

There were no differences in hsCRP levels between three groups.

Conclusions: PR prolongation shares similar characteristics of electro-anatomical remodeling with AF. Whether PR prolongation might be considered as intermediate phenotype for AF, should be proved in further longitudinal studies.

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Relationship between electrical and myocardial abnormalities in patients with myotonic dystrophy type 1

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Background: Myotonic dystrophy type 1 (MD1) is an autosomal dominant disorder characterized by skeletal muscle symptoms, cardiac abnormalities, and other systemic manifestations. Cardiac involvement in MD1 is characterized by fibro-fatty infiltration leading mostly to conduction disturbances and arrhythmias as well as to an increased risk of sudden cardiac death (SCD). Previous limited cardiovascular magnetic resonance (CMR) data report focal (non-specific late gadolinium enhancement – LGE – patterns) as well as diffuse fibrosis (shortened post-contrast myocardial T1) in these patients.

Purpose: To non-invasively characterize myocardial changes as well as the relationship between structural and electrical abnormalities in MD1 patients.

Methods: Fifty-seven MD1 patients and 15 matched healthy Controls (43±13 vs. 41±7 yrs; 46% vs. 53% male, p=NS) underwent CMR studies including ECV measurement and LGE-imaging. Additionally, ECG abnormalities defined by rhythm other than sinus and any conduction disturbance were recorded in MD1 patients.

Results: Twenty-eight percent (n=16) of MD1 patients had an abnormal ECG. A pathologic CMR was found in none of the Controls vs. 42% (n=24) MD1 patients (p=0.001) as follows: 21% had an impaired LV-EF (mostly mild) and 32% showed small areas of non-ischemic LGE with an intramural and/or subepicardial pattern (28 vs. 12%).

There were no significant differences in global ECV (26±3 vs. 26±3%, p=0.77) as well as in ECV in LGE-negative segments (26±3 vs. 26±3%, p=0.93) between MD1 and Controls. ECV in LGE-positive segments was 28±2%, significantly higher than global ECV in Controls (p=0.03). There were no significant differences between global ECV (25±3 vs. 26±3%, p=0.29) and ECV in LGE-negative segments (25±3 vs. 26±3%, p=0.11) in LGE positive vs. LGE negative MD1.

Study patients with ECG abnormalities showed more often LGE (60 vs. 21%, p=0.011) with an intramural pattern (50 vs. 20%, p=0.045) and septal location (38 vs. 10%, p=0.022) compared to MD1 patients without ECG abnormalities. On the other hand, both global ECV (26±2 vs. 26±3%, p=0.75) and ECV in LGE-negative segments (26±2 vs. 26±4%, p=0.76) were not significantly different in patients with abnormal vs. normal ECGs.

Conclusion: In MD1 patients, CMR can non-invasively depict complex myocardial changes as the presence of focal fibrosis, by LGE-CMR, as well as of diffuse fibrosis/fatty infiltration, by ECV quantification. Among the CMR abnormalities investigated in this cross-sectional study, myocardial LGE seems to be the only one associated with conduction disturbances and/or arrhythmias.

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Association of PR interval with echocardiographic parameters and biomarkers: insights from the LIFE-Adult-Study

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Background: Both long (>200 ms) and short PR intervals (<120 ms) are associated with an increased risk for atrial fibrillation (AF). Recently, we demonstrated association between PR interval prolongation and hsTroponin T, indicating subclinical cardiac impairment. The aim of this study was to investigate the association between PR interval, echocardiographic parameters and blood markers of cardiac stress, myocardial damage and inflammation.

Methods: The LIFE-Adult-Study is a population-based cohort study, which has recently completed the baseline examination of 10.000 randomly selected participants from Leipzig, a major city with 550.000 inhabitants in Germany. In the current cross-sectional analysis, individuals ≥40 years with no overt heart disease, sinus rhythm in ECG, no history of AF or antiarrhythmic drugs (including beta blockers) and available laboratory data (hsTropT, NT-proBNP, hsCRP) were included.

Results: The study population comprised 950 individuals (median age 52 (IQR 46–62) years, 40% males) with complete ECG, echocardiographic and laboratory data. The prevalence of individuals with short and long PR intervals was low (64 individuals (6.7%) and 32 (3.4%), respectively). There was significant correlation between PR interval and hsTropT levels (r²= -0.065, p=0.046). However, the difference between hsTropT levels in individuals with short, normal and long PR interval (median 3.2 vs 3.8 vs 4.8 pg/ml, p=0.083) did not reach significance.

