

P928

Managing the reperfusion ventricular tachyarrhythmias-focus on a perfused myocardium

Bernikova OG.; Sedova KA.; Azarov JE.

Institute of Physiology, Syktyvkar, Russian Federation

Funding Acknowledgements: The reported study was funded by RFBR according to the research project № 18-315-00339

Introduction. For medications conveyed by bloodflow, the ischemic myocardium is hard to be reached during coronary occlusion but a perfused area presents an accessible target. We previously demonstrated a retrospective association of reperfusion arrhythmias with repolarization prolongation in a border (still perfused) zone of ischemia. This study was aimed to test a hypothesis that the incidence of reperfusion ventricular tachycardia and/or ventricular fibrillation (VT/VF) can be modified by direct control of repolarization duration in the perfused myocardium in ischemia/reperfusion conditions.

Methods. Open-chest anesthetized adult male rats underwent 5-min LAD artery ligation followed by 15-min reperfusion. Unipolar electrograms were recorded from ischemic and nonischemic (perfused) areas with a 64-lead array. Activation times (ATs), repolarization times (RTs) and activation-repolarization intervals (ARIs, a surrogate for action potential duration) were measured in each lead. Dispersion of repolarization (DOR) was calculated as a difference between the maximal and minimal RTs from all leads. Immediately after the occlusion onset, three groups of rats were given tetraethylammonium chloride (TEA, 4 mg/kg, i.v., n = 9), pinacidil monohydrate (PIN, 0,3 mg/kg, i.v., n = 11) and placebo (Control, n = 13), respectively.

Results. During occlusion, ATs prolonged and ARIs shortened in the ischemic zone and ATs were stable in the perfused zone equally in all groups. In the perfused area, median ARIs did not change in the control group (27 [IQR 25-28] vs 26 [IQR 24-28] ms, $p > 0.05$), increased in the TEA group (31 [IQR 26-34] vs 25 [IQR 22-28] ms, $p = 0.012$) and decreased in the PIN group (18 [IQR 16-21] vs 24 [IQR 22-28] ms, $p = 0.005$) in respect to baseline, respectively. DOR was increased in the TEA group (18 [IQR 15-21] ms, $p = 0.004$) and decreased in the PIN groups (3 [IQR 1-7] ms, $p = 0.050$), as compared to the control group (7 [IQR 3-10] ms), respectively. The VT/VF incidence in the control, PIN and TEA groups was 9 out of 13, 2 out of 11 and 9 out of 9, respectively ($p = 0.001$). In logistic regression analysis including AT, ARI and DOR variables, VT/VFs were associated with ARIs in the perfused area ($B = 1.151$, 95%CI 1.017-1.302, $p = 0.026$).

Conclusion. The present study demonstrated that direct shortening of repolarization in the perfused area was associated with the decreased VT/VF incidence in acute ischemia/reperfusion model.

Subject: Poster session 2 --

P929

Gender differences of atrial innervation

Patsouk A.; Mitrofanova L.; Mikhaylov E.; Lebedev D.

Federal Almazov Medical Research Centre, arrhythmology department, Saint Petersburg, Russian Federation

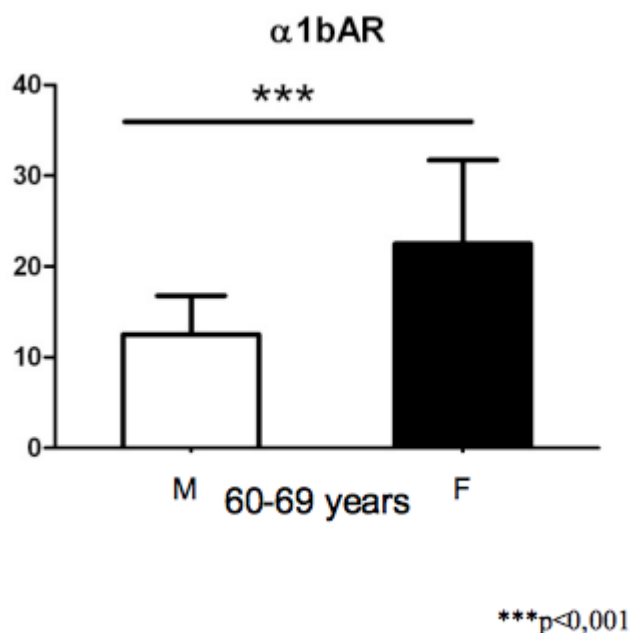
Objective: to study innervation characteristics of atria depending on gender

Materials and methods: 43 hearts with ischemic heart disease from patients (23 male and 20 female) aged 48-79 years were examined morphometrically. The density of nerve ganglia (NG) and nerve fibres (NF) were estimated in 9 different atrial zones, around the coronary sinus ostium (CSO), the sinus node (SN) and atrioventricular node (AVN). Immunohistochemistry was performed using antibodies against S100, M1 Muscarinic Acetylcholine Receptor (M1MAR), $\alpha 1b$ Adrenergic Receptor ($\alpha 1bAR$), Tyrosine Hydroxylase (TH), Choline Acetyltransferase (ChAT). The relative areas of expression of receptors, TH and ChAT were estimated in the NG and NF near the CSO.

Results: The density of NF in the muscular sleeve of right superior pulmonary vein, the density of NG between the inferior pulmonary veins and the density of NF near the SN differed significantly in males and females ($p < 0,05$). The density of NG was the highest near the CSO in males ($0,04 \pm 0,03$, $p=0,01$), but between pulmonary veins in females ($0,06 \pm 0,4$, $p=0,007$). The lowest density of NF in males was determined near the AVN, and near the SN in females. The relative expression area of M1MAR near the CSO in males was more than in females ($31 \pm 12\%$ vs $26 \pm 16\%$, $p=0,03$). The relative expression area of $\alpha 1bAR$ in males was less than in females only at ages 60-69 (Fig.1).

Conclusion: The nerve distribution in the different atrial zones and the expression of M1MAR and $\alpha 1bAR$ near the CSO have gender differences.

Abstract P929 Figure. Fig 1



P930

19 gene panel analysis for latvian arrhythmogenic right ventricular cardiomyopathy patients

Bidina LB.¹; Rots D.¹; Caunite L.²; Kupics K.²; Kalejs O.²; Gailite L.¹

¹Riga Stradins University, Riga, Latvia

²Paul Stradins Clinical University Hospital, Riga, Latvia

Funding Acknowledgements: no Acknowledgements

Introduction: Genetic testing for arrhythmogenic right ventricular cardiomyopathy (ARVC) has significantly increased in the last years. Whole exome and genome sequencing (WES) have expanded the possible genetic background of the ARVC – now 19 genes are described. Genotype and phenotype overlap are seen more frequently between different cardiomyopathies and channelopathies.

Purpose: The aim of this study was to analyze genetic variations in 19 genes which are associated with ARVC phenotype, using of next-generation sequencing (NGS).

Methods: NGS using TruSight One kit was done for 24 ARVC patients. Sentieon software was used for variant calling and the duplicate removal. wAnnoVar softwares was used to variants' annotation. GRCh38 and RefSeq transcripts were used for read alignment and variant annotation. The mean coverage was 70x and 93% of target region was sequenced at coverage at least 20x. 19 genes, which are associated with ARVC, were analyzed - PKP2, DSG2, DSC2, JUP, PLN, LMNA, SCN5A, CTNNA3, TGFB3, RYR2, TTN, TMEM43, DES, DSP, FLNC, LDB3, CDH2, TGFB3, TP63. Additionally large deletions and duplication were analyzed by MLPA analysis. Interpretation of genetic variants were done based on ACMG[LP4] erican College of Medical Genetics guidelines.

Results: One pathogenic splice site variation (rs111517471) was found for one patient in PKP2 gene, one likely pathogenic stopgain variation (rs775072385) was found for one patient in TTN gene. One likely pathogenic missense variation (rs147240502) was found for one patient in PKP2 gene, for the first time discovered in the homozygote form and inherited in autosomal recessive trait. Seven different variants of uncertain significance were found in genes DSG2, DSP, SCN5A, RYR2, CTNNA3 and DES. No large deletions nor duplication were found by MLPA analysis.

Conclusion: By performing whole exome sequencing and analyzing 19 ARVC associated genes, only for three out of 24 patients pathogenic or likely pathogenic variations were found. It is clearly seen that separated gene panels are not sufficient for diagnostic purposes of ARVC. In our opinion WES should always be performed for ARVC patients, and analysis of wide cardiology associated genes' panel should be done. The next step of our study will be an expanded cardiology associated gene panel analysis for ARVC patients.

P931

Long-term effects of transient intermittent negative upper airway pressure on atrial remodeling in a novel rat model for obstructive sleep apneaLinz D.¹; Hohl M.²; Linz B.²; Lau D.¹; Boehm M.²; Sanders P.¹¹South Australian Health and Medical Research Institute, Centre for Heart Rhythm Disorders, Adelaide, Australia²Saarland University Hospital, Department of Internal Medicine III, Cardiology, Homburg, Germany

Obstructive sleep apnea (OSA) is associated with increased occurrence of atrial fibrillation (AF). Obstructive respiratory events lead to transient hypoxia (IH) and ineffective inspiration against the occluded upper airways result in intrathoracic pressure changes and increasing cardiac transmural pressure gradients.

Objectives: To develop a novel AF animal model mimicking long-term effects of repeated transient intrathoracic pressure changes on top of IH.

Method: In spontaneously breathing sedated rats (2% isoflurane), IH (n= 9) was applied by intermittent increase in the respiratory dead volume. Reproducible and standardized obstructive respiratory events were induced by defined intermittent negative upper airway pressure (INAP = inverse CPAP) applied via a customized mask which was connected to a negative pressure device (n= 9). One minute of IH or INAP was followed by a rest period of nine minutes for four hours every second day. Rats with comparable anesthesia were used as controls (CTR). After three weeks the animals were sacrifice.

Result: Blood pressure and end-diastolic left ventricular pressure were not affected by IH or INAP. Intermittent desaturation ($\leq 77\%$ O₂) and post-apneic hyperventilation was comparable in INAP- and IH-rats, but INAP-rats showed significantly higher breathing efforts during apnea compared to IH-rats. Left atrial (LA) interstitial fibrosis formation (+135% vs. CTR, p = 0.01) and LA- myocyte diameters (+107%, p = 0.03 vs. CTR) were increased in INAP-rats, but unchanged in IH-rats. This was associated with longer inducible AF-durations in INAP-rats (p = 0.02 vs. CTR; INAP: 11.65 seconds; CTR: 0.98 seconds) but not in IH-rats (p = 0.31 vs. CTR; IH: 1.28 seconds).

Conclusion: Long-term exposure to transient INAP in rats mimics important components of OSA beyond IH and allows the study of the progressive arrhythmogenic substrate in the atrium independent of the development of hypertension or overt diastolic dysfunction.

P932

Electrophysiologic investigation of exercise-induced cardiac hypertrophy in a rodent model of athletes heart

Olah A.; Barta BA.; Sayour AA.; Urban E.; Gephard A.; Kellermayer D.; Virag-Tulassay E.; Ruppert M.; Merkely B.; Radovits T.
Semmelweis University, Heart and Vascular Center, Budapest, Hungary

Funding Acknowledgements: NKFIH (K 120277), ÚNKP-17-4 (to A.O.), STIA-KF-17 (to A.O.)

Although regular exercise training is associated with cardiovascular benefits, cardiac remodeling induced by long-term, intense exercise training is also related to increased risk of arrhythmia. We aimed at providing electrophysiologic investigation of exercise-induced myocardial hypertrophy in a rat model of athlete's heart and determining sex-specific differences.

Age-matched young adult rats were divided into female exercised (FEx), female control (FCo), male exercised (MEx) and male control (MCo) groups. After exercised animals completed a 12-week-long swim training protocol, echocardiography was used to confirm exercise-induced hypertrophy. In vivo electrophysiologic investigation was performed by programmed stimulation with an octapolar catheter inserted into the right atrium.

Myocardial hypertrophy was verified by left ventricular mass (echocardiography) and post-mortem heart weight data in both exercised groups. We found signs of atrial remodeling in female exercised rats (right atrial weight: 42.3 ± 3.6 g FEx vs. 19.5 ± 1.5 g FCo, $p < 0.05$), increased P-wave duration and amplitude, as well as altered right atrial effective refractory period. We also observed increased T-wave amplitude and QT interval in female swim-trained rats. Hearts of male exercised rats were primarily associated with increased RR duration and Wenkebach cycle length (WCL 109.8 ± 4.7 ms MEx vs. 97.3 ± 2.1 ms MCo, $p < 0.05$) compared to control ones. Exercise training was related to increased R wave amplitude and QRS duration in both genders and we could induce non-sustained atrial flutter in two (one male and one female) exercised animals by double extrastimulation.

Our data suggests that exercise-induced cardiac hypertrophy might hold an increased risk of arrhythmia. In male individuals elevated parasympathetic tone, while in female ones marks of atrial remodeling could be the characteristic alterations.

P933

Association of the atrial fibrillation and sinus bradycardia with the polymorphism of the calcium-transporting proteins of the sarcoplasmic reticulum of cardiomyocytes

Archakov EA.; Batalov R.; Usenkov S.; Smorgon A.; Khlynin M.; Muslimova E.; Afanasiev S.; Popov S.

State Research Institute of Cardiology of Tomsk, Tomsk, Russian Federation

Aim: To assess the relationship of polymorphisms of calcium-transporting sarcoplasmic reticulum proteins: calsequestrin, ryanodine receptor, Ca^{2+} -ATPase with the development of the atrial fibrillation (AF), sick sinus syndrome (SSS) and their combinations. The study included 149 patients, 84 men (56%), mean age 59.2 ± 14.9 years. Patients were divided into 3 groups according to the type of the heart rhythm disorder. The first group included 53 patients with a combination of AF and SSS in age from 31 to 93 years (mean age 67.3 ± 11.6 years). In the second group - 75 patients with AF, the mean age was 52.3 ± 13.2 years. In the third - 21 patients with SSS, the mean age is 63.4 ± 16.4 years. All patients underwent the polymerase chain reaction of the blood to determine the genotype.

Result: we analyzed of the polymorphism of calsequestrin CASQ2 rs6684209. In the first group, 38 patients (55.8%) were identified with a carrier of the CC genotype, 11 (16.1%) – CT, 1 (1.5%) – TT. In the second group 38 patients had the CC genotype (53.5%), CT – 15 (21.1%), TT – 1 (1.4%). In the third group, the CC genotype was found in 11 cases (55.0%), CT – in 6 (33.0%). Also we studied of the rs3766871 polymorphism of the RYR2 ryanodine receptor gene. In the first group 51 patients (96.2%) were identified with a carrier of the GG genotype, 2 (3.7%) – GA genotype. In the second group, 72 patients (96.4%) had the GG genotype, GA - 2 (2.6%). In the third group, the GG genotype was found in 19 cases (90.4%), GA – in 2 (9.5%). The prevalence of allele A was 1.8% in the first group, 2.7% in the second, and 9.5% in the third. The analyzed of the rs1860561 polymorphism of the Ca^{2+} -ATPase ATP2A2 (SERCA2A) revealed 33 patients (62.2%) with the GG genotype carriers, 19 (35.8%) – GA, 1 (1.8%) – AA in the first group. In the second group, the GG genotype had 50 patients (66.6%), GA - 23 (30.6%), and AA – 2 (2.6%). In the third group the GG genotype was found in 12 patients (57.2%), GA – in 9 (42.8%). The prevalence of allele A was 18.8% in the first group, 18% in the second, and 21.4% in the third. We found that in patients with the CC genotype of the CASQ2 gene, the left atrium was 42.7 ± 3.9 mm, and with the CT – 39.9 ± 5.1 mm ($p < 0.01$). The relationship of the size of the left atrium with the polymorphisms of other genes was not found.

Conclusions: the associations of the rs6684209, rs3766871, rs1860561 polymorphisms of the calcium-transporting system genes and the development of AF, SSS and their combinations were not identified. Patients with a heterozygous genotype of the CASQ2 gene were less prone to the left atrial dilatation than patients with a homozygous genotype.

P934

The effectiveness of catheter treatment of "idiopathic" form of atrial fibrillation depending on the histological changes in the myocardium

Shelemehov A.¹; Batalov RE.¹; Usenkov SU.¹; Archakov EA.¹; Gusakova AM.²; Rogovskaya UV.²; Rebenkova MS.²; Khlynin MS.¹

¹State Research Institute of Cardiology of Tomsk, Department of surgical treatment of complex cardiac arrhythmias and pacing, Tomsk, Russian Federation

²State Research Institute of Cardiology of Tomsk, Tomsk, Russian Federation

The term of "idiopathic" form of the atrial fibrillation (AF) is conditional and necessary to find the cause of the arrhythmia. Endomyocardial biopsy (EMB) may reveal such findings as the active lymphocytic myocarditis, the lymphocytic infiltration (LI), the fibrous changes (FC) and viral invasion. The effectiveness of the interventional treatment (IT) of AF is limited. This is due to the fact that the pathophysiology of the AF development is not fully clear, and there is a group of patients who haven't documented reason for the arrhythmia development. The myocardium inflammation may play a great role in the AF occurrence.

Aim: to identify the histological changes in the myocardium in patients with "idiopathic" form of AF and to determine the IT effectiveness depending on the histological changes in the myocardium.

Material and methods: The study included 81 patients (64 male (79%)) with the "idiopathic" form of AF. The average AF anamnesis was 5.5 ± 4.6 years. We excluded all known conditions, that may lead to the AF development using clinical and paraclinical methods. The radiofrequency the pulmonary veins isolation were performed. EMB from the right ventricular (RV) apex, interventricular septum and the RV outflow tract was taken. The histological and immunohistochemical studies of the biopsy material for the detection of viruses antigens (herpes viruses 1, 2 and 6 types, Epstein-Barr, adenovirus, enterovirus, cytomegalovirus, parvovirus) were performed. All patients received antiarrhythmic therapy within 3 months after the intervention. The inflammatory process activity was determined according to the Cristina Basso criteria. The effectiveness of IT was evaluated in 6 month follow up period. All patients were divided into 3 groups.

Results: According to the results of EMB, ALM was detected in 50 pts (61.7%) – the first group, LI – in 23 pts (28.4%) – the second group, no inflammatory changes – in 8 pts (9.9%) – the third group. FC in the myocardium were detected in patients of all groups. The groups differed significantly among themselves, and in the third group the level of fibrosis was the lowest. According to the data obtained the viral invasion was detected in all patients from the first group. The combination of two viruses was documented in more than 50% (33 pts) and 28 pts of them a combination of the enterovirus and herpes virus type 6 antigens was revealed. In the second group, the viral invasion was detected in 14 pat. (60.9%), and in the third only in 2 patients (25%). The effectiveness of IT was 78% in the first group, 60.9% in the second group, and 28% in the third group.

Conclusions: According to study ALM was detected in 61.7% pts with the "idiopathic" form of AF. FC of different level were detected in all groups. More than 80% of pts in all groups had the viral invasion with various viruses. The effectiveness of IT in the first group was 78%, in the second 60.9%, in the third 28%.

Subject: Poster session 2 --

P935

Circulating EPC levels in ischemic and non-ischemic heart failure: why benefit from CRT differs

Milner J.¹; Antonio N.¹; Ferreira J.¹; Domingues C.¹; Cristovao G.²; Ventura M.¹; Cristovao J.¹; Elvas L.¹; Paiva A.²; Goncalves L.¹¹University Hospitals of Coimbra, Cardiology Department, Coimbra, Portugal²Faculty of Medicine of the University of Coimbra, Coimbra, Portugal

Background: Endothelial Progenitor Cells (EPCs) are multipotent adult stem cells that circulate in the peripheral blood, playing an important role in postnatal neovascularization and repair of ischemic cardiac injury. However, levels of circulating EPCs are reduced in coronary artery disease (CAD) and correlate inversely with the severity of CAD. As such, EPC levels would be expected to be reduced in ischemic cardiomyopathy (ICM), yet little is known about EPCs in patients with chronic heart failure (HF). We sought to evaluate the relationship between the underlying HF etiology and circulating EPC levels.

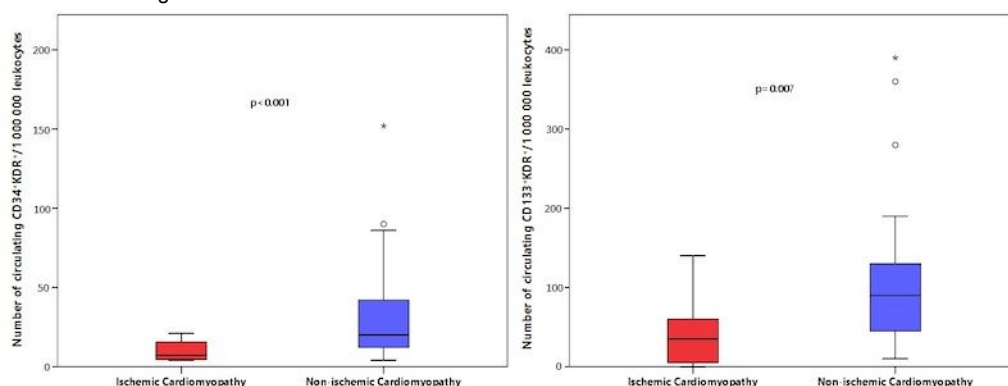
Population and methods: Prospective, single-center study of 50 patients with advanced HF submitted to cardiac resynchronization therapy (CRT), including 11 patients with ischemic cardiomyopathy (ICM) and 39 with non-ischemic dilated cardiomyopathy (DCM). Two populations of circulating EPCs were evaluated by flow cytometry previously to CRT implantation: CD34 + KDR+ and CD133 + KDR+ cells. Response to CRT was defined as a reduction in left ventricular end-systolic volume of $\geq 15\%$ at 6-months follow up. The mean follow-up was 5.4 ± 2.3 years.

