In the NSTE-ACS population, 56 of 167 (34%) patients had coronary occlusions. MAE could differentiate between coronary artery occlusion (8.9±2.2mm) and non-occlusion (10.0±2.0mm, p=0.003), and MAE of 9.2 mm yielded sensitivity and specificity levels of 68% and 61% respectively, AUC 0.65. During follow up, 22 patients died. Cox regression model gave a hazard ratio for MAE of 1.52 (95% CI 1.24-1.92), p<0,001.



Conclusion: MAE assessed by tissue Doppler echocardiography might be helpful in identifying NSTE-ACS patients at risk. MAE identified coronary occlusion and could predict mortality in patients with NSTE-ACS.

[P4993] Components of the interleukin-6 transsignalling system are associated with the metabolic syndrome, endothelial dysfunction and arterial stiffness

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Objective: The metabolic syndrome(MetS) is an increasing epidemiologic challenge and cardiovascular risk factor.Interleukin-6 (IL-6) is a cytokine that exerts its biological functionvia a complex orchestration of soluble and membrane bound receptors. We haveinvestigated associations between IL-6 and its soluble receptors, soluble IL-6receptor (sIL-6r) and soluble glycoprotein 130 (sGP130) and the metabolicsyndrome. Furthermore, we have investigated possible associations withendothelial dysfunction and arterial stiffness.

Methods: A total of 563 subjects were included in this study. Adulttreatment panel III criteria of the national cholesterol education program wereused for the definition of MetS. We used commercially available ELISA to analysecirculating levels of the markers. Pulse wave propagation time (PWP) wasdetermined to assess arterial stiffness.

Results: The criteria for having MetS were filled by 221 subjects. sGP130,sIL-6r and IL-6 levels were elevated in subjects with MetS ($p<0.05$ for allmarkers), and are associated with increasing components of MetS. Particularlyhypertriglyceridaemia, hypertension and fasting plasma glucose (FPG) seem tocarry this association. sGP130 ($p<0.01$), IL-6 ($p<0.05$) and partiallysIL-6r ($p<0.05$) correlated with markers of endothelial function (E-selectin,I-CAM-1, V-CAM-1) and inversely with PWP after adjustment for relevantcovariates.

Conclusion: sGP130, sIL-6r and IL-6 were significantly elevated in subjectswith MetS. In addition, sGP130, IL-6 and partially sIL-6r were associated withmarkers of endothelial function and arterial stiffness. This finding sheds newlight on the role of these inflammatory cytokines in subjects with MetS and thedevelopment and progression of clinically silent atherosclerosis.

[P4977] Low levels of IgM antibodies against phosphorylcholine are not associated with glucometabolic disturbances in patients with acute ST-elevation myocardial infarction

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Purpose: Phosphorylcholine (PC) is an important epitope on oxidized low-density lipoprotein (oxLDL), and IgM antibodies against PC (anti-PC) are present as natural antibodies in humans. Low levels of IgM anti-PC have been shown to be associated with an increased risk of myocardial infarction, indicating that PC may play an important role in the atherosclerotic process via oxLDL. OxLDL has proinflammatory properties and inflammation is important in the development of both cardiovascular diseases and diabetes.

The aim of the present study was therefore to elucidate a possible association between IgM anti-PC measured in-hospital and undiagnosed abnormal glucose regulation in patients with acute ST-elevation myocardial infarction (STEMI).

Methods: Patients (n=200, median age 58 (52, 68) years) with a primary percutaneous coronary intervention (PCI) treated STEMI without known diabetes were included. Serum levels of IgM anti-PC were measured in-hospital and a standardised 75g OGTT (venous plasma glucose measurements at 0 and 120 min) was performed at three-month follow-up. Based on the OGTT results, the patients were categorised according to the WHO criteria, and the term abnormal glucose regulation was defined as the sum of impaired fasting glucose, impaired glucose tolerance, and type 2-diabetes.

Results: A total of 50 patients were classified with abnormal glucose regulation at three-month follow-up. Median (25th, 75th percentiles) levels of IgM anti-PC in patients with abnormal vs. normal glucose regulation were 32.9 (23.7, 51.7) U/ml vs. 41.5 (24.7, 59.7) U/ml ($p=0.55$). Low levels of IgM anti-PC $\leq$ 24.6 U/ml (25th percentile) were not associated with abnormal glucose regulation (OR 1.2 (95% CI 0.6, 2.6), $p=0.57$).

No significant correlations were found between IgM anti-PC and different glucose parameters (admission glucose, HbA1c, fasting glucose and 2-h glucose).

Conclusions: Low levels of IgM anti-PC were not associated with newly detected abnormal glucose regulation in patients with acute STEMI

without previously known diabetes. The previously reported association between low levels of IgM anti-PC and myocardial infarction seems to be independent of glucometabolic disturbances.

[P4735] The importance of atrioventricular conduction and myocardial function in ventricular arrhythmogenesis in lamin A/C mutation carriers

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Purpose: Mutations in the Lamin A/C gene may cause dilated cardiomyopathy (DCM), typically accompanied by atrioventricular block (AVB) and high risk of ventricular tachycardia (VT). VT may occur before development of DCM and risk stratification is challenging. Mechanisms of arrhythmias in these patients are not fully understood.

Methods: We included 41 Lamin A/C mutation carriers. PQ interval from resting ECG and occurrence of VT were recorded. Myocardial function was assessed by echocardiography as ejection fraction (EF) and by speckle tracking strain from 16 LV segments as global longitudinal strain. Regional function in the interventricular septum was assessed by averaging strain from 4 septal segments and defined as septal strain.

Results: VT was documented in 21 patients (51%). Importantly, 13 patients without evident DCM had VT (62%). Prolonged PQ interval ($p<0.001$), presence of AVB ($p<0.001$) and reduced global longitudinal strain ($p=0.01$) were markers of VT, while EF was not ($p=0.55$). By ROC analysis, PQ interval >230 ms showed the best ability to discriminate between those with and without VT with a sensitivity and specificity of both 87%. PQ interval was an independent predictor of VT in multivariable analysis (OR=1.35, $p=0.01$). Septal strain was markedly reduced compared to the rest of LV segments (-16.7% vs. -18.7%, $p=0.001$). Prolonged PQ interval correlated with reduced septal function ($R=0.41$, $p=0.03$).

Conclusion: Prolonged PQ interval was the best predictor of VT and may help arrhythmic risk stratification in Lamin A/C mutation carriers. Myocardial function was most decreased in the septum and correlated to prolonged PQ interval. These findings indicate that reduced septal function and AVB are involved in mechanisms of ventricular arrhythmias in Lamin A/C mutation carriers.

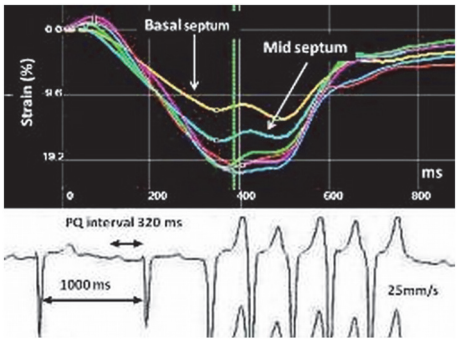

Figure 1. Reduced septal function, AVB and nsVT

[P4301] Performance of task force diagnostic criteria for identification of symptomatic patients in the nordic arrhythmogenic right ventricular cardiomyopathy registry

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Purpose: Revision of arrhythmogenic right ventricular cardiomyopathy (ARVC) Task Force diagnostic criteria in 2010 (TF2010) increased their sensitivity for detection of patients at early stages of the disease. The association between TF2010 and symptoms, however, has not been fully clarified. Our aim was to review baseline clinical and demographic characteristics of patients enrolled in the Nordic ARVC Registry and assess their relation to the early manifestations of the disease.

Methods: Patients with definite ARVC according to TF2010 enrolled in the registry at 7 sites in Denmark, Norway and Sweden were included in the analysis: n=127 (103 families), age 48±16 years, 57% male. Patients were defined as symptomatic based on the occurrence of syncope, documented ventricular tachycardia (VT) or aborted cardiac arrest (ACA) by enrolment in the registry. The performance of TF2010 and TF1994 diagnostic criteria was tested for prediction of symptoms. Minor criteria were assigned 1 point

and major criteria 2 points when calculating the total diagnostic score.