In univariable logistic analysis, short PR interval was associated with gender, LA diameter and EF, but none of the biomarkers. In multivariable analysis, short PR

interval remained significantly associated with female gender (OR 2.689, 95% CI 1.346–5.374, p=0.005) and lower EF (OR 0.944, 95% CI 0.900–0.990, p=0.018). Analyzing associations with long PR interval, age, gender, LA>40 mm, and hsTropT were significantly associated with PR prolongation. However, in multivariable analysis, only age (OR 1.047, 95% CI 1.009–1.087, p=0.016) and LA (OR 2.499, 95% CI 1.199–5.211, p=0.015) demonstrated significant association.

Conclusions: In healthy individuals, larger LA is associated with PR interval prolongation, while lower EF – with short PR interval. Longitudinal studies are needed to assess their association with AF.

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Microvolt T-wave alternans and heart rate turbulence in patients with arrhythmogenic right ventricular cardiomyopathy/dysplasia

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Arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D) is an important cause of sudden cardiac death in young adults. Heart rate turbulence (HRT) and microvolt T-wave alternans (mTWA) are known as non-invasive markers for sudden cardiac death risk stratification in ischemic heart disease. Our research focuses on studying of these markers in ARVC/D.

Purpose: To study mTWA and HRT in patients with ARVC/D in comparison with patients with idiopathic ventricular arrhythmia.

Materials and methods: 55 patients with more than 500 premature ventricular complexes (PVC)/day were divided into 2 groups. 1st group: 28 patients with ARVC/D (mean age 36±12.4 years, 14 females, ejection fraction (EF) 48±11.1%, 529±256.4 PVC/hour). Diagnosis of ARVC/D was based on the 2010 Task Force criteria. 2nd group (control): 27 patients with idiopathic ventricular arrhythmia (mean age 37±12.2 years, 16 females, EF 65±6.4%, 436±196.3 PVC/hour). MTWA (modified moving average analysis) and HRT were analyzed using Holter ECG.

Results: In 1st group mTWA amplitude was 85.4±29 μV in average. Pathological mTWA (>60 μV) was observed in 78.6% (22 patients). Pathological HRT was detected in 28.6% (8 patients), including 7.1% (2 patients) with pathological turbulence onset (TO) and turbulence slope (TS). 21.4% (6 patients) had only pathological TO.

In 2nd group mTWA amplitude was 52±22.1 μV in average. 18.5% (5 patients) had pathological mTWA. Pathological TO was observed in 7.4% (2 patients). Pathological TS was not registered.

In both groups there was no significant positive relationship between TWA amplitude and severity of PVC (neither frequency per day, nor complexity). Pathological TS also did not correlate with severity of PVC. There was weak positive relationship between pathological TO and frequency of PVC (correlation coefficient 0.23, p<0.05).

Conclusions: In patients with ARVC/D pathological mTWA and HRT were detected more often, than in the group of patients with idiopathic ventricular arrhythmia. It indicates the higher severity of electrical myocardial instability in ARVC/D in spite of equal quantity of arrhythmias.

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The use of three-dimensional echocardiography to measure left ventricular ejection fraction would increase the number of patients with indication to receive implantable cardioverter defibrillators

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Background: Sudden cardiac death (SCD) accounts for 25% of deaths due to cardiovascular disease each year worldwide. Implantable Cardioverter defibrillators (ICD) have shown to reduce the risk of SCD, and current ESC guidelines recommend ICD in patients with symptomatic heart failure (NYHA class II-III) and left ventricular ejection fraction (LVEF) ≤35% (class I, Level A) for primary prevention. However, the optimal method for measuring LVEF for patient selection remains to be clarified. Conventionally, two-dimensional echocardiography (2DE) LVEF has been used, however the latest ASE/EACVI guidelines on chamber quantitation recommend the use three-dimensional echocardiography (3DE), when available, to measure LVEF as it avoids geometric assumptions, LV foreshortening, and it has been shown to be more reproducible than 2DE.

Purpose: To analyze the clinical impact of using 3DE over 2DE LVEF on the decision to implant an ICD in patients with LV dysfunction.

Methods: We prospectively included patients with ischemic and non-ischemic cardiomyopathy with a 2D LVEF ≤40%. We used both 2DE and 3DE during the same exam. LVEF was measured using both Simpson's biplane method and with semi-automated 3D software (4D Auto LVQ). Guideline recommended cut-off values (LVEF ≤35%) were applied to both techniques to investigate the impact of using 3DE for ICD patient selection.