Results: Compared with patients with DCM, patients with ICM were more frequently male (100 vs 54%, $p = 0.005$) and exhibited more cardiovascular risk factors. There were no significant differences in age, QRS duration, left ventricular ejection fraction or volumes between the 2 groups. Regarding remodeling response to CRT, patients with ICM tended to present a lower proportion of responders than patients with DCM (36.4% vs 64.1%, $p = 0.098$, respectively). During follow-up, there were no significant differences in the mortality rate or heart transplantation rate between groups (36.4% in ICM vs 35.9% in DCM, $p = 0.977$ and 9.1% vs 2.6%, $p = 0.329$, respectively). However, patients with ICM tended to be more often hospitalized due to HF than DCM patients (mean number of hospitalizations: 1.8 ± 2.0 vs 0.8 ± 1.3 , $p = 0.052$, respectively and hospitalization rate: 63.6% vs 38.5%, $p = 0.137$, respectively). Patients with ICM showed significantly lower levels of circulating EPCs when compared to their counterparts, which was observed for both the CD34 + KDR+ (32.7 ± 31.6 vs 9.9 ± 6.8 cells/1 000 000 leukocytes, $p < 0.001$) and the CD133 + KDR+ (11.4 ± 9.5 vs 4.3 ± 4.7 cells/1 000 000 leukocytes, $p = 0.007$).

Conclusions: This study shows that in chronic HF, patients with an ischemic etiology exhibit significantly lower levels of circulating EPCs than their non-ischemic counterparts, reflecting a poorer endogenous regenerative capacity. This

EPC pauperization may hinder the left ventricular reverse remodeling process, necessary for response to CRT, and may justify why ICM patients typically benefit less from CRT.

Abstract P935 Figure.



P936

Chronic if current blockade prevents heart rate lowering during acute vagal stimulation

Scridon A.¹; Halatiu VB.²; Balan AI.²; Cozac DA.²; Perian M.²; Serban RC.³

¹University of Medicine and Pharmacy, Center for Advanced Medical and Pharmaceutical Research, Tirgu Mures, Romania

²University of Medicine and Pharmacy, Tirgu Mures, Romania

³University of Medicine and Pharmacy, Emergency Institute for CV Diseases and Transplantation, Tirgu Mures, Romania

Funding Acknowledgements: This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS-UEFISCDI, PN-II-RU-TE-2014-4-1544

OnBehalf: NA

Background: Ivabradine, an If current blocker, has shown promising results in the treatment of patients with sinus tachycardia-mediated vasovagal syncope (VVS). However, the effects of ivabradine in the setting of VVS without prior sinus tachycardia remain unknown.

Purpose: We aimed to assess the effects of chronic ivabradine administration on the heart rate and blood pressure of in vivo rats and on in vitro sinus node discharge rate, both during acute parasympathetic stimulation.

Methods: Thirteen adult male Wistar rats were randomized into two groups: control (C; n = 6) and treated with ivabradine (IVA; 10 mg/kg/day, for three consecutive weeks; n = 7). The right vagus nerve was isolated in all rats. The intact vagus nerve was stimulated electrically at a frequency of 2, 5, 10, and 20 Hz (15 s each) with 5-min intervals between stimulations (pulse duration 0.5 ms; 20 V). The nerve was then sectioned and the distal end was stimulated using the same protocol. The heart rate and the systolic blood pressure were measured non-invasively at baseline and during each stimulation. The right atrium was then removed, placed in the Steiert organ bath, and the discharge rate of the sinus node was assessed in vitro at baseline and after applying carbamylcholine in progressively higher concentrations (10⁻⁹ to 10⁻⁶ mol/L).

Results: As expected, the two groups displayed similar baseline systolic blood pressure (p = 0.95), but IVA rats presented significantly lower heart rates compared to the C rats (p = 0.02). A significant, progressive decrease in systolic blood pressure was recorded during electrical stimulation of both the intact and the sectioned vagus nerves, in both the C and the IVA rats (all p < 0.001). In the C rats, a significant, progressive decrease in heart rate was also recorded during electrical stimulation of both the intact and the sectioned vagus nerves (both p < 0.0001). In the IVA rats, however, electrical stimulation of the intact or the sectioned vagus nerves had no effect on the heart rate (both p > 0.05). A significant, progressive decrease in sinus node discharge rate was also observed in vitro, after applying progressively higher carbamylcholine concentrations, in both the C and the IVA rats (both p < 0.001).

Conclusion: In rats, chronic If current blockade prevented the heart rate lowering effect of acute in vivo vagus nerve stimulation, without affecting the blood pressure response. Meanwhile, ivabradine administration had no effect on sinus node discharge rate lowering in response to direct acetylcholine receptors stimulation. These results suggest that the beneficial effects of ivabradine reported in patients with tachycardia-mediated VVS may also extend to patients with vagal hypersensitivity and excessive cardioinhibitory responses. Our data also suggest that this 'protective' ivabradine effect is likely to be related to an effect of ivabradine on ganglionic transmission and/or on postganglionic cholinergic fibers.

Subject: Poster session 2 --

P937

Cell specific reactivation of epicardium at the origin of fibro-fatty remodeling of the atrial myocardiumSuffee N.¹; Moore-Moris TMM²; Mougnot NM.¹; Tregouet DAT¹; Dilanian GD.¹; Berthet MB.¹; Le Prince PLP¹; Puceat MP.²; Hatem SN.¹¹University Pierre & Marie Curie Paris VI, UMR_S1166, Paris, France²Aix-Marseille University, INSERM UMR_S910, Marseille, France

Background & Purpose. Atrial fibrillation (AF) is often associated with an atrial cardiomyopathy, with fibro-fatty infiltrations of the sub-epicardium as an important component. We previously reported that epicardium-derived cells (EPDCs) can differentiate into adipocytes contributing to fat depot. Here, we examined if fibroblasts can also derived from EPDCs and contribute to the fibrotic remodeling of atrial subepicardium.

Methods. Samples of human right atria obtained during routine cardiac surgery were used for histological study and to harvest EPDCs. Clinical and histological data were analyzed using generalized linear models. A model of ischemic heart failure and atrial cardiomyopathy was created in rats and in a genetic lineage tracing WT1CreERT2+/-/Rosa-tdT+/- mice to follow. Primary cell culture models was used to study EPDC differentiation. Flow cytometry assays and single cell sequencing were used to characterize subpopulations of EPDCs.

Results. In human atria, epicardium could be composed of a thin cell monolayer in contact with myocardium or adipose tissue or could be a thick layer in continuity with dense fibro-fatty infiltrates. The latter aspect predominated in old patient (>70 year) with valve mitral diseases or in AF, clinical conditions associated with an atrial cardiomyopathy. Indeed, one week after the onset of the atrial remodeling, epicardium was already thick and fibrotic both in rat and mouse. Cells co-expressing markers of epicardial progenitors and fibroblasts were detected in the subepicardium of diseased atria both in human and murine. Moreover, a number of myo/fibroblasts from WT1CreERT2+/-/Rosa-tdT+/- mice were detected in diseased atria attesting of their epicardial origin. Distinct EPDC clusters were detected from cells harvested from epicardium whereas only PDGFRa-positive cells could differentiated into fibroblasts.

Conclusions. Epicardium activation is an early event during atrial remodeling, and is a source of fibroblasts contributing to fibro-fatty remodeling. Epicardium regulates the balance between adipose expansion and fibrosis accumulation and appears as a key determinant of atrial cardiomyopathy progression.

Subject: Poster session 2 -- Arrhythmias, General – Diagnostic Methods

P938

European experience with a novel high-density grid-style mapping catheter

Della Bella P.¹; Huo Y.²; Deisenhofer I.³; Roca-Luque I.⁴; Brunelli M.⁵; Moreno J.⁶; Parwani AS.⁷; Roithinger FX.⁸; Schonbauer R.⁸; Sultan A.⁹; Anguera I.¹⁰; De Asmundis C.¹¹; Gora P.¹²; Schilling C.¹²; Sommer P.¹³

¹San Raffaele Hospital of Milan (IRCCS), Milan, Italy

²Herzzentrum Dresden, Dresden, Germany

³DHZ Munich, Munich, Germany

⁴Hospital Vall d'Hebron, Barcelona, Spain

⁵Klinikum Magdeburg, Magdeburg, Germany

⁶Hospital Ramon y Cajal, Madrid, Spain

⁷Charite - Campus Virchow-Klinikum (CVK), Berlin, Germany

⁸LK Wiener Neustadt, Wiener Neustadt, Austria

⁹Uniklinikum Köln, Köln, Germany

¹⁰Hospital Bellvitge, Barcelona, Spain

¹¹University Hospital (UZ) Brussels, Brussels, Belgium

¹²Abbott, Minneapolis, United States of America

¹³Heart and Diabetes Center NRW, Bad Oeynhausen, Germany

Introduction: A novel high-density mapping catheter received CE Mark in December 2017. The catheter is a closed-frame, four spline catheter with electrodes configured in a grid pattern. Electrode spacing is equidistant along and across splines, enabling adjacent bipolar EGMs to be recorded in two dimensions. Procedural data from multicenter experience with this high-density mapping catheter is presented.

Methods: Self-reported procedural data was collected in cases utilizing the newly approved mapping catheter during the first nine months of commercialization in Europe. Procedural characteristics recorded included indication for mapping and ablation and electrode configuration.

Results: Procedural data was collected for 1,225 cases across 131 European centers. A total of 17 indications for mapping and ablation were represented including AF, VT, and atypical flutter (Table 1). The HD Wave Solution electrode configuration, which selects the best duplicate EGM from orthogonal bipoles, was used in 58.1% of cases. The All Bipole configuration was used in 36.9% of cases, and the Along Spline configuration in 4.8% (electrode configuration not reported in two cases).

Conclusions: European experience with this high-density mapping catheter included a wide variety of atrial and ventricular arrhythmias. Equidistant spacing of electrodes in a grid pattern enabled use of a configuration which samples EGMs in two directions, selecting the best of two orthogonal bipoles for inclusion in the map. This novel configuration was used in the majority of atrial and ventricular procedures.

Indications for Mapping & Ablation

Indication for Mapping & Ablation	Case Count (%)
Paroxysmal AF	282 (23.0%)
Persistent AF	258 (21.1%)
Ischemic VT	158 (12.9%)
Atypical Flutter	144 (11.8%)
AT	76 (6.2%)
Idiopathic VT	69 (5.6%)
NICM VT	67 (5.5%)
Typical AFL	59 (4.8%)
PVC	49 (4.0%)
Other/Undefined	63 (5.1%)

Subject: Poster session 2 -- Arrhythmias, General – Diagnostic Methods

P940

Reactivity of autonomic nervous system in patients with ventricular arrhythmias

Alekseeva DYU; Mamontov OV.; Shlyakhto EV.

Almazov National Medical Research Centre, Saint Petersburg, Russian Federation

Purpose. To examine the activity of autonomic nervous system (ANS) in patients with ventricular arrhythmias (VAs) without structural heart disease in relation to the presence of anxiety.

Methods. The study group consisted of 66 subjects (29 males, mean age 42.5 ± 7.0 years) with frequent VAs ($11211.6 \pm 9995.6/24h$) during Holter ECG without structural heart disease with a high level of anxiety. All patients underwent a clinical examination, ECG, echocardiogram, ETT, Holter ECG, psychological questionnaires, psychological counseling, and mental stress tests (MST). They included emotional Stroop Color and Word Test, Anger recall, arithmetic task, talk about the disease (modification of interview). ANS reactivity was assessed using Valsalva maneuver and hand grip. The comparative analysis of reaction of VAs between MST, Valsalva maneuver and hand grip has been performed.

Results. Exaggerated reactivity of both sympathetic and parasympathetic nerves associated with appearance/increase of VAs during Stroop Color and Word Test (1.6 ± 1.8 ; $p < 0.05$, and 0.7 ± 0.9 ; $p < 0.05$). Exaggerated reactivity of parasympathetic nerves was associated with disappearance/decrease of VAs during Stroop Color and Word Test (1.4 ± 1.7 ; $p < 0.05$).

Exaggerated reactivity of parasympathetic nerves was associated with disappearance/decrease of VAs (0.7 ± 0.9 ; $p < 0.05$) (7.1 ± 7.3 , and 2.8 ± 4.2 ; $p < 0.05$) and appearance/increase of VAs (0.9 ± 0.8 ; $p < 0.05$) during arithmetic task.

Exaggerated reactivity of parasympathetic nerves was associated with disappearance/decrease of VAs during talk about the disease (8.5 ± 8.4 ; $p < 0.05$)

We found that a correlation by the reaction of VAs between MST and ETT was absent.

Conclusions. Parasympathetic over-regulation is involved in the disappearance/decrease of VAs during MST. Both sympathetic and parasympathetic nerves associated with appearance/increase of VAs during MST. The absence of correlation between MST and ETT showed a different effect of psychoemotional and physical stress on the ventricular ectopic focus.

Treatment of frequent VAs in subjects without structural heart disease with anxiety includes the identification and management of trigger factors, and, in selected cases, pharmacological and interventional treatment. Our data suggest that MST allow to identify the reactivity of ANS in patients with ventricular arrhythmias without structural heart disease and select effective antiarrhythmic therapy.

P941

Non-invasive activation maps for patients with intraventricular conduction disturbance during sinus rhythm: a comparative study

Budanova M.¹; Potyagaylo D.²; Chmelevsky M.¹; Zubarev S.¹; Treshkur T.¹; Lebedev D.¹

¹Almazov National Medical Research Centre, St-Petersburg, Russian Federation

²EP Solutions SA, Yverdon-les-Bains, Switzerland

Introduction

Activation maps obtained by non-invasive electrophysiological mapping (NEM) is a high-potential tool for analysis of excitation propagation in normal heart and in the presence of cardiac arrhythmias or conduction disturbances. However, it is well known that distinct ECG imaging (ECGI) formulations result in activation maps of different quality and clinical interpretability. In this work, we present a qualitative comparison of two ECGI techniques in patients with various intraventricular conduction patterns in sinus rhythm.

Purpose

Improve the accuracy of activation maps and, thereby, their clinical value.

Methods

Three patients with different ECG patterns of intraventricular conduction underwent NEM of a sinus rhythm using "Amycard 01C EP lab" system. First patient had an ECG corresponding to a 'healthy' sinus rhythm without conduction disturbances. Second patient had left anterior fascicular block (LAFB) and anamnesis of myocardial infarction (MI). Third patient had left bundle brunch block (LBBB). For all patients, the activation maps were created with two methods: first, isochronal maps were derived from isopotential ones using the activation direction method (ADM). Then, the nonlinear inverse ECG problem was solved in terms of depolarization times with the initial estimate provided by the critical point theorem (CPT method). The reconstruction phase was followed by visual assessment of excitation propagation and comparison with clinical and ECG data.

Results

The isochrones created by the ADM showed an early activation zone (EAZ) and the latest activation zone (LAZ) in the same cardiac regions. The EAZ for the first patient was located on the anterior RV wall, for the second and the third it was situated at the RV apex. While in the first two patients the LAZ was located at the LV apex, the LBBB patient showed an additional LAZ on inferior-basal LV wall (Figure 1.A). In contrast, the CPT method better agree with existing reports on excitation propagation in sinus rhythm. For the LBBB patient, the excitation started almost at the same time from the septal RVOT wall, inferior-basal and middle-lateral RV walls and spread further to the LV through the epicardial surface. In the LAFB patient, the EAZs were found on the RV lateral-middle and LV lateral-basal walls. For the patient without bundle branch block, the non-invasively reconstructed EAZs were located on the RVOT lateral wall and inferior-middle part of the RV. With regard to the LAZ, the LBBB activation map featured the LV lateral-basal part (Figure 1.B). For the LAFB patient, also the LV lateral-basal wall was marked being late activated, that can be caused by the past IM. For the first patient, the LAZ was recovered on the anterior-lateral-basal part of the LV and the LV apex.

Conclusion: The ECGI in terms of depolarization times resulted in improved activation maps and well reflects the processes of the excitation propagation in the heart.

Abstract P941 Figure.

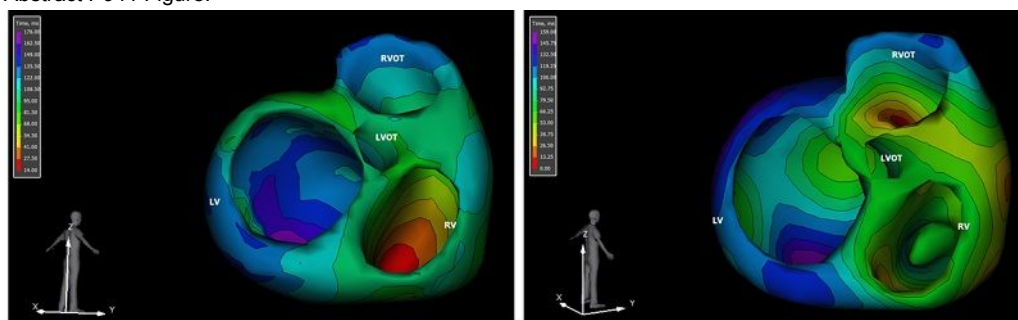


Figure 1. Activation maps for LBBB patient. A. Activation map created by ADM. B. Activation map created by CPT method.

Subject: Poster session 2 -- Arrhythmias, General – Diagnostic Methods

P942

Development and validation of a new ECG algorithm to diagnose the origin of endocardial outflow tract ventricular arrhythmias with a lead V3 precordial transition

Lazzari L.; Tordini A.; Marini C.; Donzelli S.; Carreras G.

"S. Maria" Hospital, Electrophysiology Division, Terni, Italy

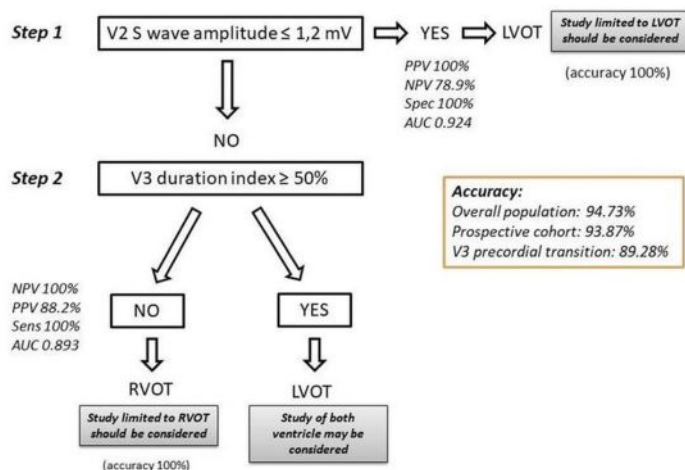
Background: To distinguish the origin of outflow tract ventricular arrhythmias (OT-VAs) with a V3 precordial transition (PT) is still a challenge. To date, the sequential approach, i.e. the study of the left ventricle OT (LVOT) only if the right ventricle OT (RVOT) findings are inconclusive, is the gold standard. However, some foci need to be studied from both ventricles as neighboring structures may be closer than the activation \ pace-mapping spatial resolution, thus misleading aortic cusp VAs as originating from septal RVOT.

Methods: 49 patients (Pts) with a left bundle branch block pattern OT-VAs were enrolled (RVOT 51.02%, LVOT 48.98%, V3 PT 57.14%). ECG characteristics of 30 Pts who underwent successful catheter ablation were analyzed for the development of a new algorithm (Pts with a V3 PT were studied in both ventricles, regardless of the findings), which was validated in a prospective cohort (19 Pts).

Results: Morphological variables with a statistically significant difference (U-Mann Whitney and t-test), better AUC and odd ratio were used: a V2 S wave amplitude ≤ 1.2 mV establishes certain diagnosis of origin at LVOT [sensitivity 73.3%, specificity 100%, PPV 100%, NPV 78.9%, $p = 0.000$, AUC 0.924; OR 6.5 (95% CI 1.8 - 28.8), $p = 0.014$].

If V2 S wave is > 1.2 mV, a V3 duration index (DI) $< 50\%$ establishes certain diagnosis of origin at RVOT [sensitivity 100%, specificity 88.2%, PPV 100%, NPV 88.2%, $p = 0.000$, AUC 0.893; OR 7.5 (95% CI 1.7 - 32.7), $p = 0.007$]. VAs with a V2 S wave is > 1.2 mV and V3 DI $\geq 50\%$ may originate from LVOT (VPP 88.2%) and a study of both ventricles is recommended. Conclusions: our algorithm allows to simplify the ablation procedure of most OT-VAs with a V3 PT (67.85%), limiting the study to one ventricle, while it can select a small sub-group of complex Pts in which a study of both ventricles is recommended (similar RVOT\LVOT findings). It also showed higher accuracy (94.73%) than other criteria in the prospective cohort.

Abstract P942 Figure. Terni Algorithm



P943

Diagnostic and prognostic value of the QRS-T angle in patients with suspected acute decompensated heart failure

Sweda R.¹; Sabti Z.²; Strebel I.²; Kozuharov N.²; Badertscher P.²; Keller DI.³; Breidthardt T.²; Haeberlin A.¹; Tanner H.¹; Mueller C.²; Reichlin T.¹

¹Bern University Hospital, Department of Cardiology, Bern, Switzerland

²University of Basel, Department of Cardiology and Cardiovascular Research Institute Basel, Basel, Switzerland

³University Hospital Zurich, Emergency Department, Zurich, Switzerland

Background/Introduction: In patients with suspected acute decompensated heart failure (ADHF), rapid diagnosis of the underlying cause and accurate risk stratification are of utmost importance.