Results: 1). The study population comprised 95 probands and 32 family members, of whom 25 were identified via family screening (20%). Mean diagnostic scores were 5.8±1.8 (TF2010) and 3.6±1.7 (TF1994). Initial disease manifestations were VT (n=55, 43%), syncope (n=20, 16%) or aborted cardiac arrest (n=13, 10%) while 39 patients did not have any of those by baseline (30%). Mean age at first symptom was lower for syncope than for VT or ACA (34±16 vs 43±15 years, p=0.028) as the first symptom. 2). Neither age, gender, imaging or depolarisation criteria were predictive of symptom occurrence, however patients with documented VT or ACA were older than those without (51±15 vs 42±15, p=0.018). The presence of inverted T-waves in leads V1-V3 was associated with symptom occurrence (OR=2.90 95%CI 1.26-6.66, p=0.012). Neither the history of sudden death nor the presence of ARVC in 1st degree relative predicted symptom occurrence. TF1994 score >3 demonstrated association with symptoms (OR=2.4, 95%CI 1.06-5.23, p=0.035 for any symptom and OR=2.7 95%CI 1.29-5.51, p=0.008 for VT or ACA only) while TF2010 score did not.

Conclusion: In patients with definite ARVC enrolled in the Nordic ARVC Registry, abnormal repolarisation is associated with history of syncope, VT or ACA as the first disease manifestation while none of other diagnostic criteria showed any significant association with the symptoms. We found no relationship between TF2010 score and symptoms as baseline.

[P4223] Area strain for the assessment of regional left ventricular wall thickening using 3D Speckle Tracking

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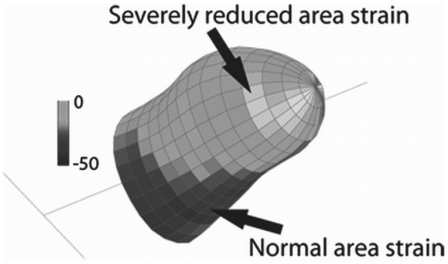
Background: 3D speckle tracking is a promising new technology. It allows reconstructing LV motion in time and space. Shortening in the longitudinal and circumferential directions can be combined in an area strain (aS) measurement which in contrast to wall thickening (radial strain) does not require endo- and epicardial border detection. We investigated the relation between aS and wall thickening by two geometrically independent measurements.

Methods: In 12 patients, 3D full volume echocardiographic clips of the LV were acquired. 3D endo- and epicardial border detection was performed to calculate wall thickening, whereas 3D speckle tracking was used to assess aS. All geometric measurements were performed frame-by-frame at 336 local sites on refined 3D meshgrids.

Results: 52'752 wall thickness - aS datapairs were retrieved. In ROC analysis, an aS>-15.3% was able to detect a systolic wall thickening <20% with a sensitivity and specificity of 83.2% and 80.2%, respectively. The area under the ROC-curve was 0.88. As expected from deformation theory, there was a nonlinear relation between wall thickening and aS (Poisson effect). The estimated Poisson's ratio (v) of myocardium was 0.39, showing that myocardium is not perfectly elastic and incompressible (v=0.50), but exhibits a volume loss during systole.



Parametric area strain imaging

Conclusions: aS derived from 3D speckle tracking reflects local wall thickening during the cardiac cycle and has the potential to detect regional contraction abnormalities. In principle, aS can be converted directly into radial strain using basic elastic deformation formulas (Poisson effect), but the compressible nature of myocardial tissue should be considered by applying a Poisson's ratio below 0.50.

[P3232] Pacing improves left ventricular filling in narrow QRS and pulmonary hypertension

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Purpose: Pacing therapy in heart failure patients with narrow QRS has gained increasing interest. The mechanism for potential cardiac improvement in this patient group remains to be explained. We hypothesised that left ventricular lateral wall pacing (LV pacing) influences septal position and thereby improves LV filling.

Methods: In 6 anaesthetised dogs we measured cardiac pressures by micromanometers and ventricular diameters and LV volume by sonomicrometry. The pulmonary artery was constricted to reduce left-to-right transeptal pressure gradient (TSG) to achieve leftward shifted septum as

seen during pulmonary hypertension. Measurements were done with the pacemaker on and off. LV end-diastolic pressure-volume curves were constructed by transient caval constriction. Improvement in LV filling was quantified as increase in LV end-diastolic volume at a given end-diastolic pressure (Figure 1).

Results: LV pacing caused a rightward shift of the LV diastolic pressure-volume relation (Figure 1). LV end-diastolic volume increased by 5.5±3.5ml (mean±SD) ($p<0.01$) at the same end-diastolic pressure (0.0±0.2mmHg (NS)). There was a concurrent shift of the septum into the right ventricle (RV) seen by an increased LV septal-to-lateral wall diameter of 3.3±3.3% ($p<0.01$) and decreased RV septal-to-lateral wall diameter of -4.5±10.1% ($p<0.05$). There was an inverse correlation between TSG and change in LV end-diastolic volume ($r=0.60$, $p<0.05$).

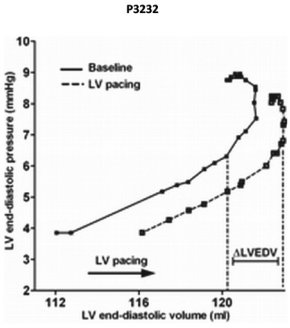

Figure 1.

Conclusion: LV pacing in narrow QRS and pulmonary hypertension improved LV filling, indicated by an increased volume at the same pressure. The increased end-diastolic volume was caused by a shift of the septum towards the RV. These findings suggest a possible haemodynamic mechanism for improvement by pacing therapy in patients with heart failure and narrow QRS.

[P2742] Wasted work fraction a novel method for assessing global and regional left ventricular function

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Background: In patients with left bundle branch block (LBBB) late activated left ventricular (LV) segments are stretched initially by contraction of early activated segments. Thereafter, early activated segments are stretched when late activated segments start to contract. The energy that is consumed to cause segmental lengthening represents a waste we therefore introduce "wasted work fraction" (WWF) to quantify this phenomenon.

Methods: We measured segmental strain by speckle tracking echocardiography in ten patients with non-ischemic cardiomyopathy and LBBB before and after cardiac resynchronization therapy (CRT) and in 20 normals. An estimated LV pressure curve was calculated using a standard waveform fitted to the relevant cardiac cycle using valvular timing. Brachial cuff pressure was used to scale systolic pressure. Regional work was calculated from strain and estimated LVP as an analogue for wall stress. Instantaneous strain rate and LVP were multiplied, to get resulting instantaneous power, which was integrated over time to give work as a function of time. Work during contraction is positive (Fig. 1, black line). Work during lengthening is negative (red line), and was considered as wasted. WWF was calculated as percent negative work of total positive work for all LV walls.

Results: In the normal population global WWF was 9±3% (mean ±SD). In patients with LBBB WWF was 36±16% and decreased significantly to 17±7% with CRT. Fig. 1 shows regional work for two segments in a patient with LBBB before and after CRT.

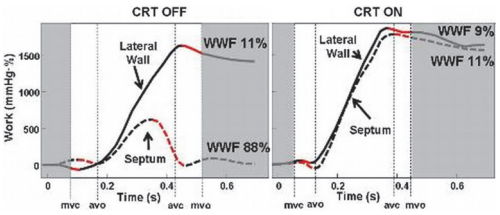

Figure 1

Conclusions: WWF can be used to assess regional "wasted work" that may contribute to global LV function if synchronized. It may serve as an important tool when evaluating the effect of CRT and optimizing device settings.

[P2628] LDL goal achievement in 576 consecutive, unselected coronary heart disease patients; status in general practice and results of a structured follow-up program in out of hospital cardiology practice

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Purpose: LDL goal achievement (LDL≤2.5 mmol/L or ≤2.0 "if feasible") is generally as low

as 1/3 in patients with high risk, including those with angiographically documented coronary heart disease (CHD), attributed to insufficient effect of drugs and side effects. We sought to assess the level of goal achievement in consecutive, unselected CHD patients remitted from primary care to a cardiology practice outside hospital and to evaluate the effect of a structured follow-up (FU) program.

Methods: All patients with CHD (ICD-10 i25.1) from 2010 were retrospectively reviewed, and all patients from 2011 were prospectively followed until LDL goals were achieved, or further trials considered futile for lack of effect, side effects or administrative reasons. As needed, statins were started, dosages increased, more potent statins prescribed and ezetimib added. In case of side effects, statins were changed.

Results: Only 1/3 of patients had LDL levels according to guidelines when remitted, after the FU program this increased to 86%. The reasons for not achieving LDL goals were insufficient drug effect in 6 patients, side effects or contraindication in 8, administrative reasons in 8 patients, and 14 were still in FU.