Results: We included 110 subjects, 79% male, 51% with ischemic dilated cardiomyopathy, age 61 years (45–77), BMI= 25±4 kg/m². Median LVEF was 32% (27–36%) by 2DE and 29% (20–37) by 3DE (p<0.001). LVEF criteria to implant ICD were met in 71% of patients with 2DE and 81% with 3DE. Using 3DE LVEF,

the decision to implant was changed in 21% of patients: 17 patients (15.5%) were reclassified as having a LVEF \leq 35%, whereas 6 patients (5.5%) were found to have LVEF $>$ 35%. Interestingly, all patients reclassified had a LVEF between 30–40%, and most of them (64%) had ischemic heart disease with wall motion abnormalities in the anterior septum or inferolateral wall (91%), which are not accounted for in LVEF calculations using 2DE.

Conclusions: Compared to 2DE, the use of 3DE LVEF has the potential to change the decision to implant an ICD in a sizable number of patients, leading to a higher number of devices being implanted. This is particularly true for patients with ischemic heart disease in whom 2DE LVEF does not take into account wall motion abnormalities in all territories. Whether 3D LVEF has the ability to improve risk stratification for SCD needs to be addressed in future studies.

P5510 | BEDSIDE

An innovative miniature patch ambulatory electrocardiographic recorder

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Background: Miniature ambulatory electrocardiogram (ECG) recorders are easy to use and have minimal impact on daily activities. They can improve compliance and ECG recordings and provide wider and faster access to ECG monitoring systems. However, the efficacy of these devices is still being investigated. We sought to compare the efficacy of one of such devices to the standard 24-hour Holter monitoring.

Methods: All consecutive patients (pts) referred for ECG monitoring with 24-hour Holter between May 2016 and July 2016 were prospectively included to simultaneously wear a mid-sternum, non-invasive, single-use, wireless ECG monitoring device with the capacity for 72 hour continuous recording (ePatch[®]). Heart rate, cardiac rhythm, heart rate variability and supraventricular and ventricular premature beats (PB) were measured by both systems and compared using paired student-t-test and Wilcoxon signed rank test, as appropriate.

Results: From the 34 pts included, 31 (mean age 65.5 \pm 15.7 years, 48.6% male) were eligible for analysis (3 pts presented technical problems with the 24-hour Holter device). The percentage of quality recordings for analysis was greater for ePatch[®] (99.6 \pm 1.1 vs. 97.7 \pm 3.8 p 0.017). Average, minimum and maximum heart rate values were not significantly different in the two recordings. All cases of atrial fibrillation in Holter monitoring were identified by ePatch[®] and all absences of atrial fibrillation in ePatch[®] were confirmed by Holter monitoring. SDNN, SDANN, rMSDD and NN $>$ 50 were not significantly different in the two recordings. ePatch[®] identified 20 out of 23 pts (87%) with supraventricular PB and the number of identified PB was not significantly different between recordings. The three pts whose supraventricular PB were not identified had $<$ 100 beats. ePatch[®] identified 24 out of 26 pts (92%) with ventricular PB and the number of identified PB was not significantly different between recordings. The two pts whose ventricular PB were not identified had $<$ 530 beats.

Conclusion: ePatch[®] is an innovative device for ECG monitoring that showed efficacy in heart rate and heart rate variability recording, cardiac rhythm identification and premature beat detection in a non-selected real world population. Due to its capacity for 72-hour continuous recording and high compliance, its practical applications might encompass the detection of atrial fibrillation that would otherwise be missed by 24-hour Holter monitoring.

P5511 | BEDSIDE

Diagnosis accuracy of provocative test in concealed long QT syndrome

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Background: A paradoxical increase in the QT interval during epinephrine infusion (Epl), exercise test (ExT) or mental stress test (MST) has been observed in concealed Long QT Syndrome (LQTS). However, respective diagnosis values of each test have never been evaluated within the same population study.

Objective: We sought to compare the diagnostic accuracy of those tests in concealed LQTS in a prospective multicentric study.

Methods: Patients with concealed type 1 or type 2 LQTS as defined by mutation status (basal QTc $<$ 470 ms) underwent the 3 tests during familial screening. Healthy patients screened after familial unexplained SCD constituted a control group. Each test was performed according to protocols previously described. A blinded ECG measurement was performed at rest, at peak heart rate and during recovery as appropriate. A positive test was defined by a QTc $>$ 480 ms or a delta QTc $>$ 30 ms.