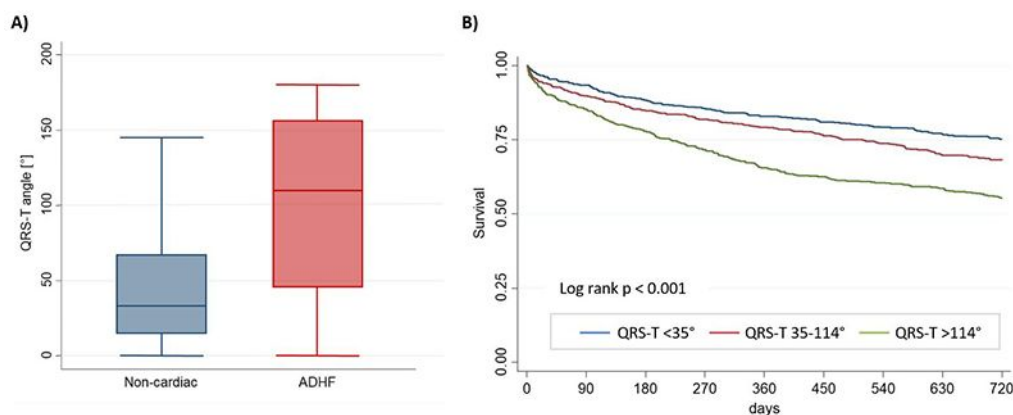
Purpose: To evaluate a) the diagnostic value of the QRS-T angle to discriminate between ADHF and non-cardiac causes of acute dyspnea and b) its prognostic value on short- and long-term rehospitalizations and mortality.

Methods: Unselected patients presenting to the emergency department with suspected ADHF were prospectively enrolled at two tertiary care centers. The QRS-T angle was automatically derived from 10-second 12-lead ECGs recorded at presentation. Patients were followed up for 2 years.

Results: ADHF was the final diagnosis in 60% of 1915 enrolled patients. The QRS-T angle was significantly higher in patients with ADHF than in patients with non-cardiac dyspnea (110° [IQR 46°-156°] vs. 33° [IQR 15°-57°], $p < 0.001$, figure panel A). The diagnostic accuracy of the QRS-T angle as quantified by the AUC was 0.75 (95%CI 0.73-0.77, $p < 0.001$) in the overall population and remained similarly high in patients with conduction disturbances, advanced age, atrial fibrillation and renal failure. Mortality rates according to QRS-T angle tertiles were 4%, 6% and 10% after 30 days and 24%, 31% and 43% after 2 years respectively (all $p < 0.001$, figure panel B). After adjustment for age, gender, BMI, medical history and QRS duration, 30-day and 2-year mortality were independently increased by 10% and 6% for every 20°-increase of the QRS-T angle ($p = 0.014$ and $p = 0.001$ respectively).

Conclusion: The QRS-T angle is a fast and inexpensive method that can assist in the discrimination between ADHF and non-cardiac causes of acute dyspnea. Due to its prognostic value with regard to both short- and long-term mortality it may moreover help in the risk stratification of these patients.

Abstract P943 Figure



Subject: Poster session 2 -- Arrhythmias, General – Diagnostic Methods

P944

Impact of mapping points in high density mapping of the left atrium

Seifert MARTIN¹; Erk J.¹; Fehrendt S.¹; Moeller V.¹; Georgi C.¹; Butter C.¹; Heiderfazit S.²

¹Heart Center Brandenburg and Immanuel Klinikum, Bernau (Berlin), Germany

²Netzwerk Rhythmologie, Cardiology, Berlin, Germany

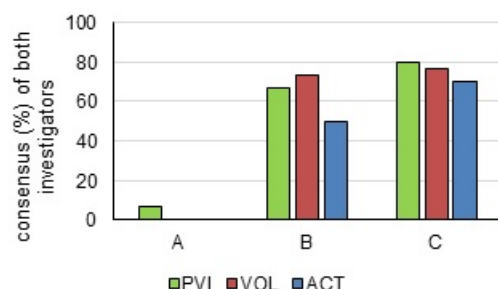
Background: Currently high-density mapping techniques are under discussion for more precisely voltage mapping, lesion validation after pulmonary vein isolation (PVI) and superior left atrial tachycardia (LAT) mapping. But the quality of high-density maps varies obviously from different mapping systems, multipolar catheter (MPC) types and numbers of mapping points. The aim of this study was to evaluate the impact of different numbers of mapping points in high-density mapping.

Methods: From February 2016 to August 2018 154 patients with previous PVI ablation and recurrence AF or LAT were mapped by multipolar catheter and a mapping system in our center. Out of them n = 30 patients centre [♂ n = 16 / ♀ n = 14; Age 76 ± 12 (53-87) years] with 8,000 to 15,000 mapping points in the primary map were collected out and were remapped with deactivated 16 of 64 electrodes of MPC (B) and 24 of 64 electrodes of MPC (A) to incorporate Maps with A <1,000 mapping points, B 2,000 to 6,000 mapping points and C 8,000 to 16,000 mapping points. All maps n = 90 were evaluated offline blindly and anonymously also by an independent and out clinic electrophysiologist in terms of PVI is evaluably in all veins yes or no, voltage map is complete appraisable in the hole left atrium (LA) and show the same low voltage areas yes or no and activation map is reveal the same critical isthmuses yes or no.

Results: In A (< 1,000) only in 1 pts (3.4%) both investigators agreed with evaluably PVI in all veins, in B (2,000-6,000) in 20 pts (66.7%) both investigators agreed with evaluably PVI in all veins and in C (8,000-16,000) in 24 pts (80%) both investigators agreed with evaluably PVI in all veins. In A in 0%, in B in 57% and in C in 78% of all maps both investigators were completing appraisable the voltage map of hole left atrium and the same low voltage areas. Finally A in 0%, B in 10% and C in 64% of all 30 maps both investigators could locate the same critical isthmuses in the activation maps.

Summary: To reach reliable and precise high-density maps which are continuously endured by independent investigators minimum 2,000 to 6,000 mapping points are needed in the majority of voltage maps to evaluated PVI and low voltage areas. But to definite the critical isthmuses in activations maps 8,000 or even more mapping points are necessary. High-density maps with more than 8,000 point increase the inter-rater reliability.

Abstract P944 Figure.



P945

Correlations between voltage map and p wave duration in patients with bayes syndrome undergoing catheter ablation for atrial fibrillation

Minciuna IA.; Cismaru G.; Rosu R.; Simu G.; Florea C.; Istratoaie S.; Gusetu G.; Zdrenghea D.; Pop D.; Puiu M.

Clinical Rehabilitation Hospital Cluj-Napoca, Cluj Napoca, Romania

INTRODUCTION: Bayes syndrome is defined as inter-atrial conduction block and is objectivized on surface ECG by a P wave duration (PWD) greater than 120 ms. This causes delayed and asynchronous left atrial (LA) activation which leads to electrophysiological and structural remodeling (dilatation, fibrosis), thus predisposing to atrial fibrillation (AF) development. Although the pulmonary veins play a crucial role in initiating AF, an important piece of the puzzle for AF initiation and perpetuation is represented by LA fibrosis. Electroanatomical voltage mapping has shown to be a reliable marker of LA fibrosis by identifying low-voltage areas in the myocardium, which have proven to have arrhythmogenic role and being also an independent predictor of AF recurrence after catheter ablation.

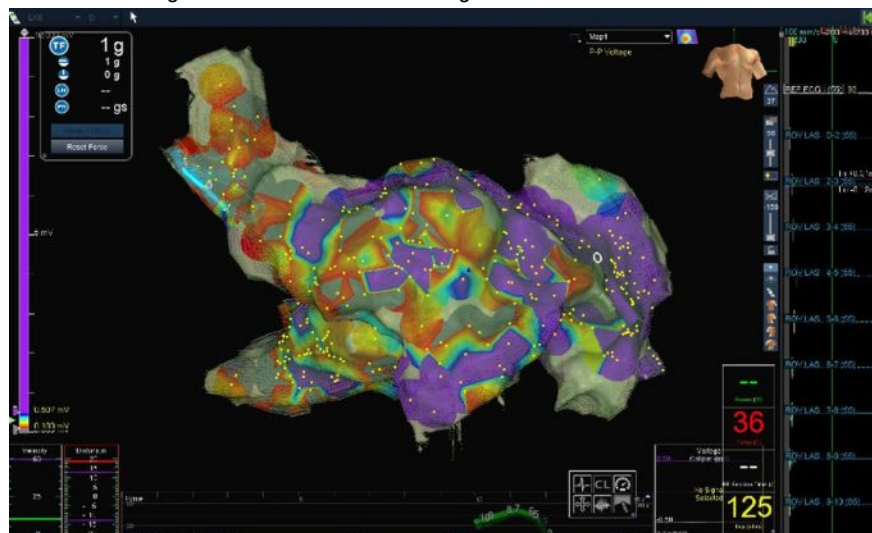
PURPOSE: The aim of this study is to see whether there is a correlation between PWD in Bayes syndrome patients and LA fibrosis assessed by low-voltage area at electroanatomical mapping prior to AF catheter ablation.

METHODS: Twenty patients undergoing catheter ablation for paroxysmal or persistent AF were subjected to bipolar voltage mapping in sinus rhythm at the beginning of the procedure. We compared maximum and minimum PWD (Pmax, Pmin), P wave dispersion (Pd = Pmax - Pmin) and LA PWD (measured from -dV/dt in leads V1 and V2 until the end of the P-wave) on surface amplified 12-lead ECG with LA low-voltage area before starting ablation shots. The presence of LA low-voltage area was defined as total area > 2 cm² at voltages < 0.5 mV.

RESULTS: Of our group, 15 patients were men (75%) and 12 patients had paroxysmal AF (60%). 10 patients had LA low-voltage area > 2 cm² (50%) in which the mean value was 12.5 ± 5.8 cm². The mean number of sampled bipolar voltage points was 2000. We found that higher LA low-voltage area was correlated with higher Pd ($R = 0.62$, $p = 0.005$), LA PWD ($R = 0.61$, $p = 0.004$) and Pmax values ($R = 0.506$, $p = 0.023$), whereas there was no correlation with Pmin. Patients that had LA low-voltage area > 2 cm² had also higher inter- and intraatrial conduction times - Pmax (143.4 ± 16.6 vs. 124.8 ± 5.9 , $p = 0.005$), Pd (49.7 ± 8.9 vs. 35.3 ± 6.5 , $p = 0.004$) and LA PWD (58.7 ± 11.3 vs. 42.89 ± 4.20 , $p = 0.008$) compared to patients with LA low-voltage area < 2 cm². The three parameters remained statistically significant after adjustment to the number of bipolar voltage points.

CONCLUSIONS: Left atrial fibrosis assessed by electroanatomical voltage mapping prior to AF catheter ablation is associated with higher inter- and intraatrial conduction times measured by PWD on 12-lead surface amplified ECG in Bayes syndrome patients. The presence of a higher LA low-voltage area in patients with paroxysmal or persistent AF is correlated with higher PWD values and could be an important predictor of arrhythmia recurrence after catheter ablation.

Abstract P945 Figure. LA anterior wall low-voltage



Subject: Poster session 2 -- Arrhythmias, General – Diagnostic Methods

P946

Association of late gadolinium enhancement in cardiac magnetic resonance and alterations such as arrhythmias and heart rate variability measured in electrocardiographic holter 24-48 hours

Diaz Garzon AA.¹; Castro JA.¹; Diana Vargas Vergara DVV¹; Manrique T.²; Brugada Tarradellas J.³; Medina H.²; Diaztagle JJ.¹; Ayala MC.¹; Forero JJ.²; Olaya AO.¹

¹Fundación Universitaria de ciencias de la salud, Cundinamarca, Bogotá, Colombia

²Foundation Cardioinfantil, Bogota, Colombia

³Hospital Clinic de Barcelona, Barcelona, Spain

Funding Acknowledgements: COLCIENCIAS - COLOMBIA

OnBehalf: NO

INTRODUCTION

The Late Gadolinium Enhancement (LGE) in cardiac magnetic resonance (CMR) is defined as a dense fibrosis area that is fixed and irreversible, and its presence and extension is considered a prognostic marker (1). Previous studies have shown the association with the presence of monomorphic ventricular tachycardia (2), as well as the presence of left ventricular enhancement as a better marker of arrhythmogenic cardiomyopathy (3). There is a few known data and more studies are required to show this association in Chagas Disease (CD).

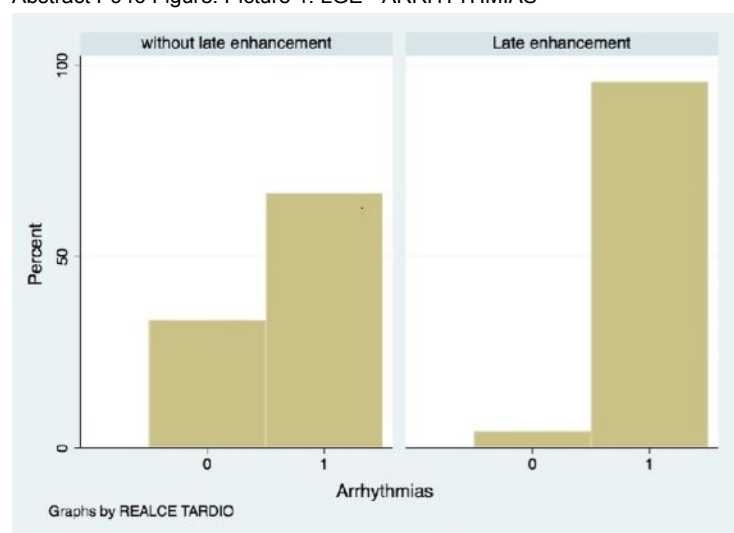
OBJECTIVE: We aimed to determine the association between the LGE and arrhythmias in Chagas seropositive patients by means of CMR and a 24 hours holter ECG

METHODS: Subanalysis of the cohort "Cardiovascular magnetic resonance as a predictor of Sudden Cardiac Death in Chagas Disease", we analyzed 38 enrolled patients (26 female, age= $57 \pm 3,77$) with chronic Chagas disease to determine if the presence of LGE is related to the presence of arrhythmias and the changes of the variability of the heart rate measured by 24 hours holter ECG. The primary endpoint is the highest incidence of arrhythmias in patients with LGE; and the secondary endpoint is the severe decrease in heart rate variability. Comparisons were performed by means of Chi-square test, calculating the Odds Ratio (OR) and 95% confidence intervals (CI) by STATA 15

RESULTS: The primary outcome was observed more frequent in patients with LGE (96% in patients with LGE versus 66% without LGE), OR: 11(95% IC 1.1-106) p: 0.014. There were no differences in the secondary outcome respect to heart rate variability (p= 0.428); A correlation between New York Heart Association (NYHA) and the presence of LGE was not found. The decrease of LVEF by CMR and the global strain was not related to the presence of arrhythmias.

CONCLUSIONS: A higher incidence of arrhythmias was found in Chagas seropositive patients with LGE. An association with the decrease in heart rate variability was not observed. LGE could be an early predictor of sudden cardiac death or chronic secondary complications to ventricular tachycardia or atrial fibrillation. We emphasize that this research is still being developed, therefore, it is possible that new findings will be reported later.

Abstract P946 Figure. Picture 1. LGE - ARRHYTHMIAS



P947

Validation of a novel electrophysiology mapping simulator system

Zanni A.¹; Sticozzi C.¹; Rossi L.¹; Penela Maceda D.¹; Napoli V.²; Napoli L.³; De Ponti R.⁴; Villani GQ.¹

¹Guglielmo da Saliceto Hospital, Cardiology, Piacenza, Italy

²Biosense Webster, Johnson & Johnson Medical SpA, Pomezia, Italy

³Mouzee, Turin, Italy

⁴University of Insubria, Department of Heart and Vessels, Varese, Italy

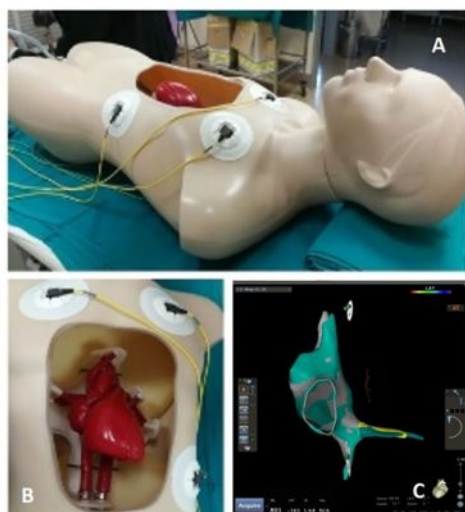
Background: A new three-dimensional heart anatomical simulator has been created combining a physical heart model with an electroanatomic mapping (EAM) system. The aim of this study is to validate this system with a left and right atrial reconstruction during a simulation session.

Methods: We developed the simulation system combining a physical heart model with an EAM system. This simulator has been then validated by twenty electrophysiologists subdivided in two groups based on their experience in electrophysiological procedures. Experts performance has been compared to the novices ones to achieve five different goals: right atrium fluoroles reconstruction, coronary sinus cannulation, patent foramen ovale cannulation, left atrium fluoroles reconstruction and pulmonary veins cannulation. A specific score for each simulation phase has been calculated. Moreover a detailed feedback has been asked to operators using a questionnaire mainly consisted of eight questions about the heart model anatomy, the catheter tip-tissue feedback and the entire simulator system; a score from 1-5 has been required (5 highest) for each question.

Results: The simulation system is located in an environment which allowed use of the main features of the EAM system including contact force sensing. No technical issue has been encountered during the validation process. Experts' performance has been significantly better than novices one in each simulation phase (right atrium reconstruction $p = 0.008$, coronary sinus cannulation $p = 0.001$, patent foramen ovale cannulation $p < 0.001$, left atrium reconstruction $p = 0.004$, pulmonary veins cannulation $p < 0.001$). Overall feedback result has been good for the experts and for the novices, without significant differences between the two groups (experts mean score 4.3 ± 0.4 , novices mean score 4.2 ± 0.5 , $p = 0.3$).

Conclusions: This novel simulator system is reliable and allows use of the main features of an EAM system in the right and left heart. The ability to discriminate different levels of experience suggests that this simulator is realistic and could be useful for electrophysiology training. The operators reported a good overall feedback using the simulator.

Abstract P947 Figure. The simulation system



P948

Right bundle brunch block in patients with acute myocardial infarction is associated with a higher in-hospital arrhythmic risk and mortality, and a worse prognosis after discharge

Martins Do Rego Farinha JM.; Parreira L.; Sa C.; Duarte T.; Marinheiro R.; Fonseca M.; Esteves ANA; Mesquita D.; Amador P.; Venancio J.; Caria R.

Hospital Center of Setubal, Cardiology, Setubal, Portugal

Introduction: Recently, the presence of right bundle brunch block (RBBB) in patients with persistent ischaemic symptoms is an indication for emergent coronary angiography.

Objective: The aim of this study was to assess the prognostic impact of RBBB in patients with acute myocardial infarction (AMI) before the implementation of the recent recommendations.

Methods: We retrospectively studied consecutive patients admitted with AMI between 2011 and 2013. We excluded patients with left bundle brunch block, pacemaker, or unspecific intraventricular conduction abnormalities. We compared 2 groups: with RBBB and without RBBB. We analysed clinical characteristics, in-hospital evolution, and major adverse cardiovascular events (MACE) during follow-up (cardiovascular death, arrhythmic events, heart failure, myocardial infarction, and stroke). Survival probability free of MACE between groups was analysed using a survival curve analysis by Kaplan-Meier method.

Results

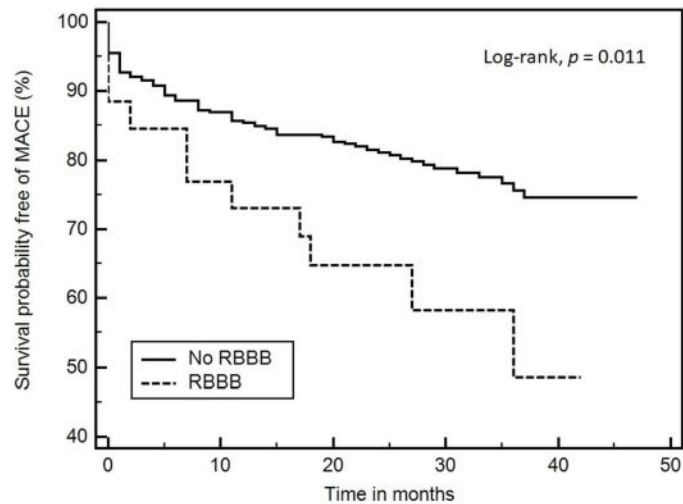
We studied 481 patients. Thirty two patients had RBBB. Comparison between groups is presented in table. After discharge, during a mean follow-up time of 24.3 ± 11.6 months, 53/457 patients died. RBBB was independently associated with MACE (adjusted OR 2.79, 95% CI 1.01 – 7.69; $p = 0.048$). The survival curve analysis showed a greater survival probability free of MACE for those patients without RBBB (Log-rank, $p = 0.011$) (Figure).

Conclusions

In this group of patients with AMI, RBBB was associated with increased in-hospital mortality and arrhythmic risk, and a worse long term survival free of all-cause mortality and cardiovascular hospitalizations.