	Retrospective study 2010	Intervention study	
		BL	FU
N	314	262	248
LDL (mean), mmol/L	2.4mmol/L	2.5mmol/L	1.7mmol/L
Patients reached LDL ≤2.0	36%	34%	86%
Patients reached LDL ≤2.5	64%	60%	89%
% Simvastatin (mean dose)	57% (41mg)	52% (38mg)	22% (37mg)
% Atorvastatin (mean dose)	32% (51mg)	38% (54mg)	67% (53mg)
% Rosuvastatin (mean dose)	0.3% (20mg)	1% (30mg)	9% (36mg)
% Ezetimib (mean dose)	10% (10mg)	13% (10mg)	56% (10mg)

All differences (except drug dosages) between baseline 2011 (BL) and follow-up (FU) were significant at P<0.001.

Conclusions: The lack of reaching LDL goals cannot be attributed to side effects or insufficient drug effect. In unselected, consecutive patients with CHD, a simple, structured FU program, using only three different statins with the addition of ezetimib when needed, can bring as many as 86% to reach this level, underscoring the importance of the logistics in this respect.

[P2615] Activated factor XII type A independently predicts outcome during seven years follow-up in patients admitted with suspected acute coronary syndrome

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Background: The aim of this analysis was to assess the long-term prognostic value of a specific type of activated factor XIIa (activated factor XII type A (XIIaA)) in a population of unselected patients admitted with suspected acute coronary syndrome.

Methods: Blood samples were drawn immediately following admission. XIIaA was determined in citrated plasma by ELISA methodology. Multivariable analysis was performed using a Cox Proportional Hazard Ratio model. Variables included in the model were XIIaA, hs-CRP, BNP and 18 conventional risk factors for coronary heart disease.

Results: At admission, 385 of 870 patients presented with a TnT above 0.05 ng/mL. After 7 years follow-up, 203 of 870 patients (23.3%) had suffered from a new myocardial infarction (MI) and 404 patients (46.4%) had either died or suffered from an MI. Admission XIIaA in the higher quartiles as compared to the lowest was significantly associated with increased risk of MI and for the combined endpoint of death or MI (data displayed in the table).

Following adjustment in the multivariable analysis, XIIaA remained a significant predictor for the combined endpoint consisting of MI or death (HR 1.47, 95% CI 1.09-1.98; Q4 vs Q1, p=0.011), whilst no independent prognostic information remained for MI alone.

Table 1. HRs for MI and for Death or MI during 7 years follow-up in 870 patients admitted with suspected acute coronary syndrome (HR; 95% CI)

XIIaA quartile	Myocardial infarction,	Death or Myocardial infarction,
	HR (95% CI)	HR (95% CI)
Q4	1.81 (1.20-2.72)	1.91 (1.43-2.56)
Q3	1.51 (0.99-2.29)	1.61 (1.20-2.16)
Q2	1.33 (0.87-2.01)	1.31 (0.97-1.78)

Conclusion: XIIaA independently predicts long-term outcome consisting of recurrent MI or all-cause mortality within seven years follow-up in patients admitted with suspected acute coronary syndrome.

[P2518] Subclinical impaired right ventricular function is present even in patients with moderate chronic obstructive pulmonary disease

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Purpose: Although invasive hemodynamic measurements of RV function such as RV EDP and cardiac index (CI) still remain the gold standard, both represent end stage disease when reduced. The present study sought to identify sub-clinical RV systolic dysfunction, prior to hemodynamic decompansation by echocardiographic imaging in a cohort of COPD.

Methods: 98 outpatients (49 men and 49 women, age 64±7 years) with stable COPD of different severity (GOLD II, III and IV) were included and compared to 34 (15 men and 19 women, age 63±7 years) healthy subjects. RV myocardial performance index (RV MPI) was estimated by pulsed tissue Doppler imaging (TDI) at the lateral tricuspid annulus. Myocardial acceleration during isovolumic contraction (RV IVA) and strain were obtained by color-coded TDI at the RV free wall basal segment. Right heart catheterization was performed, and CI determined. Patients were categorized as pulmonary hypertension (PH) if mPAP ≥ 25 and no PH if mPAP < 25 mmHg.

Results: RV MPI and both indices of RV systolic function were impaired in the patients with no PH as compared to the controls (Table). When a cut off value of ≥0.48 (3SD>mean for the control group) for RV MPI was applied, impaired RV function was identified in all patients with PH and in 36/72 (50%) patients with no PH. RV MPI, r = 0.5 (p<0.01), RV IVA, r = -0.5 (p <0.01) and εSYS, r = 0.5 (p<0.01) correlated with mPAP.

Table 1

Variables (unit)	Controls (n=34)	COPD n=98	p-value	
		No PH (n=72)	PH (n=26)	(Anova)
RV MPI (no unit)	0.33±0.05	0.50±0.12*	0.67±0.15*†	<0.01
RV basal strain (%)	-31±4	-22±4*	-18±3*†	<0.01
RV IVA (m/s²)	3.1±0.7	2.0±0.4*	1.6±0.5*	<0.01
mPAP (mmHg)§	NA	18±3	29±4†	<0.01
CI (ml/min/m²)§	NA	2.9±0.4	3.2±0.6†	<0.01
RV EDP (mmHg)	NA	7±4	11±4†	<0.01

*Values are mean ± SD. *Significantly different (p<0.01) from controls. †Significantly different (p<0.01) from no PH. NA Not available by invasive measurement.*

Conclusion: The present study has demonstrated impaired subclinical RV global and systolic function even in GOLD II in this cohort of COPD patients compared to controls. RVMPI seems to be the best echo index to identify reduced RV function in these patients.

[P2517] No impact of obstructive severity indices by spirometry on right ventricular function and pulmonary circulation in chronic pulmonary obstructive disease

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Purpose: The severity of COPD is classified by pulmonary obstructive indices such as FEV1 and FEV1/FVC. The present study aimed to investigate the impact of these parameters on RV function by echocardiography and invasive hemodynamic parameters by right heart catheterisation (RHC).

Methods: Ninety-eight outpatients (49 men and 49 women, age 64±7 years) with stable COPD of different severity (GOLD II, III and IV) were included and compared to a control group of 34 (15 men and 19 women, age 63±7 years) healthy subjects. RV myocardial performance index (RV MPI) was estimated by pulsed tissue Doppler imaging (TDI) at the lateral tricuspid annulus. Systolic strain, εSYS, was obtained by color-coded tissue Doppler at the RV free wall basal segment. RHC was performed the same day, and mean pulmonary artery pressure (mPAP) was measured at end- expiration, and pulmonary vascular resistance (PVR) was calculated.

Results: See table. No significant correlations were found between the pulmonary obstructive indices and RV MPI or εSYS when adjusted for PaO2. PaO2, however, correlated with TVI basal strain (r = -0.4, p<0.01) and RV MPI (r = -0.4, p< 0.01). Similarly, there were no associations between the pulmonary obstructive indices and the invasive measured mPAP and PVR when adjusted for PaO2. PaO2, however, correlated strongly with mPAP (r = -0.6, p<0.01) and PVR (r = -0.5, p<0.01)

Conclusions: The impact of COPD severity indices on RV function and right-sided hemodynamics as mPAP and PVR seems to be of little importance in COPD. PaO2 appears to have a

Table 1

	Controls	GOLD II	GOLD III	GOLD IV	p- value
	n = 34	n = 38	n = 30	n = 30	ANOVA
FEV_1 % predicted	NA	58±9*	40±6*†	25±7*†‡	<0.01
FEV_1/FVC	0.80±0.04	0.55±0.07*	0.46±0.10*†	0.39±0.10*†‡	<0.01
PaO2 (kPa)§	NA	10.2±1.0	9.8±1.2	7.8±1.4†‡	<0.01
RV MPI (no unit)	0.33±0.05	0.45±0.10*	0.56±0.14*†	0.63±0.15*†	<0.01
RV Basal strain (%)	–30.5±3.7	–22.2±4.2*	–20.8±2.9*	–18.9±3.3*†	<0.01
mPAP (mmHg)	NA	18±4	20±6	25±6†‡	<0.01
PVR (Wu)	NA	1.8±0.7	2.0±0.8	3.3±1.4†‡	<0.01

*Values are mean±SD. NA; not available. *†‡Significantly different from controls, GOLD II, GOLD III, respectively. §SpO2 controls = 96.7±0.8%.*

greater impact on RV function and pulmonary circulation in these patients.

[P4129] Risk factors for sudden cardiac death: Results from the Nordic arrhythmogenic right ventricular cardiomyopathy registry

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Purpose: Risk factors for sudden cardiac death (SCD) in arrhythmogenic right ventricular cardiomyopathy (ARVC) are not clear. We aimed to study this in a registry study of ARVC patients.