Results: Fifty three patients were included (20 LQT1, 10 LQT2, 23 controls). Baseline QTc was longer in LQTS patients than in controls (431 \pm 21 and 394 \pm 23ms; p $<$ 0,05). Lengthening of QTc was additionally longer in LQTS patients during ExT (78 \pm 56 and 41 \pm 29ms; p $<$ 0,05), MST (56 \pm 37 and 28 \pm 22ms; p $<$ 0,05) and Epl (127 \pm 69 and 75 \pm 55ms; p $<$ 0,05). Epl seemed to present higher sensitivity (97%; p=0.14) and MST higher specificity (95%; p=0.052) to screen LQTS. Intermediate diagnosis performances were observed during ExT

(Sp=83%, Se=81%). They were no significant difference between LQT1 and LQT2 patient response to provocative test.

Tests diagnosis performance

	Exercise test	Epinephrine infusion	MST
Sensitivity (%)	81 (22/27)	97 (28/29)	79 (15/19)
Specificity (%)	83 (15/18)	65 (13/20)	95 (19/20)
Positive predictive value (%)	88	80	94
Negative predictive value (%)	83	93	83

MST: Mental Stress Test.

Conclusion: Provocative test are critical and efficient in the diagnosis of concealed LQTS. However, their respective diagnosis values are unequal with higher sensitivity for Epl and specificity for MST.

P5512 | BEDSIDE

A new national board of health recommendation - download the heart lung resuscitation data from the automatic external defibrillator to clarify the diagnosis and find the optimal treatment

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Background: The European resuscitation guidelines propose early cardiopulmonary resuscitation and defibrillation to restart the heart. In 2011 the national board of health published the new recommendation for use of automatic external defibrillator (AED) downloads in the diagnosis and treatment of patients with out of hospital cardiac arrest.

Purpose: Download the electrocardiogram and the heart lung resuscitation data from all the used AED's to clarify the diagnosis and find the optimal treatment. Data makes it possible to evaluate the resuscitation process and give feedback to bystanders and first responders. Data precipitate research and development in the pre-professional part of the out of hospital cardiac arrest.

Methods: Out of hospital cardiac arrest patients are transported to the university hospital for acute investigations as echocardiography, coronary angiography and treatments as percutaneous coronary intervention or coronary artery bypass graft. The used AED's follow the patient to the hospital and acute transmission of AED electrocardiogram downloads & heart lung resuscitation data from 20 different AED's are possible to transmit and interpret simultaneously to the acute cardiac investigations. The AED's are provisioned with new pads, rescue kit, occasionally new battery and returned to owner next day.

Results: In the period 2014–2016 AED downloads from more than 300 patients with suspected sudden cardiac arrest displays ventricular fibrillation, pulseless electric activity, asystolia, ventricular tachycardia, pseudoventricular tachycardia (Wolff Parkinson White), third-degree atrioventricular block, atrial flutter, atrial fibrillation and sinus rhythm. AED downloads are used to differentiate between cardiac arrest and essential differential diagnoses as syncope, epilepsy, drug intoxication, respiratory arrest and medulla oblongata injury. The AED downloads reflects part of the pre-hospital resuscitation process, the quality of chest compressions (rate and occasionally depth), time to first shock, number of shocks, and time to return of normal heart rhythm.

Conclusion(s): The AED downloads provide benefits in the investigation of the patients, clarify the diagnosis and justify the optimal treatment as implantation of implantable cardioverter defibrillator, electrophysiological investigation and radiofrequency catheter ablation.

P5513 | BENCH

Rotor distribution and stability in atrial fibrillation using a non invasive body-surface mapping system

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Background: The detection of rotors in patients with atrial fibrillation (AF) using invasive and noninvasive mapping systems was described in multiple studies. However, there is a lack of information about the stability of rotors over time.

Methods: A total of 7 patients [4 male, age 64 (46–77) years, left atrial (LA) diameter 49 (37–60)] with persistent AF underwent gadolinium enhanced MRI of the torso, followed by repetitive ECG recordings in 3-hours intervals using a novel body-surface mapping system (EP Solutions). Therefore, up to 224 ECG electrodes were applied on the patient's torso and unipolar surface electrograms were recorded. A propagation phase map was generated applying a unique algorithm to identify the most frequent locations of the rotors. The rotor locations were projected on the 3D reconstruction of the atria with predefined segments (Figure 1).

Results: An average of 17,7 (9,1–28,5) sec in total of 559 ECG fragments (aver. 29; 11–48 per patient) was processed and a phase cumulative map was created. In all 7 patients multiple rotors were detected in both atria. Total number of rotors were 349 (54,1% in LA and 334 (45,9%) in RA. The majority of the rotors in the LA was located along the inferior wall (17,8%) and in vicinity to the RSPV (8,9%). RA sources were predominantly detected in the superior lateral segment (20,9%). Using cluster analysis for all ECG recordings it shows that in 3/7 (42%) patients