	No RBBB (n = 449)	RBBB (n = 32)	p-value
Age in years, mean $\pm$ SD	66.8 $\pm$ 13.3	76.1 $\pm$ 10.0	<0.001
Male gender, n (%)	322 (71.7)	21 (65.6)	0.462
Smoker, n (%)	145 (32.3)	3 (9.4)	0.007
Diabetes mellitus, n (%)	116 (25.8)	11 (34.4)	0.293
Chronic Kidney Disease, n (%)	32 (7.1)	2 (6.3)	1.000
ST-Elevation Myocardial Infarction, n (%)	235 (52.3)	16 (50.0)	0.798
PCI/CABG, n (%)	354 (78.8)	24 (75.0)	0.609
LVEF <40%, n (%)	63 (14.0)	7 (21.9)	0.295
Heart Failure, n (%)	40 (8.9)	6 (18.8)	0.109
Sustained Ventricular Tachycardia, n (%)	2 (0.4)	3 (9.4)	0.002
Resuscitated Cardiac Arrest, n (%)	11 (2.4)	1 (3.1)	0.567
Intra-Hospital Death, n (%)	16 (3.6)	5 (15.6)	0.009

Abstract P948 Figure.



P949

Accuracy of a non-invasive epicardial and endocardial electrophysiology system to assess the mechanism and site of origin of different types of supraventricular and ventricular arrhythmias

Parreira AL.; Adragao P.; Carmo P.; Cavaco D.; Pinho J.; Jeronimo R.; Carmo J.; Costa F.; Carvalho S.; Goncalves P.; Reis Santos K.
Hospital Luz, Cardiology, Lisbon, Portugal

Introduction and aims

Recently a novel non-invasive epicardial and endocardial electrophysiology system (NEES) based on electrocardiographic recording has proven effective in assessing the origin of premature ventricular contractions. The aim of the present study was to assess the accuracy of this system, for mapping different arrhythmic substrates.

Methods and results

The study enrolled 14 patients with different types of arrhythmias referred to our center for catheter ablation.

All patients underwent pre-procedural computed tomography of the heart (Angio TC) and NEES mapping. Data from the AngioTC was processed by the NEES to reconstruct a 3D model of the heart and torso. After that, the 224 body-surface electrodes were connected to the system to record the unipolar ECG signals during the arrhythmia. The complete mapping was possible even in the presence of non-sustained arrhythmias, due to the efficacy of the system in mapping an isolated single beat. The non-invasive map was performed before the ablation and the operator was blinded to the result of the endocardial mapping. The mechanism of the arrhythmia, the earliest activation site (EAS) in case of focal arrhythmias and the critical isthmus in cases of macroreentry.

All patients underwent mapping and ablation with the Carto™ system and the magnetic navigation system Stereotaxis™.

The map obtained with the NEES was compared to the one obtained with Carto and the results are presented in the Table.

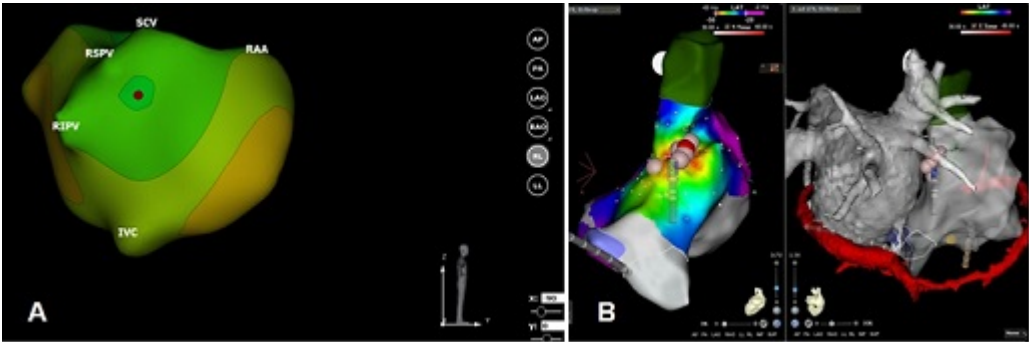
In Figure we show a case of premature atrial contractions originating at the posterior wall of the right atrium at the level of the right superior pulmonary vein; Panel A The NEES Epicardial model, isopotential map showing the origin of the arrhythmia (red dot). Panel B shows the Carto activation map displaying the RF applications at the EAS (dots)

Conclusion: The NEES correctly identified the mechanism and the origin/substrate of the arrhythmia in all patients that were successfully ablated whether due to a focal or macroreentry mechanism. The accuracy even with a small number of arrhythmia beats renders it especially useful for non-sustained or non-tolerated arrhythmias.

	N	Mechanism concordance	Substrate/origin concordance	Success of the procedure
PVCs	7	7/7	6/7*	6/7
PACs	3	3/3	3/3	3/3
Atrial Flutter	4	4/4	4/4	4/4

*Unsuccessful procedure, RF pulses applied according to Carto mapping ; PVC: premature ventricular contractions; PAC: premature atrial contractions

Abstract P949 Figure. NEES map and Carto Map



P950

Comparison of the efficacy and safety of injectable propafenone and amiodarone for elimination of paroxysmal atrial fibrillation in patients without organic heart disease

Tarasov A.; Davtyan K.; Protasova D.; Blokhina A.; Drapkina O.

National Research Center for Preventive Medicine, Moscow, Russian Federation

Introduction: One of the common reasons for calling an ambulance is a paroxysmal form of atrial fibrillation (AF). The main purpose of the treatment in this case is the elimination of an arrhythmia attack. At the prehospital stage, medicament cardioversion is often performed, which should be safe and effective with regard of limited time.

Purpose: The purpose of the study to evaluate the efficacy and safety of antiarrhythmic drugs (AAD): propafenone and amiodarone in injectable forms for elimination the AF paroxysm in patients without organic heart disease.

Methods: The research is a multicenter (9 medical centers), prospective, comparative, open, randomized on the stage of the prehospital medical care. The main criterion for inclusion in the research is the presence of paroxysm of AF of any genesis, confirmed by electrocardiogram (ECG), in men and women over 18 years old without organic heart disease. The duration of paroxysm is up to 7 days while taking an anticoagulant or up to 48 hours without anticoagulant therapy. ECG was recorded before drug administration, then after 60 minutes, after 120 minutes, and after 24 hours. Blood pressure (BP) and heart rate (HR) were also measured.

Results: The study involved 388 patients, 228 (58.8%) men and 160 (41.2%) women with AF paroxysm, lasting on average 195 minutes (3.25 hours). The group 1 (120 patients) was treated with amiodarone, 5–7 mg / kg body weight, intravenous (IV) bolus. The group 2 (268 patients) was treated with propafenone 2 mg / kg body weight, IV bolus. There were no significant statistical differences in the main characteristics between groups. For 24 hours of observation in group 1, the efficiency was 61.7% (n = 74), in group 2 – 77.6% (n = 208), p = 0.0012. The recovery time in group 1 is 110 minutes, in group 2 – 22 minutes, p = 0.0001. The elimination of paroxysm of AF up to 60 minutes was 25.8% in group 1 (n = 31), and 64.5% in group 2 (n = 173). A number of side effects were observed. Hemodynamic disorders (decrease in BP with symptomatic disorders): in group 1 – 5.8% (n = 7), in group 2 – 4.1% (n = 11), p = 0.12. Bradycardia (significant reduction in HR): in group 1 – 7.5% (n = 9), in group 2 – 5.6% (n = 15), p = 0.21. Conversion of AF to atrial flutter: in group 1 – 1.7% (n = 2), in group 2 – 3.3% (n = 9), p = 0.08. Last, the development of subjective complaints on the administration of the drug (pain in the region of the heart, headache, dizziness or dyspeptic symptoms): in group 1 – 1.7% (n = 2), in group 2 – 2.2% (n = 6), p = 0.45. No significant elongation of the P-Q, QRS and Q-T intervals was observed.

Conclusion: As can be seen from the obtained results, AAD propafenone showed reliable efficacy in comparison with amiodarone in the elimination of paroxysmal AF with a satisfactory safety profile and a rapid effect.

P953

Pharmacokinetic variability in beta-blockers used in cardiology

Aagesen FN.¹; Weeke PE.¹; Tfelt-Hansen P.²; Tfelt-Hansen J.¹¹Rigshospitalet - Copenhagen University Hospital, Cardiology, Copenhagen, Denmark²Glostrup University Hospital, Danish Headache Center, Neurology, Glostrup, Denmark**Funding Acknowledgements:** Novo Nordisk Foundation**Purpose**

To evaluate the pharmacokinetic variability of beta-blockers used in cardiology by reviewing single-dose and steady-state pharmacokinetic studies from the literature.

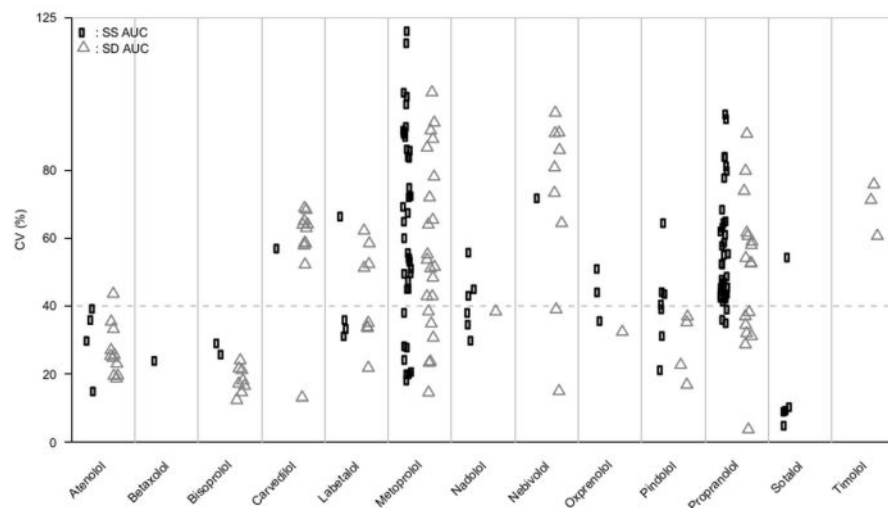
Methods

PubMed was searched for pharmacokinetic studies of beta-blockers, both single-dose and steady-state studies. Included were studies reporting maximum plasma concentration (C_{max}) and/or area under the concentration curve (AUC). The coefficient of variation (CV%) was calculated for all studies, and a CV < 40% was considered low or moderate variation, and a CV% > 40% was considered high variation.

Results

The C_{max} and AUC was reported a total of 672 times in 193 papers. Based on AUC, metoprolol, propranolol, carvedilol, and nebivolol showed high pharmacokinetic variability (highest first), whereas bisoprolol, atenolol, sotalol, labetalol nadolol, and pindolol showed low to moderate variability (lowest first).

Conclusion: We have shown a high pharmacokinetic variability between patients in some beta-blockers. A more personalized approach to the medical treatment of patients may be obtained by combining known pharmacokinetic information, pharmacogenetics and -dynamics, and patient characteristics, to avoid adverse events or lack of treatment effect.

Abstract P953 Figure. Coefficient of variation of β -blockers

P954

Premature ventricular contraction circadian profiles predict distinct clinical characteristics and beta-blocker responses

Hamon D.¹; Swid MA.²; Rajendran PS.²; Liu A.²; Boyle NG.²; Shivkumar K.²; Bradfield JS.²

¹University Hospital Henri Mondor, Cardiology, Creteil, France

²University of California Los Angeles, UCLA Cardiac Arrhythmia Center, Los Angeles, United States of America

Funding Acknowledgements: Federation Francaise de Cardiologie

Background: Frequent premature ventricular complexes (PVCs) can lead to symptoms, cardiomyopathy and increased mortality. Beta-blockers are recommended as first-line therapy to reduce PVC burden; however, the response is unpredictable.

Objective: To determine whether PVC circadian diurnal-variability patterns are associated with different clinical profiles and predict drug response.

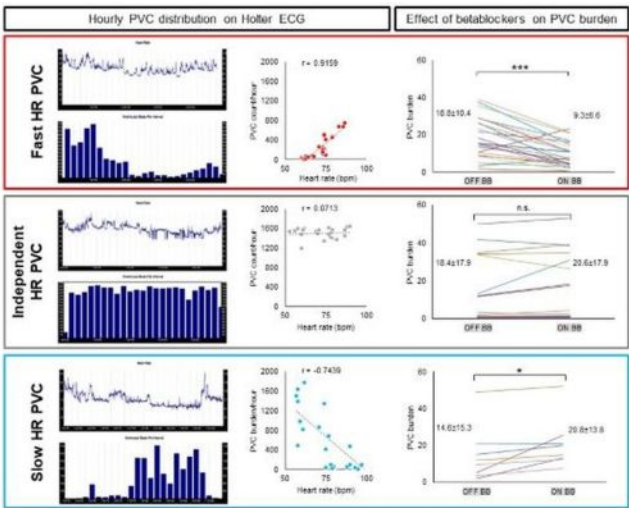
Methods: Consecutive patients with frequent PVCs (burden $\geq$ 1%), referred for Holter monitoring between 2014 and 2016, were included. Follow-up Holters, when available, were assessed after beta-blockade was initiated to assess response ($\geq$ 50% reduction). Patients were divided into 3 groups based on relationship between their hourly PVC count and mean HR during each of the 24 Holter hours: 1) fast-HR-dependent-PVC (F-HR-PVC) for positive correlation (Pearson, $P < 0.05$), 2) slow-HR-dependent-PVC (S-HR-PVC) for a negative, and 3) independent-HR-PVC (I-HR-PVC) when no correlation was found (Figure).

Results: Of the 416 patients included, 50.2% had F-HR-PVC, 35.6% I-HR-PVC and 14.2% S-HR-PVC with distinct clinical profiles (Table). Beta-blocker therapy was successful in 34.0% patients overall: Patients with F-HR-PVC had a decrease in PVC burden ($18.8 \pm 10.4\%$ to $9.3 \pm 6.6\%$, $P < 0.0001$; 62% success), I-HR-PVC had no change ($18.4 \pm 17.9\%$ to $20.6 \pm 17.9\%$, $P = 0.175$; 0% success), while S-HR-PVC had an increase in burden ($14.6 \pm 15.3\%$ to $20.8 \pm 13.8\%$, $P = 0.016$; 0% success, Figure). The correlation coefficient was the only predictor of beta-blocker success (AUC = 0.84, sensitivity = 100%, specificity = 67.7%; $r \geq 0.4$).

Conclusion: A simple analysis of Holter PVC circadian variability may provide incremental value to guide clinical PVC management. Only patients displaying a F-HR-PVC profile benefited from beta-blockers. Alternative strategy should be considered for others, as beta-blockers may have no effect or even be harmful.

N (%)	All Patients 416 (100)	Fast-HR PVC 209 (50.2)	Indep-HR PVC 148 (35.6)	Slow-HR PVC 59 (14.2)	p
Age	59.1 $\pm$ 20.8	60.9 $\pm$ 20.4	61.9 $\pm$ 19.3	45.5 $\pm$ 21.0	<0.001
Male	201(48.3)	117(56.0)	64(43.2)	20(33.9)	0.003
Symptoms	332(79.8)	167(79.9)	122(82.4)	43(72.9)	0.303
Palpitations	214(51.4)	103(49.3)	79(53.4)	32(54.2)	0.671
Body mass Index	26.5 $\pm$ 5.7	27.2 $\pm$ 6.3	26.0 $\pm$ 4.9	25.6 $\pm$ 4.9	0.091
Hypertension	207(49.8)	112(53.6)	78(52.7)	17(28.8)	0.002
Dyslipidemia	206(49.5)	108(51.7)	81(54.7)	17(28.8)	0.002
Diabetes	61(14.7)	33(15.8)	22(14.9)	6(10.2)	0.557
Smoking (former or active)	107(26.7)	63(30.1)	30(20.3)	14(23.7)	0.011
Cardiovascular Risk factors (n)	1.4 $\pm$ 1.2	1.5 $\pm$ 1.2	1.5 $\pm$ 1.2	0.9 $\pm$ 1.1	0.004
Heart disease	142(34.1)	61(29.2)	70(47.3)	11(18.6)	<0.001
Coronary artery disease	65(15.6)	30(14.4)	32(21.6)	3(5.1)	0.010
LVEF, %	58.4 $\pm$ 8.8	59.3 $\pm$ 8.0	57.3 $\pm$ 9.6	57.5 $\pm$ 9.0	0.076
PVC burden, %	8.8 $\pm$ 14.9	9.3 $\pm$ 10.1	9.1 $\pm$ 21.7	6.5 $\pm$ 5.8	0.445
Arrhythmic-MACE	12(2.9)	8(3.8)	4(2.7)	0(0)	0.296
Day/Night symptoms (Day/tot)*	24/27(47.1)	10/13(43.5)	5/7(41.7)	9/7(56.2)	0.670

Abstract P954 Figure



P955

Antiarrhythmic relevance of inhibiting cardiac and non-cardiac sodium channel isoforms for the suppression of torsades de pointes arrhythmias in the chronic av block dog

Bossu A.¹; Houtman MJC¹; Beekman JDM¹; Rajamani S.²; Belardinelli L.³; Van Der Heyden MAG¹; Vos MA.¹

¹University Medical Center Utrecht, Heart & Lung Division, Medical Physiology, Utrecht, Netherlands

²Amgen, South San Francisco, United States of America

³InCarda Therapeutics, Newark, United States of America

Funding Acknowledgements: Gilead Sciences, Inc.

Introduction: Enhancement of late sodium current (INaL) is proarrhythmic in heart failure patients. Although NaV1.5 is believed to be the main carrier, it remains unclear whether non-cardiac (neuronal and peripheral) isoforms significantly participate in cardiac electrophysiology and if their inhibition is associated with antiarrhythmic properties. GS967, a potent NaV1.5 INaL inhibitor with strong effects on non-cardiac isoforms (NaV1.1, NaV1.2 and NaV1.8), possesses a high antiarrhythmic efficacy in chronic AV block (CAVB) dogs sensitive to Torsades de Pointes arrhythmias (TdP). Eleclazine (E) is a selective NaV1.5 INaL inhibitor and A-803467 (A-8) a potent NaV1.8 blocker (IC50 8nM).

Purpose: To determine electrophysiological and antiarrhythmic effects of selective block of NaV1.5 INaL with NaV1.8 inhibition and investigate the contribution of blocking non-cardiac sodium channel isoforms for antiarrhythmic efficacy.

Methods: The potency of E (300 - 3000 nM) and A-8 (30, 100, 500 nM) to inhibit INaL and shorten action potential duration (APD) was studied in isolated dog cardiomyocytes. The antiarrhythmic properties of both drugs were investigated in suppression of dofetilide-induced early afterdepolarizations (EADs) and TdP in ventricular cardiomyocytes and sensitive CAVB dogs, respectively.

Results: In isolated ventricular cardiomyocytes, E (1100 nM IC50 for INaL inhibition) concentration-dependently shortened baseline APD by 112 and 187 ms at 1000 (n = 24) and 3000 nM (n = 21), respectively (both p < 0.05). However, selective NaV1.8 inhibition with 30 (n = 10) and 100 nM (n = 11) A-8 had no effect on INaL and baseline APD. Only 500 nM (n = 11), which also affects NaV1.5, reduced INaL by 10% and shortened baseline APD by 56 ms (p < 0.05).

In cardiomyocytes with dofetilide-induced EADs, 1000 and 3000 nM E suppressed incidence of EADs in 12/20 and 13/19 cells, respectively (both p < 0.05). In contrast, 500 nM A-8 had no effect on arrhythmic events (0/15 cells).

In CAVB dogs with dofetilide-induced TdP, E (0.6 mg/kg, 1800 nM plasma levels) exerted no antiarrhythmic effect on TdP incidence (from 4/7 to 4/7 dogs). A-8 (3 mg/kg), although not suppressing all TdP episodes (from 6/6 to 4/6, n.s.), moderately reduced their number (from 33 ± 32 to 6 ± 6 episodes/dog, p < 0.05). This antiarrhythmic effect was transient since TdP reoccurred after A-8 washout in 5/6 dogs.

Conclusion: Despite shortening repolarization and reducing EADs in vitro, selective inhibition of NaV1.5 INaL with E does not exert any in vivo antiarrhythmic effect against TdP. In addition, the moderate antiarrhythmic effect of selective NaV1.8 inhibition with A-8 is not mediated by a cardiomyocyte-specific mechanism. These data, when combined with GS967, strongly suggests that the additional blockade of non-cardiac sodium channel isoforms is of relevance to improve antiarrhythmic drug efficacy.

P956

Use of heart rate to guide exercise training intensity in patients with atrial fibrillation

Verdicchio C.; Elliott A.; Mahajan R.; Gallagher C.; Middeldorp M.; Linz D.; Lau D.; Sanders P.