Methods: The study was based on a newly started Nordic ARVC registry including patients from centers in Denmark, Sweden and Norway. It was performed as a retrospective cross sectional case control study. The outcome was defined as a composite of SCD, aborted SCD, electrical storms or appropriate implantable cardioverter-defibrillator (ICD) shocks. The inclusion criterion was a diagnosis of definite ARVC according to the 2010 task force criteria (TF2010).

The following factors were studied for their association with the outcome: age, gender, history (Hx) of syncope, Hx of atrial fibrillation, inverted T waves in ECG leads V1 to V3, epsilon wave in the ECG, right bundle branch block, presence of a pathogenic mutation, family Hx of sudden death, inducibility during electrophysiological study, > 500 ventricular premature complex/24H during Holter monitoring, positive ventricular late potential on (TF2010), Hx of ventricular tachycardia (VT), being an competitive athlete, right ventricular dilation (TF2010), left ventricular ejection fraction < 50%. All factors were primarily analyzed univariately using logistic regression, if they reached a univariate P-value < 0.05 they were secondarily studied in a multivariable logistic regression model.

Results: The population was comprised of 129 patients of which 57% were male and 71% probands. The median age was 49 (IQR 38-59) years and 73% had an ICD implanted. Median retrospective follow up was 7 (IQR 4-12) years and during follow up there were 2 patients suffering SCD, 12 suffering aborted SCD, 6 patients suffering an electric storm and 25 patients experiencing appropriate ICD shocks.

Of the tested factors, epsilon waves on the ECG and HX of VT were found to be univariately associated to the outcome. The other factors were not significantly associated. The odds ratios (OR) from the multivariable model were 3.4 (95%CI 1.2-9.7) for epsilon waves on the ECG and 8.4 (95%CI 1.8-38.6) for HX VT. They differed only insignificantly from the ones found univariately.

Conclusions: In this registry study of risk factors for sudden cardiac death in ARVC we found that a presence of an epsilon wave on the ECG and a history of ventricular tachycardia were associated with the composite outcome of sudden cardiac death, aborted sudden cardiac death, electrical storms and appropriate ICD shocks.

[P5787] Soluble ST2 reflects hemodynamic stress in heart failure

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Purpose: Soluble ST2 (sST2) is a promising biomarker in heart failure (HF), and its signalling pathway represents a potential target for drug therapy. Elevated levels of sST2 are associated with worsening HF and increased mortality. In

experimental studies, ST2 expression is induced by myocardial stress and pro-inflammatory stimuli. The determinants of sST2 levels in vivo, however, have not been well described. We aimed to assess the association between sST2-levels and prespecified hemodynamic parameters reflecting right and left ventricular pre- and afterload, as well as clinical characteristics and laboratory values.

Methods: Patients with non-ischemic, non-valvular dilated cardiomyopathy (DCM) were included in an ongoing, prospective cohort study. Baseline work up included echocardiography, right sided heart catheterization, determination of viral persistence by polymerase chain reaction on endomyocardial biopsies, blood sampling, and genetic screening for hereditary causes of DCM. Baseline sST2 was measured by a highly sensitive immunoassay. Skewed parameters, including sST2, were logarithmically transformed prior to statistical analyses. Determinants of sST2 were assessed by linear regression analyses.

Results: 92 patients aged 51±14 years were included. Baseline left ventricular ejection fraction (LVEF) by echocardiography was 27±10%. Median duration of symptoms was 209 (105-436) days and pharmacological treatment duration 81 (18-158) days. In 10 patients (11%) a probably disease-causing mutation was detected. In 16/89 patients (18%), viral RNA/DNA was detected in the endomyocardium. Soluble ST2 was significantly associated with low systolic blood pressure, elevated heart rate at rest, low LVEF, elevated right atrial pressure (RAP), elevated pulmonary capillary wedge pressure, decreased cardiac output (CO), male gender, shorter time on pharmacological treatment, and with NTproBNP and CRP. After adjusting for LVEF and CO, levels of sST2 were higher in patients with severe symptoms (NYHA III-IV) and in patients with a monogenetic cause (p =0.05), but not in patients with viral persistence. On multiple regression analysis, only HR and RAP remained independent predictors of sST2.

Conclusion: Soluble ST2 levels are higher in patients with HF and elevated right and left ventricular filling pressures and severe symptoms; even after adjusting for LVEF and CO. Hemodynamic parameters, unlike CRP and NT-proBNP, are independently associated with sST2. Our results imply that in dilated cardiomyopathy, sST2 reflects hemodynamic decompensation.

[P5542] Permanent cardiac pacing in children - choosing the optimal pacing-site: a multicentre study

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Purpose: We evaluated the effects of pacing-site on left ventricular (LV) synchrony and function in children requiring permanent pacing.

Methods: 178 children (age <18 years) from 21 centers with complete AV block and a structurally normal heart undergoing permanent pacing were cross-sectionally studied. Median age at evaluation was 11.2 (inter-quartile range (IQR) 6.3-15.0) years. Median pacing duration was 5.4 (IQR 3.1–8.8) years. Data were analyzed in a core lab. Pacing-sites were the free wall of the right ventricular (RV) outflow tract (RVOT, N=8), lateral RV (RVLat, N=44), RV apex (RVA, N=61), RV septum (RVS, N=29), LV apex (LVA, N=12), LV mid-lateral wall (LVLat, N=17) and LV base (LVB, N=7).

Results: LV synchrony, pump function (ejection fraction (EF), end-systolic volume index and change in shortening fraction as compared to pre-implantation values) and contraction efficiency were significantly affected by pacing-site and were superior in children paced at LVA/LVLat. LV dyssynchrony assessed by radial strain correlated inversely with LV EF (R=0.80, P=0.031). Pacing from RVOT/RVLat predicted decreased LV function (LV EF <45%; OR 5.19 CI 1.74-15.50, P=0.003) whereas LVA/LVLat pacing was associated with preserved LV function (LV EF >55%; OR 6.97, CI 2.21-22.00, P<0.001). Age at implantation, pre-implantation LV size and function, duration of pacing, DDD mode, QRS duration and presence of maternal auto-antibodies had no significant impact in a multivariable analysis.

Conclusions: LV mechanical synchrony, pump function and contraction efficiency may significantly deteriorate with RVOT/RVLat pacing and are best preserved with LVA/LVLat pacing.

[1187] Myocardial infarction with normal coronary arteries is common and associated with normal findings on CMR - results from the Stockholm Myocardial Infarction with Normal Coronaries (SMINC) Study

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Objectives: Myocardial infarction with angiographically normal coronary arteries (MINCA) is an important subgroup of myocardial infarction where the prevalence, underlying pathophysiology, prognosis and optimal management are still largely unknown. Cardiac Magnetic Resonance Imaging (CMR) has the potential to clarify the underlying pathology in these patients. Our objective was to investigate the diagnostic value of CMR in this group of patients.

Design: The Stockholm Myocardial Infarction with Normal Coronaries (SMINC) study is a prospective multicenter observational study.

Setting: Coronary Care Units in the Stockholm Metropolitan Area.

Subjects: MINCA patients between 35-70 years of age were consecutively included in the screening phase of the SMINC study. All patients had a typical clinical presentation, fulfilling the universal definition of myocardial infarction according to ESC/ACC/AHA and had a normal coronary angiography. Patients with known structural or coronary heart disease or other known causes of elevated troponins were excluded.

Results: All together, 176 MINCA patients were screened 2007-2011. Of them 152 were investigated with CMR. During the time period 277 patients were eligible for the study representing 6.3% of all patients with a diagnosis of myocardial infarction undergoing coronary angiography. The investigation was performed median 12 (IQR 6-28) and mean 20 days after the initial presentation to hospital. Sixty-seven percent of the examinations were completely normal whereas 19% of the patients had signs of myocardial necrosis. Only 7% had signs of myocarditis. The remaining patients (7%) had either unrecognized hypertrophic cardiomyopathy or could not be classified. The frequency of Takotsubo stress cardiomyopathy was 22% of all patients screened with CMR.

Conclusion: In this consecutive series of MINCA patients CMR could help to differentiate between myocarditis, myocardial necrosis and normal myocardium. The incidence of MINCA was higher than previously shown. Based on the results and assumptions, we propose that the incidence of MINCA is 7-8%.We also found a lower prevalence of myocarditis than in previous studies. After excluding myocarditis, MINCA consists of a larger group of patients with a normal CMR and a smaller group with myocardial necrosis. The etiologies of these different CMR findings need to be explored.