University of Adelaide, Centre for Heart Rhythm Disorders, Adelaide, Australia

OnBehalf: Centre for Heart Rhythm Disorders

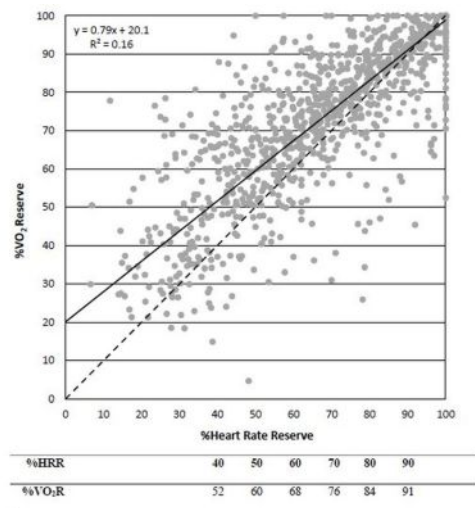
Objectives: The current guidelines for the prescription of exercise in patients in cardiovascular disease rehabilitation programs recommend heart rate reserve (HRR) as the primary method for guiding exercise intensity. In this context, HRR is adopted as a surrogate measure of the oxygen uptake reserve (VO2R). The % heart rate reserve (%HRR) during exercise shows close agreement with % VO2 Reserve (%VO2R) in some studies and is recommended parameter to guide exercise training in patients with heart failure. However, the relationship between %HRR and %VO2R in atrial fibrillation (AF) is not well described. We assessed the validity of %HRR as a surrogate for %VO2R to guide exercise intensity in patients with AF.

Methods: 101 patients with AF presenting for a cardiopulmonary exercise test (CPET) were enrolled in the study. Resting and Peak HR and VO2 values from CPET were used to calculate HRR and VO2R. HR and VO2 values were recorded continuously throughout exercise to determine %HRR and %VO2R at each workload. Linear regression was used to calculate the slope and y-intercept for %HRR versus %VO2R. Predefined analysis was performed to assess impact of rhythm during exercise, beta blockers and chronotropic incompetence (CI) on the association between HRR and VO2R.

Results: The mean slope of %HRR - %VO2R was 0.79 ± 0.4 being significantly less than 1.0 (mean difference: -0.21, 95% CI -0.30 to -0.12, $p < 0.001$). The mean y-intercept slope calculated was 20.1 ± 41.6 , which significantly differed from a hypothetical value of 0 (mean difference: 20.1, 95% CI 11.9 to 28.3, $p < 0.001$). There was poor correlation between %HRR and %VO2R ($r^2 = 0.16$). Although VO2peak was unaffected by rhythm during exercise ($p = 0.8$) or CI ($p = 0.3$), it was reduced with beta-blockers ($p = 0.02$). However, the HRpeak was increased in AF ($p < 0.01$) and reduced in presence of CI ($p < 0.01$) or beta-blockers ($p = 0.02$). AF rhythm during CPET, beta-blockers or CI did not independently explain the poor correlation between VO2R and HRR.

Conclusion: In patients with AF, %HRR is not equivalent to %VO2R. There was no significant effect of rhythm at time of testing, presence of chronotropic incompetence or beta-blockers on this relationship. These findings highlight that the HR prescription of exercise intensity in AF patients should be guided by an individualised HR-VO2 relationship assessed and calculated by a CPET and cannot be generalised.

Abstract P956 Figure. Slope of HRR and VO2R



P957

Analysis of predictive factors for propafenone proarrhythmia. Does exercise ECG play a role during long term propafenone treatment?

Kalmar PJ.¹; Medves-Vaczi K.¹; Hodosi K.²; Clemens M.¹; Bodi A.¹; Szabo GT.¹; Csanadi Z.¹; Nagy-Balo E.¹

¹University of Debrecen, Department of Cardiology and Cardiovascular Surgery, Debrecen, Hungary

²University of Debrecen, Department of Internal Medicine, Debrecen, Hungary

Background: Propafenone proarrhythmia (PPA) is a rare but potentially life-threatening complication affecting 1-10% of patients treated for benign supraventricular (SV) arrhythmias. Limited data exist assessing the potential predictors for PPA. Performing exercise ECG may be considered, based on expert opinion, however no study proved its true benefit during long term therapy. Our study aimed to investigate the predictors for PPA paying special attention to the role of exercise ECG.

Methods and results: A total of 129 patients (mean age:66 SD:11 years, 44% male) with structurally normal heart on echocardiography treated with propafenone due to SV arrhythmias between January 2010 and September 2017 were enrolled in this retrospective study if they were on ongoing propafenone or had PPA during follow-up (FU). In patients with PPA (significant QRS widening on resting ECG or wide QRS tachycardia during FU) propafenone treatment was stopped. All patients on ongoing propafenone therapy underwent an exercise ECG based on modified Bruce protocol. Patients were grouped in the following categories: positive exercise ECG (defined as an increase by ≥ 40 msec of baseline QRS duration, n = 9), negative exercise ECG (n = 96) and PPA (n = 24). Among baseline clinical parameters the duration of propafenone therapy and the incidence of previous tachycardiomyopathy (TCMP) were significantly different between the groups (p = 0.014 and p = 0.002, respectively). On a multivariate analysis only previous TCMP was predictive for PPA (12.797, CI:3.039-53.887; p = 0.001). Besides, a longer duration of propafenone therapy was predictive for a positive exercise ECG (1.016, CI:1.005-1.028; p = 0.005). During a mean follow-up of 44 SD:48 months no PPA occurred in the negative exercise ECG group, while 1 PPA (11%) occurred in patients with positive exercise ECG.

Conclusions: Previous TCMP is an independent predictor of PPA in patients with apparently normal heart. The impact of a negative exercise ECG on PPA during long-term follow-up can be questionable as the result of exercise ECG may be changed during propafenone treatment. The effect of a positive exercise ECG on PPA was not possible to assess in the present study due to a low event rate, however significant QRS widening during exercise ECG occurred only in a minority of patients.

P958

Venous thrombosis in patients after catheter ablation. Efficacy and safety of enoxaparin therapy with the transition to warfarin and monotherapy with rivaroxaban

Loginova AI.; Maykov EB.; Balachonova TV.; Kropacheva ES.

Cardiology Research and Production Center, Moscow, Russian Federation

Background: Among the complications associated with catheter ablation, thrombosis of the femoral vein puncture site deserves special attention, which is associated with the potential danger of thromboembolism from the proximal femoral vein segment.

Methods: The study included patients from 18 years and older with heart rhythm disorders and planned catheter ablation. All patients underwent an ultrasound duplex vascular scan of the iliac-femoral segment before the intervention and no later than 24 hours after. When parietal venous thrombosis (VT) was detected at the femoral vein puncture site, all patients were randomly assigned to two treatment groups. In group I enoxaparin 1 mg/kg was prescribed every 12 hours with switching to warfarin after 7 days with maintenance of the target INR values (2.0-3.0). In group II rivaroxaban therapy was started at a dose of 15 mg x 2 p/day for 21 days with a further transition to a dose of 20 mg/day. The total period of observation and treatment of patients was at least 3 months. In case of the detection of floating VT, all patients underwent anticoagulant therapy (ACT) according to a scheme similar to group I.

Results: 500 patients were observed. Parietal (n = 38) or floating (n = 3) VT puncture site was identified in 41 patients. In group I (n = 16) complete lysis of VT was noted by the 7th day of treatment in 9 patients (56.3%), however this scheme was associated with a greater risk of complications from the puncture site in the form of arteriovenous fistulae (n = 4; 25 %) and intermuscular hematomas (n = 4; 25%). In group II (n = 26), no complications were noted, the lysis time of VT was on average 21 days (n = 69 %). Complete lysis of VT was noted in both groups at the time of the control observation point (3rd month).

Conclusion: The efficacy of the two treatments regimens was comparable (p = 0.5). Enoxaparin therapy is more effective in the early stages of treatment of VT, but is associated with a greater risk of the complications (p = 0.0117, odds ratio – 0.022). Monotherapy with rivaroxaban is safer and is not inferior in effectiveness to group I with longer observation.

P959

Risk of cardiac arrhythmias after electrical accident: a single-center study of 480 patients

Pilecky D.¹; Vamos M.²; Bogyi P.³; Muk B.³; Stauder D.³; Racz H.³; Nyolczas N.³; Duray GZ.³; Zacher G.³; Zima E.⁴

¹Klinikum Passau, Passau, Germany

²JW Goethe University, Frankfurt am Main, Germany

³Medical Centre, Hungarian Defence Forces, Budapest, Hungary

⁴Semmelweis University, Heart Center, Budapest, Hungary

Background: Patients with electrical injury are considered to be at high risk of cardiac arrhythmias. Due to the small number of studies, there is no widely accepted guideline regarding the risk assessment and management of arrhythmic complications after electrical accident (EA).

Purpose: Our retrospective study was designed to determine the prevalence of ECG abnormalities and cardiac arrhythmias after EA, to evaluate the predictive value of cardiac biomarkers for this condition and to assess in-hospital and 30-day mortality.

Methods: Consecutive patients presenting after EA at the emergency department (ED) of our institution between 2011 and 2016 were involved in the current analysis. ECG abnormalities and arrhythmias were analyzed at admission and during ECG monitoring. Levels of cardiac troponin I, CK and CK-MB were also collected. In-hospital and 30-day mortality data were obtained from hospital records and from the national insurance database.

Results: Of the 480 patients included, 184 (38.3%) had suffered a workplace accident. The majority of patients (96.2%) had incurred a low-voltage injury (<1000V). One hundred and four (21.7%) patients had a transthoracic electrical injury while 13 (2.7%) patients reported loss of consciousness. The most frequent ECG disorders at admission were sinus bradycardia (<60bpm, n = 50, 10.4%) and sinus tachycardia (>100bpm, n = 21, 4.4%). Other detected arrhythmias were as follows: newly diagnosed atrial fibrillation (n = 1); frequent multifocal atrial premature complexes (n = 1); sinus arrest with atrial escape rhythm (n = 2); ventricular fibrillation terminated out of hospital (n = 1); ventricular bigeminy (n = 1); and repetitive nonsustained ventricular tachycardia (n = 1). ECG monitoring was performed in 182 (37.9%) patients for 12.7 ± 7.1 hours at the ED. Except for one case with regular supraventricular tachycardia terminated via vagal maneuver no new-onset clinically relevant arrhythmias were detected during the ECG monitoring. Cardiac troponin I was measured in 354 (73.8%) cases at 4.6 ± 4.3 hours after the EA and was significantly elevated only in one resuscitated patient. CK elevation was frequent, but CK-MB was under 5% in all patients. Both in-hospital and 30-day mortality were 0%.

Conclusions: Most of cardiac arrhythmias in patients presenting after EA can be diagnosed by an ECG on admission, thus routine ECG monitoring appears to be unnecessary. In our patient cohort cardiac troponin I and CK-MB were not useful in risk assessment after EA. Late-onset malignant arrhythmias were not observed.

Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P960

Relationship between interatrial septum motion and persistent atrial fibrillation recurrence after catheter ablation

Kobayashi H.; Okada A.; Tabata H.; Shoin W.; Okano T.; Yoshie K.; Shoda M.; Kuwahara K.

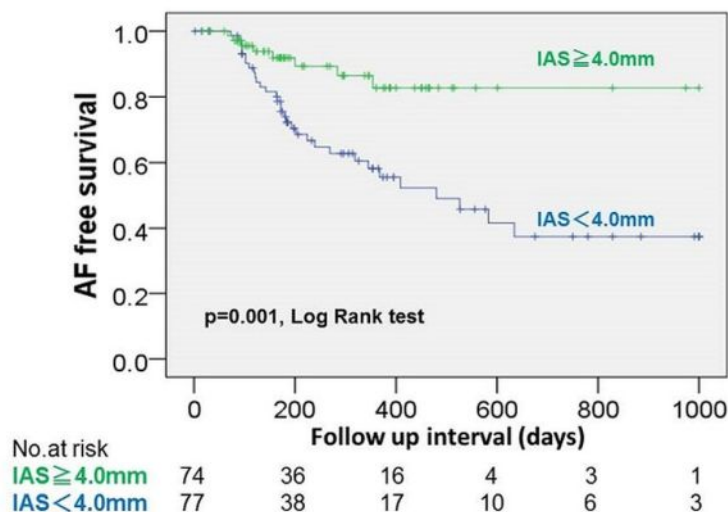
Shinshu University Hospital, Cardiovascular Medicine, Matsumoto, Japan

Background: It has been reported that decline in the interatrial septum (IAS) motion reflects remodeling of the left atrium (LA) of patients with persistent atrial fibrillation (psAf). In this study, we aimed to clarify the relationship between IAS motion and Af recurrence after catheter ablation (CA).

Methods and results: In our institution, consecutive 151 patients with psAf received CA were enrolled. Transesophageal echocardiography was performed before CA, and IAS motion was measured during Af rhythm. IAS motion was defined as the distance from the most forward position to the most backward position of IAS in cardiac cycle by M-mode system. The median of IAS motion was 4.0mm [2.4-4.9], and the number of cases which AF recurred after CA was 40 (26.5%). When all patients were divided into two groups with IAS motion = 4.0 as a cut-off value, Kaplan-Meier analysis revealed a significant recurrence rate in low IAS motion group ($p = 0.001$, Log Rank test). Multivariate analysis showed that IAS motion decline is a predictor of AF recurrence ($p = 0.017$, 95% CI 1.04-1.47).

Conclusion: The recurrence of psAf after CA may be predicted by the decline in IAS motion.

Abstract P960 Figure. AF free survival curve by IAS motion



Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P961

The association between the severity of sleep apnea and atrial remodeling with atrial fibrillation

Takagi T.¹; Nakamura K.¹; Ishii R.¹; Asami M.¹; Enomoto Y.¹; Noro M.²; Sugi K.³; Nakamura M.¹; Hashimoto H.¹; Sahara N.¹; Shimizu T.¹

¹Toho University Ohashi Medical Center, cardiology, Tokyo, Japan

²Toho University Sakura Medical Center, cardiology, Chiba, Japan, Cardiology, Sakura, Japan

³Odawara Cardiovascular Hospital, cardiology, Odawara, Japan

Background: The relationship between atrial fibrillation (AF) and sleep apnea, and continuous high atrial pressure with apnea induce atrial remodeling are well known, but the effects on right and left atrial each remodeling have not been adequately studied.

Objective: The purpose of this study was to evaluate sleep apnea, atrial volume, and low voltage zone for mapping in AF patients in order to investigate the influence of sleep apnea on bi-atrial remodeling.

Methods: A total of 120 AF patients who had undergone catheter ablation were enrolled in this study. In all patients, sleep study was evaluated, bi-atrial volume were determined by CT imaging and the evaluation of atrial substrate were performed by using 3D mapping system, as index of atrial remodeling.

Results: Based on left atrium volume (LAV) and right atrium volume (RAV), subjects were classified into 4 groups: 61 controls, 9 LA dilatation, 21 RA dilatation and 29 bi-atrial dilatation with no significant differences in terms of age, BMI, the type of AF. NT-pro BNP mean levels, Apnea Hypopnea Index (AHI) were higher in atrial dilatation group compared to without group. In univariate analysis, AHI correlated with NT-pro BNP levels ($r = 0.285$, $p = 0.003$), LVEF ($r = 0.251$, $p = 0.01$), and RAV ($r = 0.281$, $p = 0.004$). Multiple regression analysis showed that AHI were independent variables of increased RAV, whereas LVEF and NT-pro BNP were independent variables of increased LAV, respectively.

Conclusion: RA dilatation was relative to severity of SAS regardless of paroxysmal and persistent AF. Sleep apnea causes recurrence after AF ablation, it is necessary to pay attention about the association between sleep apnea and RA dilatation.

Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P962

The relationship between left atrial fibrosis and left ventricular diastolic dysfunction in paroxysmal atrial fibrillation

Gizatulina T.; Pavlov A.; Kolunin G.; Shorochova I.; Martyanova L.; Kharats V.; Belonogov D.; Ulyanov A.

Tyumen Cardiology Research Center, Tyumen, Russian Federation

Background: Whether left atrial fibrosis in patients with atrial fibrillation (AF) is a primary form of atrial pathology or consequence of left ventricular diastolic dysfunction continues to be a debatable issue. Electroanatomical mapping (EAM) allows to image and to define the atrial fibrosis as a substrate of AF.

Purpose: To assess the relationship between the severity of left atrial fibrosis and signs of diastolic impairments in patients with paroxysmal AF.

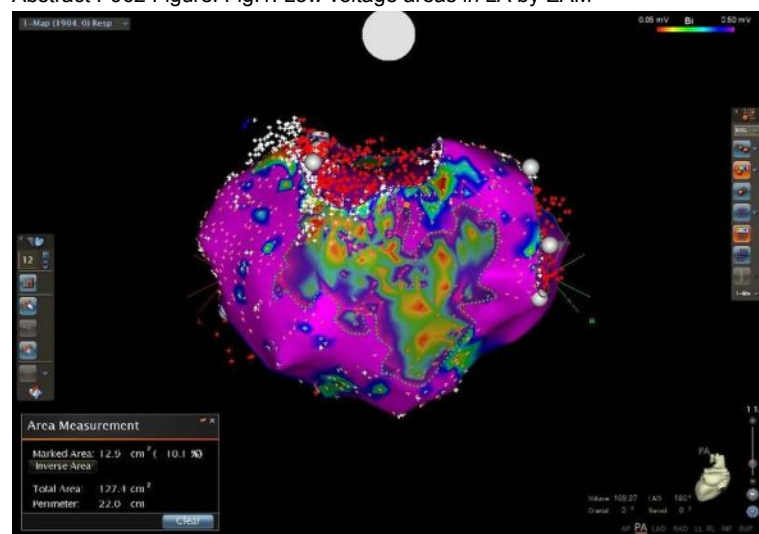
Methods: 32 patients with paroxysmal AF (mean age 57.3 ± 8.9 years, 16 males) were enrolled in the study, including 16 patients with arterial hypertension (AH), 12 – with coronary artery disease and AH. In all patients the level of NT-proBNP in the blood was determined. To assess the diastolic function there was carried out comprehensive echocardiography with the calculation of generally accepted parameters in accordance with the Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography, endorsed by ASE and EACVI (2016). EAM before ablation was done in sinus rhythm. The bipolar low voltage areas of fibrosis in left atrium were identified with the cut-off <0.5 mV (Fig.1). For the quantification of atrial fibrosis, the following indicators were calculated: total square of fibrosis (Sf), % of fibrosis in relation to the total square of the left atrium (%Sf), number of fibrosis zones (Nf). The degree of atrial fibrosis estimated as an analog of the UTAH staging system: UTAH I: $<5\%$ fibrosis; II: 5% to 19% fibrosis; III: 20% to 35% fibrosis; and IV: $>35\%$.

Results. The level of NT-proBNP was divided into degrees: <125 pg/ml, 125-600 pg/ml and >600 pg/ml. There was a positive significant correlation between the degree of NT-proBNP increase with Sf ($R = 0.37$, $p < .05$), %Sf ($R = 0.38$, $p < .05$), as well as the degree of fibrosis on UTAH ($R = 0.39$, $p < .05$). All patients had preserved systolic left ventricular function. Decrease of septal $e' < 7$ cm/s was correlated with the increase of Sf, %Sf and Nf: $R = 0.41$, $R = 0.42$ and $R = 0.40$, respectively ($p < .05$). Decrease of lateral $e' < 10$ cm/s was associated with the increase of Nf: $R = 0.40$ ($p < .05$). A significant negative correlation between %Sf and pulmonary vein diastolic velocity (PVD) was detected: $R = -0.39$ ($p < .05$), and positive correlation with S/D ratio (pulmonary vein systolic velocity to PVD ratio): $R = 0.39$ ($p < .05$). At the same time, PVD significantly correlated with the thickness of interventricular septum ($R = -0.36$, $p < .05$), septal $e' < 7$ cm/s ($R = 0.31$, $p < .05$) and DT of mitral E velocity ($R = -0.57$, $p < .05$).

There was revealed a positive correlation between Sf, %Sf and the presence of tricuspid regurgitation: $R = 0.43$ and $R = 0.45$, respectively ($p < .05$).

Conclusion: The data obtained confirm the relationship of left atrial fibrosis with early signs of diastolic dysfunction of the left ventricle in the form of abnormal relaxation, expressed in disorders of early diastolic left ventricular filling.

Abstract P962 Figure. Fig.1. Low voltage areas in LA by EAM



P963

Extent and spatial distribution of left atrial arrhythmogenic sites, late gadolinium enhancement at MRI and low voltage areas in patients with persistent atrial fibrillation

Chen J.¹; Arentz T.¹; Cochet H.²; Kim S.³; Moreno-Weidmann Z.¹; Mueller-Edenborn B.¹; Minners J.¹; Lehrmann H.¹; Trenk D.¹; Allgeier J.¹; Hocini M.¹; Jais P.²; Haissaguerre M.²; Jadidi A.¹

¹University Heart Center Freiburg-Bad Krozingen, Arrhythmia Department, Freiburg, Germany

²LIRYC Institute, Bordeaux University, CHU Haut-Lévêque, Bordeaux-Pessac, France

³Abbott, Minnesota, United States of America

Funding Acknowledgements: This work was funded by a research grant of the Gerda Müller Weber-Foundation / German Heart Foundation (Deutsche Herzzstiftung).

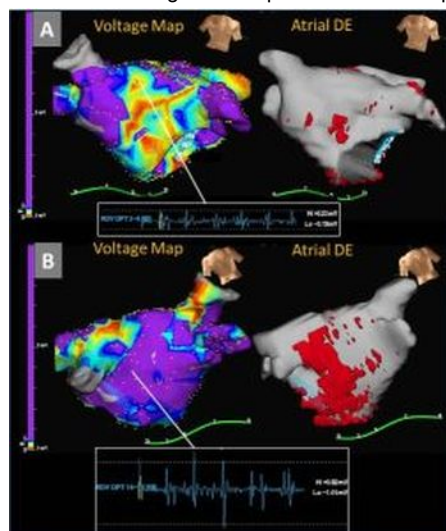
Background: Arrhythmia recurrence following pulmonary vein Isolation (PVI) is high in persistent atrial fibrillation (AF) due to atrial arrhythmogenic fibro-fatty substrate that can be identified as low voltage areas or atrial delayed Gadolinium enhancement (DE) at magnetic resonance imaging (MRI).

Methods: We assessed the spatial relationship of arrhythmogenic left atrial (LA) areas with rotational (RotA) or continuous activity (CA) to DE areas and low voltage area. Sixteen patients with persistent AF (6 long-standing) underwent DE-MRI (1.25 × 1.25 × 2.5 mm) prior to PVI. LA voltage-mapping was acquired in AF (> 1000 sites/LA) and the regional activation patterns of AF wavelets (145920 AF EGMs) were analyzed. Sites with rotational or continuous activities were characterized (voltage, duration) and their spatial relationship to DE and low voltage areas < 0.5 mV was assessed.

Results: DE and low voltage areas covered 55% and 24% ($p < 0.01$) of total LA surface, respectively. DE was present at 61% of low voltage areas, whereas low voltage was present at 28% of DE areas. Rotational and continuous activities more frequently co-localized with low voltage areas than with DE areas (78% vs 63%). Regional bipolar voltage of rotational vs continuous activity was 0.64 ± 0.47 mV vs 0.58 ± 0.51 mV. All 28 rotational activities and 56 continuous activities areas contained electrograms with prolonged duration (115 ± 14 ms) displaying low voltage (0.34 ± 0.11 mV).

Conclusion: A small portion of DE and low voltage areas harbor the arrhythmogenic areas displaying repetitive rotational or continuous activity. Most continuous or rotational activities co-localized with low voltage areas, while there was less co-localization with DE areas. There is an important mismatch between DE areas and low voltage areas which needs to be considered when used as target for catheter ablation (see Figure 1).

Abstract P963 Figure 1. Representative example



Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P964

Correlation of left atrial low voltage and fractionation substrate between sinus rhythm and atrial fibrillation: high density mapping of the arrhythmogenic substrate in patients with persistent AF

Chen J.¹; Jadidi A.¹; Mueller-Edenborn B.¹; Moreno-Weidmann Z.¹; Lehrmann H.¹; Allgeier J.¹; Trenk D.²; Neuman F.J.³; Arentz T.¹

¹University Heart Center Freiburg-Bad Krozingen, Arrhythmia Department, Freiburg, Germany

²University Heart Center Freiburg-Bad Krozingen, Department of Pharmacology, Freiburg, Germany

³University Heart Center Freiburg-Bad Krozingen, Department of Cardiology, Freiburg, Germany

Funding Acknowledgements: This work was funded by a research grant of the Gerda Müller Weber-Foundation / German Heart Foundation (Deutsche Herzstiftung).

Background: Novel low-voltage based ablation therapy for persistent AF – in addition to pulmonary vein isolation (PVI) - has been recently introduced and can be performed either in sinus rhythm (SR) or during AF. However, the spatial correlation between the arrhythmogenic substrate displaying (a) low voltage area (LVA) and (b) prolonged fractionated potentials (FPs) in different rhythms (AF vs SR) remains unclear.

Purpose: To compare the relationship of atrial LVA and prolonged fractionated potentials (FPs) between SR and AF in patients with persistent AF.

Methods: Thirty-nine patients with persistent AF underwent high density mapping of left atrium (LA) (>1000 points/LA) in AF and SR prior to ablation. LVA was defined as <0.5mV during AF and <1.0 mV in SR. In SR, FPs were defined as atrial electrograms displaying ≥5 deflections and a duration ≥50ms on a single bipolar. In AF, prolonged fractionated activity was defined as EGM with a duration ≥70% of local AFCL. Both were considered as pathological substrate and were annotated on the LA geometry for correlation to LVA.

Results: 69% of patients showed low voltage substrate (LVS) during both rhythms. 3% had no LVS in any rhythm, 15% had LVS in AF only. The extent of LVS in AF vs SR was 29± 22% vs 27 ± 24% of total LA surface.

In AF, the locations of LVS were: posterior LA (87% patients), anterior LA (85%), antero-septal (74%), roof (64%), and lateral LA (38%). In SR, the locations of LVS were: anterior LA (62% of patients), antero-septal (49%), posterior LA (46%), roof (41%) and lateral LA (15%).

Discrepancies in LVA were present between AF and SR: 17% of analyzed LA areas displayed low voltage in AF, but not in SR. Moreover, 7% of regions displayed low voltage in SR, but not in AF. 52% of LA regions showed LVS in both AF and SR.

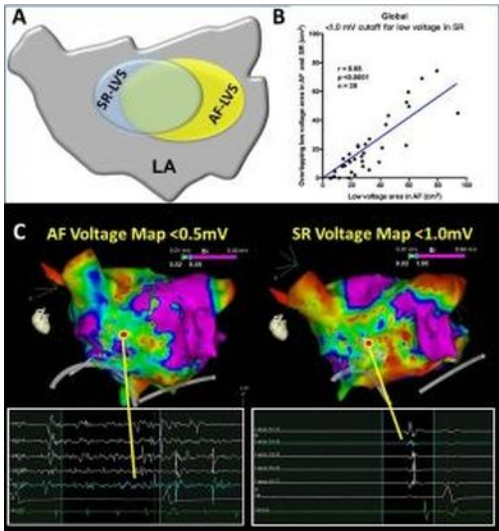
Quantification of overlapping LVA between AF and SR allowed a detailed comparison: The highest overlap between LVS in AF and SR was found at the anterior and antero-septal LA (78% and 67% of AF-LVS overlapped with SR-LVS). At the anterior and posterior LA, more than 80% of SR-LVS (in SR) overlapped with AF-LVS. Fig. 1 A&B illustrate the correlation of LVS-extent between AF and overlapping LVS in AF&SR.

Comparison of electrogram fractionation between AF&SR: 67% vs 73% of FPs were located in LVA during AF vs SR. 67% sites with prolonged FPs in AF showed fractionation in SR. In contrast, 71% of FPs in SR also showed prolonged FPs in AF. Electrogram bipolar voltage of FPs during SR and AF were 0.76 ± 0.42 mV vs 0.72 ± 0.42mV.

Importantly, 50% of potential AF sources within low voltage area and prolonged activity displayed FPs in SR (Fig. 1C).

Conclusions: Significant differences in electrogram voltage, fractionation and duration exist between SR and AF at same locations. However, 71% of fractionated potentials in SR display potential arrhythmogenic activity during AF (prolonged activity ≥70% AFCL).

Abstract P964 Figure 1 LVS and FPs in AF and SR



Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P965

Biomarkers in atrial fibrillation: novel red flags to keep in mind

Merino Merino AM.¹; Perez Rivera JA.¹; Saez De La Maleta Ubeda R.²; Salgado Aranda R.¹; Pascual Tejerina V.¹; Martin Gonzalez J.¹; Garcia Fernandez J.¹; Al Kassam Martinez D.²

¹University Hospital of Burgos, Cardiology, Burgos, Spain

²University Hospital of Burgos, Clinical Analysis, Burgos, Spain

Introduction: Atrial fibrillation (AF) is the most frequent arrhythmia and its development is determined by remodeling and myocardial fibrosis. Urate, proBNP, troponin (TnUS), CRP, galectin-3 (gal3) and ST2 are some biomarkers involved in these processes and might be important to understand the development of persistent AF. Their early determination may also be useful to select patients in risk of developed persistent AF and to initiate preventive treatments. However, no previous studies have determinate if these biomarkers are significantly higher in AF patients vs healthy subjects.

Purpose: We designed a cross-sectional study to know the differences in biomarkers between patients with persistent atrial fibrillation and healthy subjects

Methods: We included 116 patients with persistent AF submitted to electrical cardioversion (ECV) (cases) and 29 healthy subjects (controls). The biomarkers studied were proBNP, urate, C reactive protein (CRP), gal-3, ST2, TnUS and fibrinogen. We compared biomarkers values in peripheral blood sample between cases (extracted before the ECV) and controls, using tStudent in all the test for independent samples. Also, we studied the efficiency of biomarkers in distinguish cases and controls using the area under the curve ROC.

Results: There were not significant clinical differences between both groups. All biomarkers except for CRP and fibrinogen were significantly higher in cases than controls. ProBNP was the most efficient biomarker to distinguish cases and controls, followed by urate, ST2, TnUS and gal3 (Table). The best cut-off value for proBNP was 182 pg/ml (sensitivity (Sn) 99.1%, specificity (Sp) 96.6%).

Conclusion: ProBNP, gal3 and ST2 were higher in cases than in controls. This fact may be useful to predict which patients may have higher risk to develop persistent AF and to lead the treatment in those patients with established AF. Furthermore, the increase of these biomarkers in AF highlights the role of inflammation and fibrosis in this disease.

	CASES (N = 166)	CONTROLS (N = 29)	P	AREA UNDER THE CURVE
ProBNP (pg/ml)	859.5 ± 627	29 ± 57	<0.001	0.996
Urate (mg/dl)	6.15 ± 2.28	5.1 ± 1.6	0.001	0.699
CRP (mg/L)	2 ± 3	2 ± 2	NS	0.539
Troponin (ng/L)	9 ± 6	7 ± 7.48	0.029	0.635
Fibrinogen (mg/dl)	326.5 ± 95.75	315 ± 78	NS	0.494
Galectin-3 (ng/ml)	16 ± 5.68	14 ± 3.05	0.043	0.615
ST2 (ng/ml)	35.39 ± 20.03	24.84 ± 14.33	0.007	0.667

P966

Galectin-3 as a new thrombotic risk factor in patients with atrial fibrillation

Merino Merino AM.¹; Perez Rivera JA.¹; Saez De La Maleta Ubeda R.²; Salgado Aranda R.¹; Pascual Tejerina V.¹; Martin Gonzalez J.¹; Garcia Fernandez J.¹; Al Kassam Martinez D.²

¹University Hospital of Burgos, Cardiology, Burgos, Spain

²University Hospital of Burgos, Clinical Analysis, Burgos, Spain

Introduction: In patients with atrial fibrillation (AF) only clinical features are considered to evaluate thrombotic risk and prescribe anticoagulants. The CHA2DS2-VASc scale is the most used score to assess thrombotic risk, but some of its components are often difficult to check out in the first evaluation of the patient in the emergency room. New objective and easy to determine variables should be described to improve the thrombotic risk assessment in patients with AF.

Purpose: Our aim is to know if Galectin 3 (gal3), a biomarker related to myocardial fibrosis, is associated to a high thrombotic profile in patients with AF.

Methods: We consecutively included 114 patients with persistent non valvular AF. We carried out a cross-sectional study comparing the gal3 values and the thrombotic risk, using the CHA2DS2-VASc (low risk if <2 or high risk if ≥2). We used the tStudent for quantitative independent samples, Chi square test for qualitative independent samples and Pearson correlation test to assess the association between gal3 and CHA2DS2-VASc values.

Results: Basal characteristics of the population included are described in Table 1. As it was expected, there were significant differences in most of the clinical variables because some of them are included in CHA2DS2-VASc scale. Patients with high thrombotic risk had significantly higher values of gal3 (18.85 ± 4.97 ng/ml vs 16.39 ± 5.43 ng/ml $p = 0.004$). We found a positive correlation between the values of gal3 and CHA2DS2-VASc ($r = 0.232$; $p = 0.01$).

Conclusion: In our patients with persistent AF, the higher thrombotic risk is, the higher gal3 values are. One possible explanation to this finding is that gal3 levels had been previously correlated with a wide range of the components included in CHA2DS2-VASc scale. In addition, gal3 has an ability of binding to von Willebrand factor, so it helps in modulation of early thrombus formation. These facts could explain our findings.

Table 1

VARIABLE	CHA2DS2-VASc < 2 N= 84	CHA2DS2-VASc ≥ 2 N= 30	P
Age	59.6 ± 7.8	72.2 ± 5.5	<0.001
Men	70 (83.3%)	10 (33.3%)	<0.001
Hypertension	37 (44%)	28 (93.3%)	<0.001
Diabetes	9 (10.7%)	7 (23.3%)	NS
Smoker	17 (20.2%)	0	<0.001
Renal disfunction	1 (1.1%)	1 (3.3%)	NS
Stroke	1 (1.1%)	2 (6.6 %)	NS
SAHS	9 (10.7%)	1 (3.3)	NS

Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P967

Patients with atrial fibrillation and a possibly temporary cause: a different prognosis when atrial fibrillation is paroxysmal or persistent?

Bisson A.¹; Bodin A.¹; Clementy N.¹; Pierre B.¹; Babuty D.¹; Lip G.²; Fauchier L.¹

¹Tours Regional University Hospital, Hospital Trousseau, Tours, France

²Liverpool Heart and Chest Hospital, Liverpool, United Kingdom

Atrial fibrillation (AF) may be related to acute, temporary causes including alcohol use (eg, "holiday heart syndrome"), myocardial ischemia or acute coronary syndrome, myocarditis or pericarditis, sepsis, pulmonary embolism or other pulmonary diseases, hyperthyroidism, and other metabolic disorders. In such cases, successful treatment of the underlying condition may promote the resolution of AF. It remains unclear whether AF pattern may affect outcome in this setting and whether oral anticoagulation (OAC) should be systematically prescribed for these patients. Our objective was to describe the outcomes in patients with such a temporary cause of AF (TCAF), and to compare the specific subgroups of patients with paroxysmal or persistent TCAF.

Methods. All patients with AF seen in our institution were identified in a database. The adverse outcomes were investigated during follow-up. Among 8962 patients with AF, we focused the analysis on 5467 patients with non-permanent AF of whom 936 (17%) had at least one possible TCAF as mentioned above. Among them, 900 (96%) had paroxysmal AF and 36 (4%) had persistent AF.

Results. In patients with TCAF, CHA2DS2VAsC score was higher than in other patients (3.6 ± 1.7 versus 3.0 ± 1.7 , $p < 0.0001$) and treatment with oral anticoagulation was less frequent (37% versus 52%, $p < 0.0001$). During a mean follow-up of 2.5 years (maximum 10.0 years), 78 stroke/TE and 156 deaths were recorded in the 5467 patients. The rate of stroke/TE was similar in patients with TCAF and in other AF patients (Crude hazard ratio [HR] = 1.24, 95%CI 0.97-1.59, $p = 0.11$; HR = 1.02, 95%CI 0.79-1.32, $p = 0.85$ after adjustment on age, CHA2DS2VAsC score, OAC and antiplatelet use, and other comorbidities). Mortality was higher in patients with TCAF when compared to other AF patients (Crude HR = 1.82, 95%CI 1.52-2.18, $p < 0.0001$; adjusted HR = 1.43, 95%CI 1.18-1.75, $p = 0.004$).

Patients with paroxysmal TCAF had a similar rate of stroke/TE (adjusted HR 1.39, 95%CI 0.33-5.87, $p = 0.66$) and a similar rate of death than those with persistent TCAF (adjusted HR 1.36, 95%CI 0.49-3.76, $p = 0.56$). OAC use was independently associated with a better prognosis for death/stroke/thromboembolism in TCAF (HR = 0.53, 95% CI 0.39-0.72, $p < 0.0001$ after adjustment on age and CHA2DS2VAsC score and comorbidities) and results were similar whether patients had paroxysmal or persistent TCAF.

Conclusion. AF patients with a possibly temporary cause of AF had a similar risk of stroke/thromboembolism and a worse prognosis for all-cause mortality than other AF patients. Prognosis was similar whether patients had paroxysmal or persistent TCAF and oral anticoagulation was associated with a better prognosis whether TCAF was paroxysmal or persistent.

P968

Paroxysmal atrial fibrillation is not one entity: data from RACE V

De With RR.¹; Erkuner O.²; Rienstra M.¹; Schotten U.³; Ten Cate H.⁴; Spronk H.⁴; Blaauw Y.¹; Tieleman RG.⁵; Hemels M E W.⁶; De Groot JR.⁷; Al-Jazairi M I H.¹; Kroon AA.⁴; Luermans JGLM.²; Van Gelder IC.¹; Crijns HJGM.²

¹University Medical Center Groningen, Department of Cardiology, Groningen, Netherlands

²Maastricht University Medical Centre (MUMC), Department of Cardiology, Maastricht, Netherlands

³Maastricht University, Department of Physiology, Maastricht, Netherlands

⁴Maastricht University Medical Centre (MUMC), Department of Internal Medicine, Maastricht, Netherlands

⁵Martini Hospital, Department of Cardiology, Groningen, Netherlands

⁶Rijnstate Hospital, Department of Cardiology, Arnhem, Netherlands

⁷Amsterdam University Medical Center, Department of Cardiology, Amsterdam, Netherlands

Funding Acknowledgements: CVON grant 2014-9; unrestricted grant support from Medtronic

OnBehalf: RACE V

Background. Atrial fibrillation (AF) often starts as a paroxysmal self-terminating arrhythmia. Yet, limited information is available on the different patterns and durations of paroxysmal AF.

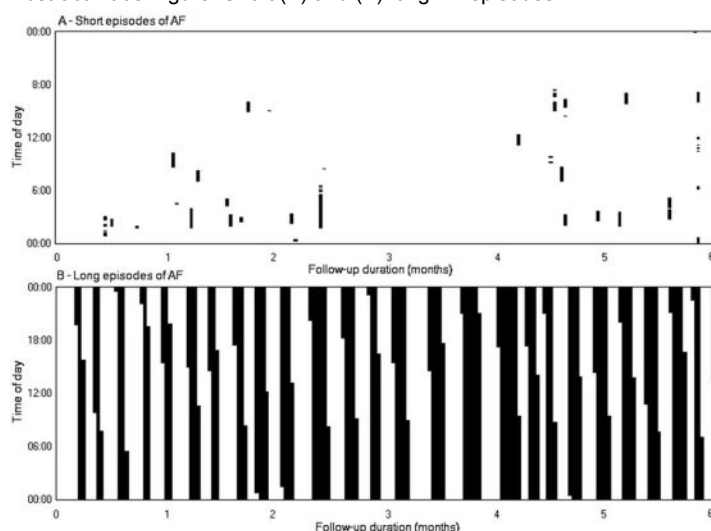
Purpose. We aim to describe different AF patterns and its association with clinical characteristics in patients with paroxysmal AF in whom continuous rhythm monitoring is performed during 6 months of follow-up.

Methods. A total of 202 patients with paroxysmal AF included in the Reappraisal of Atrial Fibrillation: Interaction Between HyperCoagulability, Electrical Remodeling, and Vascular Destabilisation in the Progression of Atrial Fibrillation (RACE V) registry were studied. All had completed 6 months rhythm follow-up with continuous monitoring by an implantable loop recorder or pacemaker. Patients were divided into 4 types of paroxysmal AF: no recurrent AF during follow-up; short-lasting episodes (<6 hours); intermediate episodes (6-12 hours); long episodes (>12 hours).

Results. Mean age was 64 ± 9 years, 58% were men. Total history since diagnosis of AF was $2.1 [0.5-4.4]$ years, 34% had heart failure, 50% had hypertension. During follow-up 65 (32%) patients had no AF, 45 (22%) had short, 37 (18%) intermediate and 55 (27%) had long episodes of AF. Figure 1 shows examples. Each day is represented by a bar. White means no AF is present, and black represents episodes of AF. The Y-axis is the time of day; X-axis represents 6 months of follow up. Patients with long episodes were more often men (73% versus 59% in no AF, 38% in short and 60% in intermediate episodes; $P = 0.006$), had more often coronary artery disease (22% versus 8% in no AF, 7% in short, 8% in intermediate episodes; $P = 0.042$), and higher left ventricular mass (178 ± 55 versus 156 ± 44 in no AF, 141 ± 36 in short, 167 ± 36 gram in intermediate episodes; $P = 0.013$). Left atrial volume index was smaller in patients without recurrent AF (31 ± 10 versus 37 ± 13 in short, 38 ± 11 in intermediate, and 36 ± 11 mL/m² in long episodes; $P = 0.009$).

Conclusions. In paroxysmal AF patterns differ. This signifies that paroxysmal AF is not one entity. Therefore, continuous rhythm monitoring may help to personalize AF therapies in the future.

Abstract P968 Figure. Short (A) and (B) long AF episodes



Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P969

Independent association of galectin-3 with risk of atrial fibrillation

Agbaedeng TA.¹; Munawar DA.¹; Emami M.¹; Mahajan R.¹; Lau DH.¹; Sanders P.²

¹University of Adelaide, Department of Medicine, Centre for Heart Rhythm Disorders, Adelaide, Australia

²South Australian Health and Medical Research Institute, Department of Heart Health, Centre for Heart Rhythm Disorders, Adelaide, Australia

Introduction: Fibrosis is the structural surrogate for atrial fibrillation (AF). Emerging evidence shows that pro-fibrotic biomarkers can be used for risk stratifying patients. Galectin-3 (Gal-3), a pro-fibrotic marker, has been shown to associate with an increased risk of AF.

Purpose: To investigate the relation between Gal-3 and atrial fibrillation in a meta-analysis.

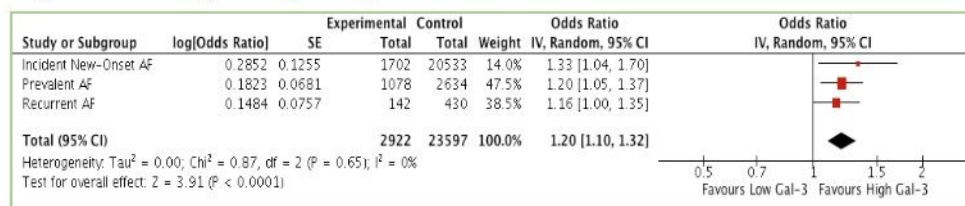
Methods: We performed an exhaustive literature search on PubMed and Embase using the keywords: "Galectin-3" OR AND "Atrial Fibrillation" through 2017. After exclusion, 15 studies were pooled in a random effects meta-analysis.