[3783] The effect of visit-to-visit variability in blood pressure on stroke and coronary events in the TNT, IDEAL and CARDS trials

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Purpose: It has been proposed that visit-to-visit variability in systolic blood pressure (SBP) predicts CV risk independently of mean SBP. This study assessed the association between visit-to-visit variability in BP and the risk of CV events (CVE) among high-risk patients in the TNT, IDEAL and CARDS trials, and investigated whether BP and BP variability contributed to differences in clinical benefits observed with different statin treatment regimens.

Methods: Mean values of BP parameters from 20,952 patients in TNT, IDEAL and CARDS were calculated and analyzed to determine the risk of CVE in relation to visit-to-visit variability in BP and evaluate any impact of these BP parameters on the treatment effect in these trials.

Results: Visit-to-visit variability in SBP and diastolic blood pressure (DBP) were significant risk factors for stroke and coronary events after adjusting for treatment (Table) and/or other BP parameters (data not shown). The treatment effect (atorvastatin 80 mg [ATV 80] vs ATV 10 in TNT; ATV 80 vs simvastatin 20-40 mg in

Effect of visit-to-visit BP variability						
Model	SBP	DBP				
	HR* (95% CI)	χ^2	P	HR* (95% CI)	χ^2	P
Stroke (N=20,952)						
SD BP	1.345 (1.26-1.43)	81.5	<0.0001	1.23 (1.145-1.32)	31.8	<0.0001
CV BP	1.33 (1.24-1.42)	68.8	<0.0001	1.25 (1.17-1.34)	40.8	<0.0001
VIM BP	1.31 (1.225-1.40)	61.1	<0.0001	1.23 (1.15-1.32)	32.4	<0.0001
ASV BP	1.36 (1.28-1.45)	97.7	<0.0001	1.26 (1.18-1.36)	43.8	<0.0001
Coronary Events (N=20,952)						
SD BP	1.16 (1.12-1.21)	63.7	<0.0001	1.19 (1.14-1.23)	78.7	<0.0001
CV BP	1.195 (1.15-1.24)	86.8	<0.0001	1.23 (1.18-1.27)	121.5	<0.0001
VIM BP	1.205 (1.16-1.25)	95.9	<0.0001	1.19 (1.14-1.23)	78.3	<0.0001
ASV BP	1.17 (1.13-1.21)	70.6	<0.0001	1.20 (1.15-1.24)	90.2	<0.0001

**HR for 1 SD increase of variability in BP; SD = Standard deviation; CV = Coefficient of variation; VIM = variability independent of mean; ASV = average successive variability.*

IDEAL; ATV 10 vs placebo in CARDS) for reducing risk of stroke (HR 0.81, 95% CI 0.69-0.945) and coronary events (HR 0.81, 95% CI 0.74-0.88) was not affected by adjustment for SBP or DBP variability or other BP parameters.

Conclusions: Higher visit-to-visit variability in BP is associated with significantly increased CV risk. The clinical benefit seen with intensive atorvastatin therapy in TNT and IDEAL, or atorvastatin therapy vs placebo in CARDS, in reducing CVE in high-risk patients is not mediated through reduction in BP or BP variability.

[P3921] Visual assessment of apical rocking predicts response and long-term survival following cardiac resynchronization therapy

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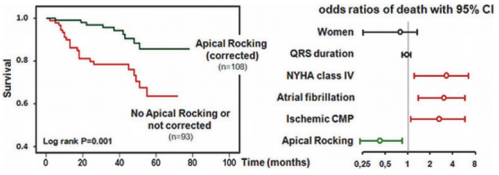
Background: Motion of the left ventricular (LV) apical myocardium perpendicular to the LV long axis (apical rocking), is an often observed phenomenon in asynchronously contracting ventricles. In this study, we tested if visual assessment of apical rocking can predict reverse remodeling and survival in cardiac resynchronization therapy (CRT) candidates.

Methods: A total of 201 patients eligible for CRT (63±11 years, ejection fraction 26±6%) underwent standard echocardiographic examination before and 12±2 months after device implantation. Three blinded physicians were asked to predict response to CRT (yes/no) by visually assessing the presence of apical rocking and extend and localization of infarct scar. Response was defined as LV end-systolic volume decrease ≥15%. Patients were followed for an average period of 37±19 months for the occurrence of cardiac death.

Results: Visually assessed apical rocking predicted reverse remodeling with a sensitivity, specificity and accuracy of 89, 83 and 86%, respectively. Physicians' prediction of CRT response integrating apical rocking and scar burden resulted in a sensitivity, specificity and accuracy of 95, 85, and 90%, respectively. When corrected by CRT, visually detected apical rocking was the only parameter associated with favorable outcome, whereas worse functional class, a high scar burden (≥6 segments) and atrial fibrillation were associated with poorer survival (Figure). Baseline LV ejection fraction and QRS duration did not predict outcome.



Conclusions: Simple visual assessment of apical rocking is a robust predictor of response and long-term survival after CRT. In patients with heart failure of ischemic origin, visual assessment of scar burden further enhances predictive power of visible LV dyssynchrony.

[P4211] Impact of acute normobaric hypoxia on regional and global myocardial function: a speckle tracking echocardiography study

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Objective: Aim of this study was to evaluate the influence of hypoxia on myocardial function.

Methods: Fourteen subjects underwent two-dimensional speckle tracking echocardiography (2D-STE) examination during normoxia and in a normobaric hypoxia chamber. Examinations were performed at rest and during bicycle exercise test. The following parameters were quantified in both atria and ventricles: Strain (S), systolic strain rate (SRS), early (SRE) and late (SRA) diastolic strain rate. In addition, left ventricular (LV) overall twist, systolic twist- and diastolic untwist rate were quantified.

Results: During hypoxia SRS and SRE increased significantly in both ventricles compared to baseline. The increase of LV SRS and SRE during normoxic exercise was significantly higher when compared with exercise under hypoxia (for SRS -0.55±0.22 vs. -0.34±0.24 1/s, p = 0.024; for SRE 0.56±0.29 vs. 0.23±0.29 1/s, p = 0.005). For the right ventricle (RV) no significant difference of exercise induced increase of systolic contractility was found (SRS -1.07±0.53 under normoxia vs. -1.28±0.24 1/s under hypoxic conditions, p = 0.47). LV overall twist, systolic twist- and diastolic untwist rate were enhanced during hypoxia. A shift from passive conduit (SRE) to active contraction (SRA) phase during hypoxia was noted for the right atrium (RA) (SRE/SRA 0.72±0.13 under hypoxia vs. 1.17±0.17 under normoxia). SRE/SRA of RA correlated to systolic pulmonary pressure (r = -0.78, p < 0.001) (Figure 1).

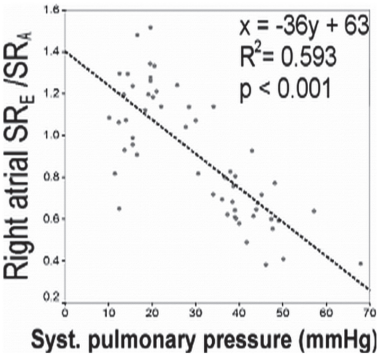

Figure 1

Conclusions: Exposure to normobaric hypoxia leads to an increase of LV overall twist and regional myocardial deformation in both ventricles. The contractile reserve during hypoxic exercise is reduced in LV. In addition, hypoxia had an impact on the ratio of passive conduit to active contraction phase in right atrium.

[P2367] Effect of four different drug regimens on ventricular rate and quality of life in patients with permanent atrial fibrillation

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Purpose: To compare the effect of 4 different rate-reducing once daily pharmacologic treatments on the ventricular heart rate (HR) and quality of life (QoL) in patients with permanent atrial fibrillation (AF).

Methods: 60 patients (mean age 71±9 years, 42 men and 18 women) with permanent AF were studied in a randomised, investigator-blinded, cross-over design. The following treatment regimens were compared: Metoprolol 100 mg o.d., verapamil 240 mg o.d., diltiazem 360 mg o.d. and carvedilol 25 mg o.d. Each treatment was administered for 3 weeks. At baseline and on the last day of each treatment period, 24-hour HR was measured by Holter-ECG and symptoms and quality of life (QoL) were assessed with Short Form 36 (SF-36) and Symptom Checklist (SCL) questionnaires.

Results: The 24-hour mean HR were: Baseline (no treatment) 96±12 bpm, metoprolol 82±11 bpm, verapamil 81±11 bpm, diltiazem 75±10 bpm and carvedilol 84±11 bpm. All drugs reduced the HR compared to baseline (p<0.001 for all). The HR was significantly lower during treatment with diltiazem than all the other drug regimens (p<0.001 for all). Compared to baseline, treatment with diltiazem significantly reduced both symptom frequency (p<0.001) and severity (p=0.005), whereas treatment with verapamil reduced only symptom frequency (p=0.012). Women reported more frequent and more severe symptoms than men, both at baseline and during all drug regimens. None of the treatments significantly influenced general QoL compared with baseline.