Results: In a meta-analysis of over 23,000 patients, AF patients demonstrated higher plasma levels of Gal-3, with trends toward significance ($p = 0.08$). Multivariable adjusted logistics showed significant association between 1-unit increment in Gal-3 and the prevalence of AF. Similarly, and after a mean follow-up of 7 years, 1-SD increase in Gal-3 demonstrated 25% predicted risk of new-onset AF. Further, high serum Gal-3 was also associated with reduced ablation success rate, with up to 16% elevated risk of recurrent atrial arrhythmias predicted by 1-SD increase in Gal-3.

Conclusion: Gal-3 independently predicts elevated risk of AF occurrence and recurrent AF post-ablation. Serum sampling of pro-fibrotic biomarkers may prove useful in detecting patients at risk of future AF.

Abstract P969 Figure.

Figure. Summary of adjusted pooled risk estimates



Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P970

Leukocyte telomere length is a surrogate marker of biological age predicts atrial fibrillation and stroke: a meta-analysis

Emami M.; Agbaedeng T.; Mishima R.; Kadhim K.; Thyagarajah A.; Munawar D.; Linz D.; Hendriks J.; Middeldorp M.; Gallagher C.; Mahajan R.; Lau DH.; Sanders P.

University of Adelaide, Centre for Heart Rhythm Disorders, Adelaide, Australia

OnBehalf: Centre for Heart Rhythm Disorders (CHRD)

Introduction: Chronological age is the most common risk factor for atrial fibrillation (AF). Telomere length is emerging as a marker of biological age. The association between biological age and AF, cardio-metabolic risk factors, and stroke is not well established.

Objectives: The association between leukocyte telomere length (LTL) as a biological ageing marker and its role in predicting AF, hypertension (HTN), diabetes mellitus (DM), body mass index (BMI), and stroke was investigated in a meta-analysis

Methods: A broad computerised literature search on PubMed and EMBASE limited to human studies were performed using the words AF, HTN, DM, BMI, stroke, and LTL in different formats and spellings from inception to October 2018. After exclusions, 91 studies were identified with a total of 63,514 participants. Studies were pooled per their primary outcome into five different meta-analyses (AF, HTN, DM, BMI, and stroke). The results were presented as odds ratio (OR). LTL was measured by quantitative PCR and presented as the ratio of telomeric DNA (T) to a single copy reference DNA (S): T/S ratio (mean $\pm$ SD). LTL was presented in quartiles with Q1 representing the shortest.

Results: For AF, the pooled analysis of 11,351 participants (4 studies) demonstrated that shorter LTL is strongly associated with a higher risk of AF compared to longer LTL [Q1/Q4 OR 1.27 (1.08, 1.49), $p = 0.003$] even when adjusted for other variables including chronological age. The association of LTL with stroke [Q1/Q4 OR 1.37 (0.99- 1.89), $p = 0.06$] was not significant. However, there was a significant association between telomere attrition and DM [OR 7.3 (5.10-10.45)], HTN [OR 6.87 (3.31-14.26)], and BMI [OR 4.92 (4.74-5.11)].

Conclusion: Biological age is strongly associated with the risk of AF independent of other variables including chronological age. Cardio-metabolic risk factors like DM, HTN, and obesity increases telomere attrition and accelerates biological ageing, therefore, increases the risk of AF.

Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P971

Association of sleep-disordered breathing severity with cardiac structural remodelling in patients with atrial fibrillation

Kadhim K.¹; Jones D.²; Elliott AD.¹; Middeldorp M.¹; Hendriks J.¹; Mahajan R.¹; Mcevoy RD.³; Lau D.¹; Sanders P.¹; Linz D.¹

¹University of Adelaide, Centre for Heart Rhythm Disorders, Adelaide, Australia

²University of Adelaide, Adelaide, Australia

³Flinders Medical Centre and Flinders University, Adelaide Institute for Sleep Health (AISH), Adelaide, Australia

Background: Sleep-disordered breathing (SDB) is prevalent in patients with atrial fibrillation (AF). Patients with SDB experience more frequent and more severe episodes of AF, and the treatment of concomitant SDB in AF patients enhances the likelihood of maintaining sinus rhythm. Atrial structural remodelling is an integral part of AF substrate development. We sought to assess the association between SDB severity and structural and functional echocardiographic parameters in patients with AF.

Methods: Prospectively-collected registry data for 442 consecutive patients with AF and SDB were analysed. All patients underwent formal overnight polysomnography. SDB severity was classified using the apnoea-hypopnoea index (AHI) as follows: <5/hr, no SDB; 5-14/hr, mild SDB; ≥15/hr, moderate-to-severe SDB. Further, apnoeic episodes were classified as central or obstructive depending on chest wall movement and detected airflow. Contemporaneous echocardiographic data was recorded and included left atrial diameter (cm), bi-plane left atrial volume (cm³), left ventricular internal diameter in diastole (LVIDd), and ejection fraction (EF%).

Results: Mean age for the population was 60 ± 11 years, mean CHADs2Vasc score was 1.8 ± 1.2 and 69% were men. Paroxysmal AF was present in 61.8% of the population and 16.3% had previous AF ablation. Left atrial diameter was significantly increased as the severity of SDB increased: 3.8 [IQR: 3.4-4.3] cm for no SDB, 4 [IQR 3.6-4.3] cm for mild SDB and 4.2 [3.8-4.5] cm for moderate-to-severe SDB ($p < 0.001$). Additionally, left atrial volume also increased as the severity of SDB increased: 61 [47-86] cm³, 63 [49-79.5] cm³ and 73 [56-91] cm³ for no, mild, and moderate-to-severe SDB respectively, $p < 0.001$. There was no significant differences in left ventricular diameter ($p = 0.08$) or EF% ($p = 0.5$). AHI correlated significantly but modestly with left atrial diameter ($r = 0.2$, $p < 0.001$) and left atrial volume ($r = 0.13$, $p = 0.008$). Within the components of the AHI, each of total apnoea index, obstructive apnoea index and hypopnoea index had significant correlation with left atrial volume ($p = 0.01$, 0.01 and 0.02 respectively) and left atrial diameter ($p = 0.01$, 0.01 and <0.001 , respectively). However, central apnoea index had no correlation with either measurements ($p = 0.28$ for both).

Conclusion: SDB severity is associated with increased left atrial dimensions in patients with AF. Obstructive, but not central apnoeas contributed to this association. Whether pathophysiological processes mainly present in obstructive apnoeas, such as intrathoracic pressures swings, contribute to arrhythmogenic atrial structural remodelling in AF requires further study

P972

Endoatrial contact phase mapping in atrial fibrillation using the PentaRay catheter: is any rotor there? Yes, but not around for long

Severi S.¹; Lozupone G.¹; Fioravanti M.¹; Valinoti M.¹; Dal Monte A.²; Tomasi C.²; Corsi C.¹

¹University of Bologna, Cesena, Italy

²Santa Maria delle Croci Hospital, Ravenna, Italy

Background: Electrical rotors role in sustaining atrial fibrillation (AF) and as therapeutic targets in the ablation procedure have been extensively investigated. Up to now, rotors detection and locationing during ablation have been based on basket catheter mapping, which is aimed at a simultaneous acquisition of electrograms (EGMs) from the whole left atrium (LA). However, this mapping might be hampered by low spatial resolution and poor contact of electrodes to the atrial wall.

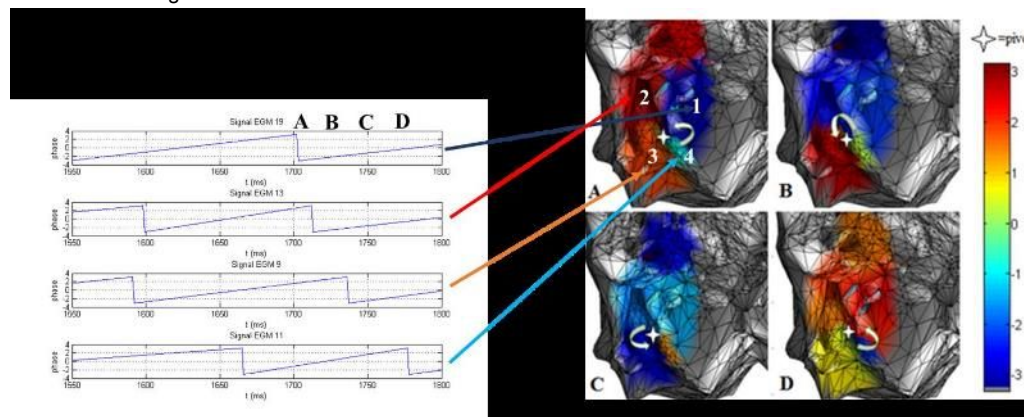
Purpose: To evaluate rotor detection and locationing performed by means of the PentaRay catheter, which is characterized by lower spatial coverage, higher resolution and better contact.

Methods: Eight patients with persistent AF (age: 57 to 82 y, 3/8 male) were assessed. All patients underwent ablation procedure using CARTO3 mapping system. Unipolar atrial EGMs were acquired using the PentaRay catheter. For each patient several EGMs acquisitions ("epochs"), lasting 2.5 seconds each, were analyzed. A previously developed modified version of the sinusoidal recombination method and the Hilbert transform were applied. Phase maps were constructed on the portion of the 3D geometry of the LA covered by the catheter; to each point on the anatomy was assigned the phase value computed considering the signal from the nearest electrode. Rotor was defined when a phase singularity with a lifespan greater than one AF cycle length was detected. The implemented algorithm was able to detect both spatially stable and meandering rotors and to quantify their persistence in time.

Results: An example of a detected rotor is shown in the figure. On the left panel we show the phase signals derived from four EGMs; on the right panel the phase signals are color-coded on the LA surface in four different timings (A-D) and the corresponding phase singularity points are shown with the white star. Considering 10 mm as the maximum distance between the electrodes and the atrial wall, the computed coverage of the PentaRay catheter was $12.4\% \pm 2.5\%$ of the whole endoatrial wall. The dominant frequency estimated and used for the sinusoidal recombination method was 4.1 ± 0.3 Hz. For each patient 9.4 ± 6.3 epochs were analyzed, in 5.3 ± 4.6 of which at least a rotor was detected ($46.9 \pm 32.2\%$). In the 2.5 sec epochs with at least a rotor, the number of detected stable rotors was 1.7 ± 0.6 , with a persistence in time of 283 ± 39 ms (max: 926 ms) while no meandering rotors were detected.

Conclusions: We applied an independent phase mapping approach for 3D rotor detection on the LA surface. Preliminary results show that using the PentaRay catheter spatially stable rotors in the LA can be detected. However, in our patients, such rotors were found to have a very short persistence in time. We may hypothesize that LA chamber coverage has a central role for the detection of meandering rotors, whose pivot is not stable in the small portion of mapped atrial wall.

Abstract P972 Figure.



Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P973

Association between biomarkers and atrial fibrillation in patients undergoing implantation of a dual chamber pacemaker

Korantzopoulos P.¹; Plakoutsi S.¹; Kyrlas K.¹; Bazoukis G.²; Liberopoulos E.³; Milionis H.⁴

¹University of Ioannina Medical School, Department of Cardiology, Ioannina, Greece

²Evangelismos General Hospital of Athens, Second Department of Cardiology, Athens, Greece

³University of Ioannina Medical School, Second Department of Internal Medicine, Ioannina, Greece

⁴University of Ioannina Medical School, First Department of Internal Medicine, Ioannina, Greece

Introduction: Atrial fibrillation (AF) is a common arrhythmia in the elderly and is more prevalent in patients with sick sinus syndrome. Inflammation and oxidative stress seem to play a significant pathophysiologic role in AF development and perpetuation.

Purpose: We aimed to examine the association between simple routine laboratory parameters with AF in patients who underwent implantation of a dual chamber pacemaker due to sick sinus syndrome or due to high-degree atrioventricular block.

Methods: Consecutive patients who received a dual chamber pacemaker in years 2016 and 2017 were analyzed. Specifically, we recorded clinical and laboratory (hematological, biochemical, electrocardiographic, and echocardiographic) parameters. The final analysis included 217 patients with sick sinus syndrome and 393 patients with high-degree atrioventricular block. Comparisons according to the presence or not of AF history were performed.

Results: 102/217 (47%) of the sick sinus syndrome patients (median age 77 years, 54% men) had AF history while 54/393 (14%) of high-degree atrioventricular block patients (median age 79 years, 54% men) had a history of this specific arrhythmia. The multivariate analysis indicated that the red blood cell distribution width (RDW) (OR:1.17; 95% CI: 1.05-1.36; $p = 0.05$), and levels of γ -glutamyl transferase (γ GT) (OR:1.15; 95% CI: 1.03-1.28; $p = 0.04$) had an independent association with AF history in patients with sick sinus syndrome. On the other hand, in patients with high-degree atrioventricular block, no correlation between AF and the studied biomarkers was evident.

Conclusions: Sick sinus syndrome is related to AF while biomarkers that have been linked with inflammation and oxidative stress such as RDW and γ GT have a statistically significant association with AF history in this population. No corresponding association was observed in patients with disorders of atrioventricular conduction. The correlation of specific biomarkers with AF development after pacemaker implantation represents a subject of future research.

Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P974

Atrial fibrillation following coronary artery bypass grafting - the role of a preexisting pro-arrhythmic atrial remodeling

Serban RC.¹; Pintilie I.²; Somkereki C.¹; Perian M.³; Chinezu L.³; Banescu C.⁴; Scridon A.²

¹University of Medicine and Pharmacy, Emergency Institute for CV Diseases and Transplantation, Tirgu Mures, Romania

²Institute of Cardiovascular Diseases, Targu Mures, Romania

³University of Medicine and Pharmacy, Tirgu Mures, Romania

⁴University of Medicine and Pharmacy, Center for Advanced Medical and Pharmaceutical Research, Tirgu Mures, Romania

Funding Acknowledgements: This work was supported by a grant of the Ministry of Research and Innovation, CNCS-UEFISCDI, project number PN-III-P1-1.1-TE-2016-0382.

Background: Atrial fibrillation (AF) is the most common arrhythmia following coronary artery bypass grafting (CABG). Although the occurrence of AF in this setting is strongly linked to surgery-related factors, not all CABG patients present AF. This suggests that pro-arrhythmic (electrical, structural, and/or autonomic) atrial remodeling may preexist in patients that develop AF following CABG.

Purpose: We aimed to assess whether a preexisting pro-arrhythmic atrial remodeling could contribute to the risk of post-CABG AF.

Methods: The study included 30 consecutive patients with no AF history hospitalized for an elective isolated on-pump CABG. Continuous ECG monitoring was performed in all patients up to post-CABG day 5. The autonomic tone was assessed prior to surgery using 24-h ECG-based heart rate variability analysis. A right atrial appendage sample was collected from each patient and was used for assessing (1) action potential (AP) parameters (i.e., AP amplitude, duration and velocity of depolarization, and AP duration to 90% of complete repolarization) using the microelectrode technique; (2) atrial histology; and (3) expression levels of several genes known for their involvement in atrial arrhythmogenesis (i.e., CACNA1C, SCN5A, GJA5, KCNQ1, KCNE2, and KCNJ2). All parameters were compared between patients with and without post-CABG AF.

Results: AF occurred in 11 (36.7%) of the 30 study patients. There was no significant difference in total surgery time, aortic clamping time, or extracorporeal circulation time between patients with and without post-CABG AF (all $p > 0.05$). Compared to non-arrhythmic patients, AF patients had higher resting heart rate (i.e., increased sympathetic tone) and higher root mean square of successive differences (i.e., increased vagal tone) (both $p = 0.03$). The severity of inflammatory infiltrates and interstitial fibrosis were similar between AF and non-AF patients, but adipose tissue infiltrates were significantly more important in AF patients (score 2 [1-3] versus 1 [1.0-1.5]; $p = 0.02$). All AP parameters, as well as the expression levels of the six studied genes were similar between patients with and without post-CABG AF (all $p > 0.05$).

Conclusion: The present study demonstrates that AF continues to represent a common post-CABG complication, affecting more than one third of patients undergoing CABG, and suggests that the occurrence of AF in CABG patients with similar surgery times is not a random phenomenon. Patients who developed AF following CABG presented a preexisting structural (increased fatty infiltrates) and autonomic (sympatho-vagal co-activation), but not electrical (electrophysiological or molecular) remodeling. Despite these preexisting features, AF did not occur in these patients prior to CABG, suggesting that these changes may be necessary, but are insufficient for AF occurrence in the absence of additional arrhythmogenic factors.

Subject: Poster session 2 -- Atrial Fibrillation - Pathophysiology and Mechanisms

P975

Aortic pulse wave velocity assessment during atrial fibrillation

Khokhar KB.¹; Lau DH.¹; Stiles MF.²; Mahajan R.¹; Elliott A.¹; Edwards S.³; Munawar A.¹; Thiyagarajah A.¹; Linz D.¹; Emami M.¹; Stokes M.¹; Sanders P.¹

¹Royal Adelaide Hospital, Centre for Heart Rhythm Disorders (CHRD), Adelaide, Australia

²Waikato District Hospital, Cardiology, Waikato, New Zealand

³University of Adelaide, Statistics, Adelaide, Australia

Background and Introduction: Aortic stiffness (AS), as a surrogate for central high blood pressure (CBP) and prehypertension, is increasingly recognized as a novel risk factor in development of AF. Aortic pulse wave velocity (aPWV) assessment by carotid-femoral PWV (cfPWV) estimation is the recommended method to evaluate AS non-invasively. However, no studies were performed to validate aPWV in AF.

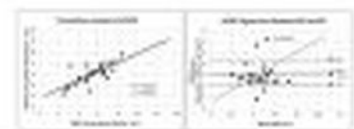
Objective: We sought to validate non-invasive aPWV assessment during AF by comparing it with aPWV estimate in sinus rhythm (SR).

Method: The cfPWV was averaged over 20 seconds and recorded non-invasively in 31 consecutive participants (mean age 64 ± 6 years, 57% male) during AF (6.04 ± 1.75 m/s) and SR (5.75 ± 2.0 m/s). Correlation analysis was performed, and Bland Altman plots were employed to determine the agreement between non-invasive estimate of aPWV during AF and SR.

Results: A moderate but significant correlation was found between mean aPWV during SR and AF (5.9 ± 0.4 m/s vs. 6.3 ± 0.4 m/s, $R^2 = 0.55$, $p = 0.001$; Figure 1- left panel). Moreover, a significant overestimation of aPWV was seen during AF with an adjusted mean difference of $+0.4$ m/s (95% CI -0.8 to 1.4 m/s, $p = 0.049$; Figure 1-right panel). However, using the median of 79bpm as a cut-off for low vs high HR during AF, a statistically significant over-estimation of aPWV was reported only for higher HR group ($+0.62$ m/s, 95% CI -1.2 to 1.2 , $p = 0.018$) but not at low HR of <79 bpm, ($+0.27$ m/s, 95% CI -0.6 to 0.9 , $p = 0.39$).

Conclusion: Our study is the first to demonstrate that non-invasive estimation of aPWV can be reliably performed in rate-controlled AF. This can help identify patients at risk of accelerated conduit arterial stiffness leading to premature cardiovascular events and AF progression.

Abstract P975 Figure. Aortic PWV assessment during AF



P976

Role of nocturnal hypoxemic burden for disease-orientated assessment of sleep apnea severity in ambulatory patients with atrial fibrillation

Linz D.¹; Nalliah C.²; Kadhim KADHIM¹; Middeldorp M.¹; Elliott A.¹; Mcevoy D.¹; Kalman J.²; Mahajan R.¹; Lau D.¹; Baumert M.¹; Sanders P.¹

¹South Australian Health and Medical Research Institute, Centre for Heart Rhythm Disorders, Adelaide, Australia

²Royal Melbourne Hospital, Royal Melbourne Hospital, Melbourne, Australia

Background: Studies investigating the relationship between sleep-disordered breathing (SDB) and atrial fibrillation (AF) have largely assessed SDB-severity by the apnea-hypopnea index (AHI). The AHI does not incorporate nocturnal hypoxemic burden which may increase the risk of prevalent non-paroxysmal AF (nPAF) as the clinical manifestation of more progressed AF substrates. This investigation sought to systematically characterize the composition of AHI and hypoxemic burden to define a disease-orientated metric for SDB-severity best correlating with prevalent nPAF.

Methods: Polysomnography and overnight oximetry data were obtained in 435 consecutive ambulatory AF patients to determine the composition of AHI (apneas vs. hypopneas), the number of acute episodic desaturations per hour (oxygen desaturation index, ODI) and the composition of total time spent below 90% oxygen saturation (T90Total) attributed to acute desaturations (T90Desaturation). Logistic regression analysis was used to characterize the association with prevalent nPAF.

Results: One hundred sixty-nine AF patients (38%) had nPAF and one third had moderate-to-severe SDB (AHI > 15) (n = 149, 34%). 82% of the median total AHI (9.4 [3.6 – 20.1]) could be attributed to hypopneas. Only 29% of events were associated with episodic desaturations, which contributed to 96% (T90Desaturation) of the variation in T90Total. T90Total varied widely in patients with low ODI due to variable durations and nadirs of distinct desaturation events. Not AHI, but T90Total and ODI were gender and age independent predictors of nPAF. However, diabetes, hypertension and body mass index made a more significant contribution to the overall risk of nPAF in this AF cohort. Positive airway pressure reduces AHI, ODI and T90 in AF-patients.