Conclusion: In this study, diltiazem 360 mg o.d was the most effective drug regimen for reducing HR in patients with permanent AF. Arrhythmia-related symptoms were reduced by treatment with the calcium channel blockers diltiazem and verapamil, but not by the beta blockers. Women were generally more symptomatic than men.

[5228] Fatter - but fitter? Leisure time physical activity and estimated peak oxygen uptake in a Norwegian population 1984-2008. The Nord-Trondelag Health study (HUNT 1-3)

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Purpose: As all western countries experience an increase in the prevalence of overweight and obesity, one could expect a decrease in leisure-time physical activity (LTPA) level. The aim of this study was to describe changes in LTPA in a general Norwegian population from 1984-86 to 2007-08, and to analyze these changes in relation to changes in body mass index (BMI), resting heart rate, blood pressure and estimated peak oxygen uptake (VO2peak) in the same time period. We hypothesized that the population had become fatter, but to exercise more, and hence become fitter during this time period.

Methods: We used data from the Nord-Trondelag health study (HUNT, part 1-3), with data on self-reported LTPA amount and intensity from 61 547 subjects in HUNT1 (1984-1986) and from 42 753 subjects in HUNT3 (2007-2008). We compared LTPA in subgroups of participants, according to gender, age, and BMI, and considered LTPA-data in light of population changes in BMI, blood pressure and resting heart rate. VO2peak was estimated based on direct measurement in 4631 subjects in HUNT3, using gender, age, resting heart rate, BMI and physical activity as predictors.

Results: The main changes in physical activity from 1984-1986 to 2006-2008 include a decline in the proportion of the population reporting < once weekly LTPA (from 41.0% in HUNT1 to 21.8% in HUNT3), and an increase in the proportion reporting ≥ twice weekly LTPA (from 35.0% in HUNT1 to 56.7% in HUNT3). In this time period, BMI (in kg/m^2) increased from 25.2 (SD 3.9) to 27.1 (SD 4.4). Resting heart rate (in beats/min) decreased from 74.7 (SD 12.5) to 70.4 (SD 11.7), and systolic and diastolic blood pressure (in mmHg) decreased from 138.5 (SD 23.5) to 130.8 (SD 18.5) and from 84.6 (SD 11.6) to 73.5 (SD 11.2), respectively. We saw similar increases in frequency, duration and intensity of LTPA across genders, age groups and BMI subgroups from HUNT1 to HUNT3. Estimated VO2peak (in mL/min/kg) decreased significantly from 43.4 (SD 7.8) to 40.9 (SD 6.5) for men and from 34.0 (SD6.5) to 32.6 (SD 7.4) in women.

Conclusion: Although self-reported LTPA increased in a Norwegian population from 1984-1986 to 2007-2008, BMI increased, and fitness decreased in the same timeperiod. We think these changes are due to increased sedentary time.

[5255] Non-invasive regional work reflects myocardial metabolic demand in patients with left bundle branch block

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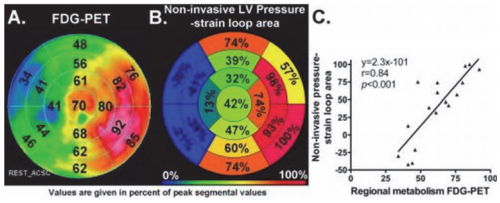
Background: Left bundle branch block (LBBB) causes heterogeneous left ventricular (LV) work distribution. The aim of cardiac resynchronization therapy (CRT) is to synchronize LV contraction to improved pump function and reverse remodeling. Therefore, assessing regional work is of great interest in this patient group. In the present study we calculate regional work by a previously validated noninvasive method using strain by speckle tracking echocardiography (STE) and non-invasively estimated LV pressure (LVP) and assess its ability to reflect regional metabolism by FDG-PET.

Methods and Results: Six patients with LBBB (QRS 165±16 ms, mean±SD) and no coronary disease were studied. Segmental strain was measured by STE, and estimated LV pressure curve was calculated using a standard waveform fitted to the relevant cardiac cycle using valvular timing by ultrasound. Brachial cuff pressure was used to scale systolic pressure. Work was calculated as area of the pressure-strain loops. PET acquisition was started 60-80 min after intravenous administration of FDG, with 8 gates per RR interval. The correlation between segmental values of the loop area and FDG uptake for all patients was r=0.81 with an individual range of 0.70-0.87. The figure shows bulls eye plots for regional glucose uptake (A) and non-invasive pressure-strain loops (B) and the respective correlation (C) in one of the patients.



Conclusions: There was a strong correlation between regional glucose uptake and regional work. These findings indicate that non-invasively estimated LV pressure-strain loops reflect regional metabolism in patients with LBBB.

[2212] The effect of visit-to-visit variability in blood pressure on stroke and coronary events in 5213 patients with diabetes: pooled analyses of TNT, IDEAL, and CARDS trials

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Purpose: It has been suggested that visit-to-visit variability in systolic blood pressure (SBP) predicts cardiovascular (CV) risk independently of mean SBP in patients with hypertension and other CV risk factors. The aim of this analysis was to determine the association between visit-to-visit variability in BP and the risk of CV events in patients with diabetes and whether these parameters contributed to the differences in clinical benefit observed with different statin treatment regimens.

Methods: Mean values of BP parameters from the 5213 patients with diabetes in the TNT, IDEAL, and CARDS trials were calculated and analyzed to determine the risk of CV events in relation to visit-to-visit variability in BP and evaluate any impact of these BP parameters on the treatment effect.

Results: Visit-to-visit variability in SBP and diastolic BP (DBP) were significant risk factors for stroke and coronary events after adjusting for treatment (Table) and/or other BP parameters (data not presented). The treatment effect (atorvastatin 80mg [ATV 80] vs ATV 10 in TNT; ATV 80 vs simvastatin 20-40mg in IDEAL; ATV 10 vs placebo in CARDS) for reducing risk of stroke (HR 0.67, 95% CI 0.50–0.90) and coronary events (HR 0.83, 95% CI 0.70–0.98) was not affected by adjustment for SBP or DBP variability or other BP parameters.

Conclusion: Higher visit-to-visit variability in SBP or DBP is associated with significantly increased CV risk. The clinical benefit seen with ATV 80 in TNT and IDEAL or ATV 10 in CARDS in reducing the risk of CV events is not mediated through reduction in BP or BP variability.

Table 1. Effect of visit-to-visit BP variability

Model	SBP	DBP				
	HR* (95% CI)	χ^2	P	HR* (95% CI)	χ^2	P
Stroke (N=5213)						
SD	1.235 (1.096, 1.391)	11.991	0.0005	1.123 (0.984, 1.281)	2.966	0.0850
CV	1.243 (1.099, 1.405)	12.035	0.0005	1.161 (1.022, 1.318)	5.273	0.0217
VIM	1.243 (1.098, 1.407)	11.810	0.0006	1.124 (0.986, 1.282)	3.053	0.0806
ASV	1.250 (1.116, 1.399)	14.963	0.0001	1.203 (1.066, 1.358)	8.923	0.0028
Coronary Events (N=5213)						
SD	1.185 (1.102, 1.274)	20.967	<0.0001	1.207 (1.120, 1.301)	24.196	<0.0001
CV	1.213 (1.126, 1.306)	26.173	<0.0001	1.234 (1.149, 1.325)	33.153	<0.0001
VIM	1.224 (1.136, 1.318)	28.297	<0.0001	1.206 (1.120, 1.299)	24.317	<0.0001
ASV	1.181 (1.101, 1.267)	21.782	<0.0001	1.248 (1.164, 1.337)	39.235	<0.0001

**HR for 1 SD increase of variability in BP; SD = Standard deviation; CV = Coefficient of variation; VIM = variability independent of mean; ASV = average successive variability.*

[P4220] Impaired LV systolic function in asymptomatic lean individuals with obstructive sleep apnoea evidenced by speckle-tracking echocardiography

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Aims: Obstructive sleep apnoea syndrome (OSA) predisposes to heart failure, but may be related to co-morbid obesity. We aimed to clarify the impact of OSA on LV function independent of obesity.

Methods: 40 patients with OSA (AHI, apnea-hypopnea-index ≥10) but free of cardiovascular disease were categorized into lean (body-mass-index, BMI <30; "OSA-lean", n=18) or obese (BMI ≥30; "OSA-ob", n=22) and compared with 41 healthy controls. Comprehensive echocardiographic analysis included global LV longitudinal strain (LVLS), and myocardial velocities by tissue Doppler imaging.

Results: See table. OSA-lean and OSA-ob displayed mild overweight and moderate obesity, respectively. Blood pressure and LV mass index were higher in OSA-lean than controls, and further increased in OSA-ob. LVEF was slightly but significantly lower in both OSA groups, while only OSA-ob showed reduced diastolic function. LVLS was lower both in OSA-lean and OSA-ob than controls. Importantly,

LVLS was strongly and inversely correlated with AHI (R=-0.6; P<0.00001), even after adjusting for BMI.

Left ventricular mechanics in OSA			
Parameter	Controls	OSA lean	OSA obese
	N=41	N=18	N=22
AHI, apnea-hypopnea-index	1.1±0.2	22.6±4.0**	28.4±4.0††
BMI, body mass index (kg/m²)	24.7±0.4	26.7±0.3**	33.7±0.8††##
MAP, mean arterial blood pressure (mmHg)	94±2	100±2	104±3††
LV mass index (g/m²)	76.6±2.1	84.3±3.4*	89.1±3.4††
LV ejection fraction (%)	61.3±0.8	58.4±0.8*	58.9±0.9†
LVEDD, LV end-diastolic dimension (mm)	51.7±0.6	51.6±0.9	53.6±0.6†
RWT, relative wall thickness	0.31±0.01	0.33±0.01*	0.37±0.01††#
Left atrial diameter (mm)	32±0.5	32±0.7	37±0.7††##
Transmitral E/A ratio	1.9±0.1	1.6±0.1	1.4±0.1†#
E/é ratio	7.7±0.3	8.3±0.7	10.5±0.8††#
LVLS, global LV longitudinal strain (%)	-18.0±0.3	-15.8±0.4**	-15.7±0.5††

**P<0.05, **P<0.01, OSA lean versus controls. †P<0.05, ††P<0.01, OSA obese versus controls. #P<0.05, ##P<0.01, OSA lean versus OSA obese. Unpaired t-test, P<0.05 was considered significant.*

Conclusion: Co-morbid obesity and hypertension were associated with modest cardiac hypertrophy and reduced diastolic function in OSA patients. Conversely, both lean and obese OSA patients displayed reduced LVLS that correlated with OSA severity index, suggesting specific pathophysiological mechanisms.

[P1845] Markers of endothelial and platelet activation are associated with high on-aspirin residual platelet reactivity

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Purpose: Despite COX-1 inhibition by aspirin, platelets in patients with coronary artery disease (CAD) can be activated through other mechanisms.

Methods: 1001 stable CAD patients, all on single aspirin treatment, were classified by the PFA100 method as having high on-aspirin residual platelet reactivity (RPR) or not. Markers of hypercoagulability, endothelial and platelet activation as related to RPR, were evaluated to explore the potential mechanisms behind high on-aspirin RPR.

Results: 25.9% (n=259) of the patients had high on-aspirin RPR. S-thromboxane B2 levels were very low in both groups. Patients with high on-aspirin RPR had significantly higher levels of von Willebrand Factor (vWF) (p<0.001), platelet count (p=0.008), total tissue factor pathway inhibitor (TFPI) (p=0.005) and β-thromboglobulin (β-TG) (p=0.041) compared to patients with low on-aspirin RPR.

No significant differences between the groups were observed in levels of endogenous thrombin generation (ETP), pro-thrombin fragment 1+2 (F1+2), D-dimer, soluble TF (sTF) or P-selectin (all p>0.05).

Conclusions: High on-aspirin RPR as defined by PFA100 seems not to be due to increased thrombin activity as evaluated with ETP, sTF, F1+2 or D-dimer. The elevated levels of platelet count, β-TG, TFPI and especially vWF might be explained by increased endothelial and platelet activation in these patients.

Markers of coagulation and platelet activation			
	High RPR (n=259)	Low RPR (n=741)	p-value
ETP (nM*min)	1439 (1229, 1572)	1436 (1240, 1610)	0.55
F1+2 (pg/ml)	204 (156, 279)	205 (150, 276)	0.46
D-dimer (ng/ml)	394 (273, 592)	399 (281, 615)	0.65
sTF (pg/ml)	141 (105, 188)	146 (103, 199)	0.32
TFPI Free (ng/ml)	15.2 (12.5, 18.1)	14.3 (12.0, 17.9)	0.07
TFPI Total (ng/ml)	68.4 (60.0, 78.6)	65.5 (57.2, 74.3)	0.005
vWF (%)	124 (94, 146)	100 (79, 126)	<0.001
β-TG (IU/ml)	33.3 (25.2, 46.3)	31.3 (24.3, 42.2)	0.041
P-Selectin (ng/ml)	30.5 (22.4, 39.1)	29.8 (21.3, 39.0)	0.62
Platelet count (x10 9)	236 (200, 273)	224 (192, 262)	0.008

Median values (25, 75) are given.

[P2756] How reliable are dyssynchrony measurements in the presence of infarct scar?

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Background: Assessment of mechanical dyssynchrony to predict response to cardiac resynchronization therapy (CRT) is the main goal of the echocardiographic screening of CRT candidates. However, the impact of infarct scar on this assessment remains controversial. In this study, we investigated the impact of scar extend and localization on conventional dyssynchrony parameters and the new parameter of apical rocking.

Methods: We studied data of 36 infarct patients with normal QRS duration and preserved LV function and 55 CRT candidates (31% ischemic cardiomyopathy). Infarct scar localization and extend was defined by contrast-enhanced MRI. Influence of infarct scar on the motion pattern of the LV was examined by measuring direction and amplitude of apical rocking. Results were compared with conventional dyssynchrony measurements, i.e. the standard deviation of time to peak velocity in 12 mid and basal segments (SD-Ts12), the difference of time to peak velocity between anteroseptal and posterior wall (AP-Del) and septal to lateral delay in time to peak velocity (SL-Del).

Results: Infarct patients showed relevant apical rocking in 61% while the apex moved regularly away from the infarct during systole. Scar extend correlated inversely with apical rocking ($r = -0.36$, $P < 0.05$). Conventional dyssynchrony parameters were positive in 20% – 35% of infarct patients. In CRT candidates without scar, apex motion is dominated by the conduction delay (systolic motion towards lateral). In CRT candidates with ischemic CMP this pattern is modulated by the scar. Again, apical rocking was inversely related to scar extend ($r= -0.62$, $P < 0.05$). In all CRT candidates apical rocking showed higher sensitivity, specificity and accuracy to predict response to CRT compared to conventional dyssynchrony measurements.

Conclusion: LV motion patterns are dominated by conduction delays but modulated by infarct scar. Higher scar burden results in less pronounced apical rocking. Apical rocking has a higher accuracy for the prediction of CRT response than conventional echo parameters. We therefore propose apical rocking as useful screening parameter for CRT candidates.

[P1298] High level of physical activity may impair myocardial function in patients with arrhythmogenic right ventricular cardiomyopathy

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Purpose: Exercise is supposed to increase the risk of ventricular arrhythmias in patients with arrhythmogenic right ventricular cardiomyopathy (ARVC). However, the impact of exercise on myocardial function in ARVC has not been fully described.

Methods: In all, 98 Norwegian ARVC patients and mutation positive family members from the Nordic ARVC registry were studied (age 44±17years, 55% male). Patients with activity >750 MET-min/week were defined as athletes. LV ejection fraction (EF), right ventricular outflow tract (RVOT) diameter and RV diastolic diameter (RVDD) were assessed by echocardiography. Exercise induced VT was defined as VT or VF occurring during significant exercise.

Results: Of the 98 ARVC patients, 26 (27%) were defined as athletes (69% male). Athletes were younger than non-athletes (39±15 vs 46±17years, p=0.04). Athletes were not more frequently probands than non-athletes (p=0.26) and occurrence of total VT did not differ (p=0.33). However, exercise induced VT occurred in 31 patients (34%) and was more frequent in athletes (54%) compared to non-athletes (24%) (p<0.01). Athletes had lower LVEF compared to non-athletes (54% vs 58%, p= 0.03). RVOT diameter and LVEF correlated in athletes (R=0.55, p< 0.001) (Figure), but not

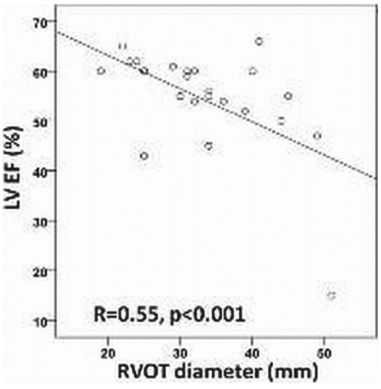

Figure 1. LVEF and RVOT diam in 26 ARVC athletes

in non-athletes (p=0.13). In the total population, RVOT diameter (36±7 vs 30±7mm, p<0.01) and RVDD (46±7 vs 39±8mm, p=0.01) were increased in those with exercise induced VT (p=0.01).

Conclusion: LVEF was reduced in athletic ARVC patients. Reduced EF was related to increased RV dimensions in athletes, but not in non-athletes. RV dimensions related to exercise induced VT. These findings indicate that history of vigorous exercise may reduce LV function in ARVC patients in addition to be a risk factor for VT during ongoing exercise.

[P3667] Mortality risk stratification in Chronic Heart Failure patients: an analysis of the Controlled Rosuvastatin Multinational Trial in Heart Failure (CORONA)

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Background: Classification And Regression Decision Trees (CARDT) are an attractive method of assigning risk as they are concise, do not rely on model assumptions, are easily understood by clinicians and can be incorporated into software applications.

Methods: Patients from the CORONA study with chronic heart failure due to left ventricular systolic dysfunction (LVSD) and ischaemic heart disease (IHD) who had a measurement of amino-terminal pro-brain natriuretic peptide (NT-proBNP) were included in this analysis. CARDT were constructed using 1798 randomly selected patients as a training dataset and another 1826 patients as a validation set to stratify patients into those with a low, medium or high mortality (all-cause) at 1-year. Fourteen clinical variables were considered including age, sex and data obtained from the clinical history and examination and standard laboratory measurements. The CARDT were compared with logistic regression (LR) models using ROC curves.

Results: The median age was 72 (IQR: 67-78) years, 75% of patients were men and 10% had died by 1-year. In the CARDT, NT-proBNP was the strongest predictor of mortality. Body mass index (BMI) added a little more information, with further small contributions from creatinine, cholesterol, systolic BP, age and heart rate. Similar predictors were found in LR-models. Using CARDT, 14% of patients with an NT-proBNP >4,577pg/ml had a one year mortality of 24.3%, 43% with an NT-proBNP <1,145pg/ml had an annual mortality of 5.3% and those with intermediate plasma NT-proBNP concentrations had an annual mortality of 10.5%. Addition of BMI identified only few patient (n = 28; 1.5%) who had an NT-proBNP <1,145pg/ml but BMI <21.2 with an annual mortality of 14.3%. The CARDT performed similarly to LR-models for predicting mortality (training dataset: ROC area with 95% CI, 0.733 (0.693 – 0.772) for CARDT and 0.747 (0.710 – 0.785) for LR-model; validation dataset: 0.668 (0.626-0.710) for CARDT and 0.683 (0.641 – 0.726) for LR).

Conclusions: CARDT analysis suggests that NT-proBNP is a useful predictor of outcome in patients with heart failure due to LVSD and IHD. Few other variables add clinically useful prognostic information. This could greatly simplify prognostic assessment in this population.

[P5654] Low self-estimated quality of life after myocardial infarction and future cardiovascular risk

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Background: Depression is common among patients with coronary artery disease (CAD) and furthermore, depression is a risk factor for the development of CAD, and worsens outcome when present in patients with established CAD. Less data is available about self-estimated quality of life and future events.

Aim: To examine whether self-estimated quality of life after a recent myocardial infarction was associated with future cardiovascular risk.

Methods: 123patients with a hospital-diagnosed myocardial infarction (MI) occurring 3 months before inclusion were included. Traditional cardiovascular riskfactors were measured and the Minor Symptoms Evaluation Profile (MSEP) was used to evaluate self-estimated quality of life at entry of the study. Mean follow-up period was 6.0±1.4 yr. The combined end-point consisted of cardiovascular death, myocardial infarction, stroke and hospitalization due to ischemic heart disease with and without revascularization.

Results: There were 30 cardiovascular endpoints (CVE) during follow-up. The group with a CVE during follow-up had worse entry MSEP values compared to those without a CVE even after

adjustments for age, smoking, cholesterol, blood pressure and plasma glucose.

Conclusion: Low self-estimated quality of life was associated with a poor outcome after myocardial infarction. The underlying pathophysiological mechanism is not clear and merits further research.

[P2744] Early diastolic strain rate predicts response to heart failure therapy in patients with dilated cardiomyopathy

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Objective: The aim of this prospective study was to assess the value of speckle tracking echocardiographic (2D-STE) parameters to predict response to heart failure therapy in patients with dilated cardiomyopathy (DCM).

Methods: Eighty-seven patients (mean age 51±13 years) with DCM, defined as ejection fraction (EF) <45%, left ventricular (LV) end-diastolic diameter >112% of normal range derived from age and body surface area. Based on 2D-STE following parameters were extracted from three apical views of the LV: global longitudinal strain (GLS), systolic (SRS) and diastolic strain rate (SRE). Mechanical dispersion was calculated as standard deviation of time-to-peak strain values including all LV segments.

Results: After receiving heart failure therapy (mean 25 months, range 1.5-42) 50 patients reached combined endpoint defined as following: death, heart transplantation, rehospitalisation due to heart failure, and absence of improvement in EF. On stepwise multivariate regression analysis, SRE was independently of EF and LV volumes predictive for combined endpoint (OR 0.44, 95%CI 0.27-0.70, p=0.001) with an area under the ROC-curve (AUC) of 0.91 (Figure 1). In patients with cQRS duration ≤120ms mechanical dispersion was predictive for combined endpoint with the highest AUC (OR 1.53, 95%CI 1.08-2.16, p=0.002; AUC=0.94)

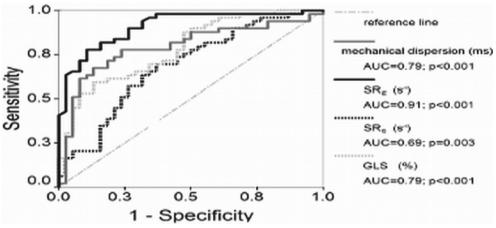

Figure 1. ROC curves for prediction of endpoint in all patients.

Conclusions: In this study, SRE, a surrogate parameter of myocardial relaxation, was able to predict a response to heart failure therapy in patients with DCM. In patients with narrow QRS complex, mechanical dispersion yielded the highest predictive value. Parameters of 2D-STE may contribute to risk stratification in this patient population.

[P2655] Covariates of global longitudinal strain and displacement in type 2 diabetes: a speckle tracking echocardiography study

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Purpose: We aimed at identifying determinants of left ventricular (LV) longitudinal deformation in type 2 diabetic patients.

Methods: Global longitudinal strain (GLS) and displacement (GLD) were measured by speckle tracking as the average values of 6 LV segments in apical 4-chamber view in 399 type 2 diabetic patients without known cardiac disease, participating in the left ventricular DYsfunction in DiAbetes (DYDA) study.

Results: The total population was 61±7 years old and included 35% women, 60% patient with treated hypertension and 25% with LV hypertrophy. Mean GLS was -17.6±3.3% and mean GLD 4.2±1.2 mm. When splitting the population by median GLS (-17.4%), patients with lower GLS also had lower GLD as well as higher heart rate, lower body mass index, lower stress-corrected endocardial and midwall shortening and lower LV ejection fraction, while blood pressure, glycemic control, LV mass and Doppler indices of LV filling and pulmonary venous flow did not differ (Table). In multivariate regression analyses, lower GLS (Multiple R=0.41, p<0.01) was associated with lower GLD (β=0.38) and higher N-terminal pro brain natriuretic peptide (β=0.11, both p<0.05), while lower GLD (Multiple R=0.50, p<0.01) was associated with older age (β=0.11), lower systolic

blood pressure (β=0.13), higher heart rate and female gender (both β=0.16, all p<0.05).

Table 1

Variable	Lower GLS	Higher GLS	p
Clinic systolic blood pressure (mmHg)	136±13	137±16	ns
Clinic diastolic blood pressure (mmHg)	80±9	81±7	ns
HbA1c (%)	6.8±1.3	6.9±1.3	ns
GLS (%)	-15.0±1.9	-20.0±2.3	<0.001
GLD (mm)	3.9±1.1	4.6±1.2	<0.001
Body mass index (kg/m^2)	27.7±4.0	28.9±4.5	0.009
Left ventricular ejection fraction (%)	60±5	62±4	<0.001
Stress-corrected endocardial sgortening (%)	95±13	99±12	0.004
Stress-corrected midwall shortening (%)	87±12	90±11	0.020

Conclusion: In type-2 diabetic patients without known cardiac disease, participating in the DYDA study, clinical and echocardiographic variables only explained 17-25% of the variation in global longitudinal speckle strain and displacement.