Conclusions: In AF patients, hypopneas constitute a majority of respiratory events and hypoxemic burden is mainly a cumulative consequence of episodic desaturations. Hypoxemic burden performed better in predicting nPAF than AHI, but concomitant modifiable risk factors made a more significant contribution to the overall risk of nPAF versus PAF.

Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P977

Subclinical atrial fibrillation and clinical outcome in patients with pacemaker

Park YJ.; Lee SS.; Gwag HB.; Park KM.; On YK.; Kim JS.; Park SJ.

Samsung Medical Center, Seoul, Korea Republic of

Background/Introduction

Long term intracardiac monitoring in patients with permanent pacemakers (PPM) and implantable defibrillators detects subclinical atrial fibrillation (SCAF) in 28% to 68% of these patients within the first 1 to 3 years after implantation. The SCAF episodes, which have been shown in previous studies to be associated with an increased risk of clinical AF and stroke. However, there are few studies in patients with SCAF on Asian population.

Purpose

This study examined the relationship between SCAF burden and progression of clinical AF, ischemic stroke, heart failure hospitalization, other clinical outcomes on Asian population.

Methods

This study is single center retrospective study. In patients with bradyarrhythmia, underwent implantation of PPM were enrolled. Patients with preexisting AF, atrial lead malfunction, within follow up duration 3 month were excluded. We subdivided group of patients depending on SCAF burden. Primary outcome was composite of progression of clinical AF, ischemic stroke, heart failure (HF) hospitalization.

Result

A total of 496 patients were enrolled. 233(47.0%) were male, and the mean age was 65.6 years.

During the median follow up 5.4 years at least one SCAF episodes was detected by in 344 patients(69.3%). Among the patients with SCAF, high burden group accounted by 34.4%. Primary

outcome was occurred in 5(3.28%) of none group, 5(2.84%) of low burden group, 25(44.6%) of high group.

Conclusion: High burden of SCAF was associated with increased risk of progression to clinical atrial fibrillation, ischemic stroke.

Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P978

Guideline-directed therapy at discharge is important in patients with heart failure and atrial fibrillation

Ahn M.¹; Kim KJB²; Lee LJH¹

¹Yonsei university, Seoul, Korea Republic of

²Kyunghee University, Cardiology, Seoul, Korea Republic of

Aims: There are limited and conflicting data regarding the prognostic implication of guideline-directed therapy, especially in heart failure (HF) patients with atrial fibrillation (AF). Thus, this study evaluated the relationship between guideline adherence to recommended therapy at discharge and relevant 60-day clinical outcomes in acute HF patients with AF having reduced ejection fraction (HFrEF) or preserved ejection fraction (HFpEF).

Methods and Results: Of 5,625 acute HF patients in the Korean Acute Heart Failure Registry, 2,071 with documented AF (HFrEF, n = 986; HFpEF, n = 1,085) were separately analysed. A guideline adherence score was calculated for the prescription of angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, β -blockers, mineralocorticoid receptor antagonists, and anticoagulants. In HFrEF patients with AF, there was significant trend of increase in mortality (p for trend <0.001) and composite endpoint (p for trend = 0.002) according to guideline adherence. Poor adherence was associated with a significantly high risk of mortality (hazard ratio [HR], 4.75; 95% confidence interval [95% CI], 1.77–12.74) and composite endpoint (HR, 2.36; 95% CI, 1.33–4.18). In HFpEF patients with AF, there was a significant increasing trend for rehospitalization (p for trend = 0.04) and composite endpoint (p for trend = 0.03). However, the beneficial effect of good guideline adherence was statistically non-significant for all clinical outcomes.

Conclusion: Better adherence to guidelines was associated with a better 60-day prognosis in both HFrEF and HFpEF patients with AF. However, the beneficial effect of guideline adherence was more pronounced in HFrEF patients with AF.

Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P979

Atrial fibrillation in arrhythmogenic right ventricular cardiomyopathy and its association with ventricular arrhythmias

Baturova MA.¹; Svensson A.²; Svendsen JH.³; Bundgaard H.³; Carlson J.⁴; Platonov PG.⁴

¹Department of Cardiology, Clinical Sciences, Lund University, Lund, Sweden, Research Park, St.Petersburg State University, St.Petersburg, Russian Federation

²Linköping University, Department of Cardiology and Department of Medical and Health Sciences, Linköping, Sweden

³Rigshospitalet - Copenhagen University Hospital, Department of Cardiology, The Heart Centre, Copenhagen, Denmark

⁴Lund University, Department of Cardiology, Clinical Sciences, Lund, Sweden

Background: Recent studies in arrhythmogenic right ventricular cardiomyopathy (ARVC) have drawn attention to atrial arrhythmias.

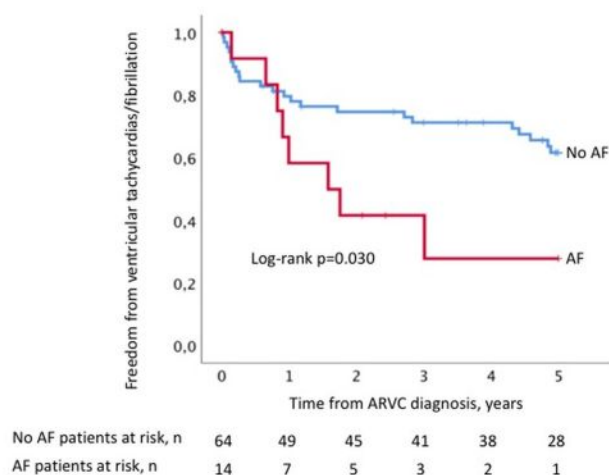
Purpose: We aimed to assess the prevalence of atrial fibrillation (AF) and its association with future ventricular tachyarrhythmias in ARVC patients.

Methods: Study sample comprised 78 patients with a definite ARVC diagnosis according to the 2010 Task Force criteria (TFC2010) from three tertiary care centers participating in the Nordic ARVC Registry (33% females, median age at ARVC diagnosis 41 years [interquartile range 25%-75% (IQR) 32-55 years]). The information about AF and VT/VF episodes was obtained from the ARVC Registry and from the electronic ECG databases which contains all ECG recordings in the hospital catchment areas from 1988.

Results: AF was diagnosed in 26 patients (33%): In 14 patients before ARVC diagnosis (18 %) and in 12 patients during follow-up (15%). The median age at AF onset was 54 years (IQR 33-63 years). The only independent factor associated with AF at the time of ARVC diagnosis was previous ventricular tachycardias/fibrillation (VT/VF) (odds ratio 7.71, 95% confidence interval (CI) 1.56-28.38, $p = 0.012$). AF diagnosed before the ARVC diagnosis was established predicted VT/VF during follow-up (univariate hazard ratio (HR) 2.41; 95% CI 1.06-5.46, $p = 0.035$; see Figure).

Conclusion: AF is a common arrhythmia in ARVC patients. AF significantly increases the risk of VT/VF in ARVC patients.

Abstract P979 Figure.



Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P980

Predictors of de novo atrial arrhythmia after isolated surgical aortic valve replacement in severe degenerative aortic stenosis

Hwang YM.¹; Kim J.²

¹Catholic medical center, St. Vincent's Hosp., Suwon, Korea Republic of

²Asan Medical Center, Seoul, Korea Republic of

Objective: Patients with degenerative aortic stenosis (AS) are known to be prone to any arrhythmia compared to healthy population of same age. However, incidence of long term post-operative atrial arrhythmia is not investigated in isolated aortic valve replacement with degenerative AS. We sought to evaluate the incidence of atrial arrhythmia during long term follow up after AVR.

Method: This is a single tertiary center retrospective study, evaluating the clinical outcomes, especially regarding atrial arrhythmia development in patients who underwent isolated surgical aortic valve replacement due to aortic stenosis. Enrolled patients underwent surgical isolated aortic valve replacement from January 2005 to May 2015. Clinical information attained by chart review. We reviewed pre-operative electrocardiogram (ECG) and described as baseline rhythm. Perioperative, postoperative and obtainable ECGs including Holter data were thoroughly reviewed. In addition, any adverse clinical event during follow up period was gathered.

Results: We analyzed 663 patients, pathologically proven degenerative AS with obtainable ECGs. Mean age of the patients was 67.1 ± 8.1 years, 285 patients had bicuspid aortic valve (43.0%), mean follow up after AVR was 1026 ± 357 days. Immediate postoperative atrial arrhythmias were observed in 106 patients (16.0%, 66 patients were atrial fibrillation). Most of the patients with immediate postoperative atrial arrhythmias (83 patients, 78.3%) had transient arrhythmia documented only during index hospitalization. Twenty three patients had recurrent atrial fibrillation after POD >30days. Beyond 30 days, 63 patients (9.5%) developed de novo atrial arrhythmias. Most of the developed atrial arrhythmia was atrial fibrillation (n = 44, 69.8%) which required further medical intervention.

Conclusion: Isolated AVR in degenerative AS patients carry relatively high incidence of atrial arrhythmia during follow up. The most common form of atrial arrhythmia was atrial fibrillation in this population. After atrial fibrillation is diagnosed, large percentage of these patients had treatment adjustment. Medical attention in post-AVR patients is critical to diagnose atrial fibrillation and manage timely.

Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P981

Rapid improvement in left ventricular function after sinus rhythm restoration in patients with idiopathic cardiomyopathy and atrial fibrillation

Mueller-Edenborn B.¹; Mueller-Edenborn B.¹; Minners J.²; Allgeier J.¹; Burkhard T.³; Lehmann H.¹; Ruile P.²; Merz S.²; Allgeier M.²; Neumann F.-J.²; Arentz T.¹; Jadidi A.¹; Jander N.²

¹University Heart Center Freiburg-Bad Krozingen, electrophysiology, Bad Krozingen, Germany

²University Heart Center Freiburg-Bad Krozingen, cardiology, Bad Krozingen, Germany

³University Hospital Basel, cardiology, Basel, Switzerland

Background: Sinus rhythm restoration (SRR) in patients with atrial fibrillation and heart failure may improve systolic function and impact on consecutive clinical management such as ICD-implantation rate.

Purpose: To investigate time course and potential predictors of the response to SSR.

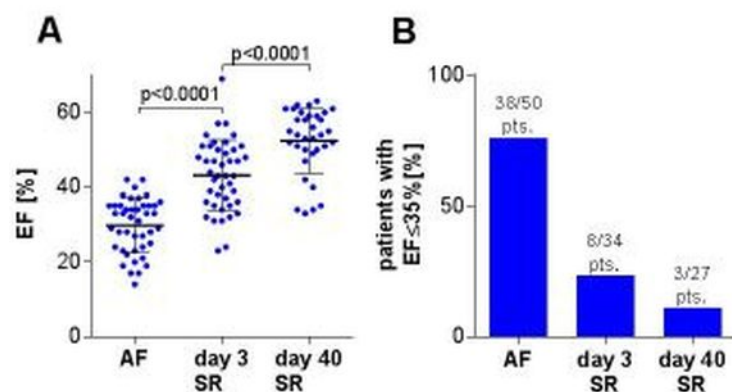
Methods: We prospectively studied 50 consecutive patients who presented in heart failure with reduced ejection fraction and concomitant AF. After exclusion of valvular and coronary artery disease patients underwent electrical cardioversion. Serial echocardiography, cardiac magnetic resonance imaging (cMRI), and 24h-ECGs were performed at baseline, and on days 3 and 40 following SRR.

Results: Baseline left ventricular ejection fraction (EF) of the study population (76% male, age 69 ± 11 y) was $30 \pm 7\%$. Sustained SRR ($\geq$ three days) significantly improved EF (figure 1A; day 3: $43 \pm 7\%$, $n = 46$; day 40: $53 \pm 9\%$, $n = 34$; $p < 0.001$) as quantified by echocardiography. Comparable results were obtained using cMRI (baseline: $29 \pm 8\%$; day 3: $42 \pm 9\%$). Three patients showed no response to SRR (EF-improvement $< 15\%$). The percentage of patients meeting current criteria for ICD-implantation for primary prevention dropped from 76% ($n = 38$) to 11% ($n = 3$) on day 40 following SRR (figure 1B). No specific clinical or echocardiographic factor predicting improved EF after SRR could be identified.

Conclusions: The majority of patients presenting with non-ischemic, non-valvular heart failure with reduced ejection fraction and concomitant AF show a significant and rapid improvement in EF following SRR. An attempt at SRR and reassessment of the need for ICD implantation after 40 days may be warranted in all such patients.

Abstract P981 Figure.

FIGURE 1



P982

Arrhythmogenic atrial substrate in suspected heart failure with preserved ejection fraction: implications for development of future atrial fibrillation

Mueller-Edenborn B.¹; Kocher S.²; Minners J.²; Chen J.²; Zeh W.²; Lehmann H.¹; Allgeier J.¹; Neumann F.-J.²; Arentz T.¹; Jadidi A.¹

¹University Heart Center Freiburg-Bad Krozingen, electrophysiology, Bad Krozingen, Germany

²University Heart Center Freiburg-Bad Krozingen, cardiology, Bad Krozingen, Germany

Funding Acknowledgements: founded by internal sources

Introduction: Atrial fibrillation (AF) increases morbidity and mortality in heart failure with preserved ejection fraction (HFpEF), yet identification of arrhythmia-naïve HFpEF-patients at highest risk to develop new-onset AF is challenging. Amplified p-wave duration >150 ms (APWD) was previously demonstrated to non-invasively identify arrhythmogenic atrial substrate with high sensitivity and specificity.

Purpose: To investigate the importance of APWD to predict new-onset AF in HFpEF.

Methods: Ninety-nine consecutive patients with symptomatic heart failure and left ventricular ejection fraction >50% underwent exercise testing with concomitant right-heart catheterization, left-heart catheterization and echocardiography. Significant arrhythmogenic atrial substrate was diagnosed when APWD was >150 ms. Patients without history of AF (n = 87) were followed for new-onset AF in 6-12 months intervals.

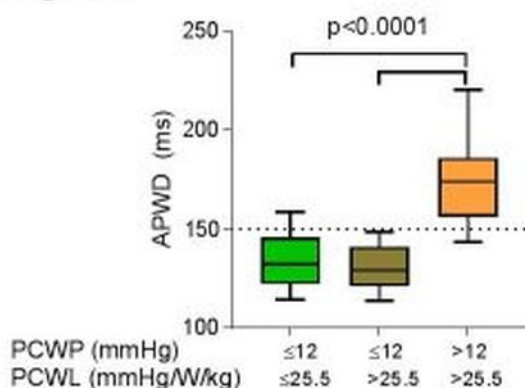
Results: 87% of patients with advanced HFpEF (pulmonary capillary wedge pressure [PCWP] at rest >12 mmHg) had evidence of arrhythmogenic atrial substrate (figure 1; APWD 175 ± 29 ms vs. 132 ± 14 ms with PCWP < 12 mmHg, $p < 0.0001$). The presence of arrhythmogenic atrial substrate as evidenced by an APWD >150ms was associated with a ten-fold increased risk for new-onset AF during a 4.6 years follow-up (hazard ratio [HR] 9.684, 95% CI: 2.61-35.89, $p < 0.0001$), comparable to advanced HFpEF (HR 7.20, 95% CI 2.24-23.10, $p < 0.001$). Early HFpEF with normal resting PCWP, but pathological increase to exercise >25.5 mmHg/W/kg was not related to arrhythmogenic atrial substrate (figure 1; APWD 131 ± 13 ms vs. 134 ± 15 ms with normal pressures, $p = 0.395$) and did not carry an elevated risk for incident AF (HR 3.44, 95% CI: 0.57-20.72, $p = 0.178$).

Presence of arrhythmogenic substrate was independent of left atrial indexed volume (LAVI) and largely (85,7%) occurred in normal sized atria (LAVI <34ml/m²). LAVI did not predict future AF (HR 2.099, 95% CI: 0.27-16.27, $p = 0.478$).

Conclusions: APWD-analysis identifies arrhythmogenic atrial substrate in a large part of HFpEF-patients, who carry an incremental risk to develop future AF.

Abstract P982 figure 1

Figure 1



Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P983

Greater cardiorespiratory fitness reduces atrial fibrillation incidence: a meta-analysis

Verdicchio C.; Elliott A.; Mahajan R.; Lau D.; Sanders P.

University of Adelaide, Centre for Heart Rhythm Disorders, Adelaide, Australia

OnBehalf: Centre for Heart Rhythm Disorders

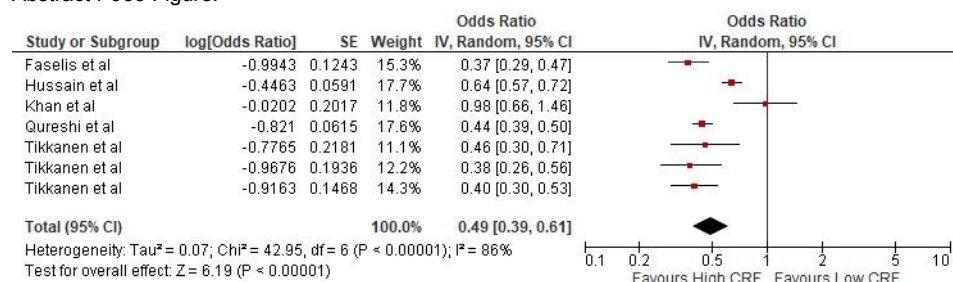
Introduction: The prevalence of atrial fibrillation (AF) has increased dramatically over the past two decades. Regular aerobic exercise and subsequent improvements in cardiorespiratory fitness (CRF) has shown to reduce the risk of cardiovascular disease incidence, morbidity and all-cause mortality. In AF there is evolving data regarding the relationship between exercise and AF risk. This meta-analysis aims to assess studies that have analysed the relationship between CRF measured at baseline by a symptom-limited exercise stress test and AF risk at follow-up.

Methods: The systematic literature review was conducted using PUBMED, MEDLINE and EMBASE databases, with five studies meeting the inclusion criteria. A random-effects meta-analysis was then used to compare the multivariate risk estimates of the lowest CRF group from each cohort with the group of the highest CRF.

Results: Data from 586,881 individuals (47.8% males) was used for analysis with a mean age of 55 ± 2 years and a mean follow-up period of 11 ± 6 years. The pooled risk of AF in the high-CRF group versus the low-CRF group showed a significant lowered risk of incident AF 0.49 (95% CI, 0.39-0.61, $p < 0.01$). AF incidence rates per 1000 person-years was lower in those in the high-CRF group 6.9 ± 0.7 compared to the low-CRF group 21 ± 13.4 .

Conclusion: There is an independent relationship between a higher CRF and a decreased incidence in AF, with a higher CRF protective against AF. Therefore, this highlights the role of exercise and maintenance of CRF for the prevention of AF and may be a target for improving outcomes in patients at risk of or with AF.

Abstract P983 Figure.



Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P984

Trends and outcomes among nonagenarians for atrial fibrillation: an insight from the nationwide inpatient sample 2005-2014

Voruganti DC.¹; Shantha GPS²; Pelosi F.²; Jongnarangsin K.²; Deshmukh A.³; Mohsen A.⁴; Briasoulis A.¹; Giudici MC.¹

¹University of Iowa, Iowa City, United States of America

²University of Michigan, Ann arbor, United States of America

³Mayo Clinic, Rochester, United States of America

⁴Louisiana State University, New Orleans, United States of America

Background: The individuals aged above 90 years constitute an increasing proportion of patients presenting with Atrial Fibrillation (AF). However, little is known about in-hospital outcomes of patients over 90 years with AF. We sought to investigate the gender differences among patients hospitalized for atrial fibrillation (AF), and assess the trends over 10 years from 2005 to 2014 through a publically available database, the National Inpatient Sample (NIS)

Methods: All patients of age greater than or equal to 90 years, with a primary diagnosis of atrial fibrillation ICD -9 CM code 427.31, were included in the study. Multivariate logistic regression analysis was performed to assess the factors associated with in-hospital mortality and 10-year trend analysis was also done. All analysis was performed with SAS 9.4 software.

Results: Hospitalizations for AF among nonagenarians increased by 50% during the study period (17,295 in 2005 to 25,830 in 2014. Patients hospitalized with AF were more likely to be females (77.42% vs.22.57%). Men admitted with AF were more likely to undergo cardioversion/ablation procedures (6.14% in men vs 5.06% in women, $P < 0.0001$). In hospital mortality (3.21% in 2005 to 2.38% in 2014) and length of stay (4.53 days in 2005 to 4.13 days in 2014, $P < 0.0001$) decreased during the study period. Females had higher incidence of stroke (3.89% vs. 0.98% in males, $P = 0.0073$) and gastro-intestinal bleeding (1.21% vs. 0.36% in males, $P = 0.71$). Hospital admission on a weekend, presence of congestive heart failure, and renal failure, and individuals with more than 7 chronic conditions were associated with higher odds were associated with increased in-hospital mortality.

Conclusion: Hospitalization rates for AF have increased among nonagenarians from 2005 to 2014. However, in-hospital mortality and length of stay have improved.

Subject: Poster session 2 -- Atrial Fibrillation - Epidemiology, Prognosis, Outcome

P985

Prevalence and associated stroke risks of HIV in patients with atrial fibrillation: a nationwide cohort study

Jung H.¹; Yang PS.²; Sung JH.²; Jang E.¹; Yu HT.¹; Kim TH.¹; Uhm JS.¹; Kim JY.¹; Pak HN.¹; Lee MH.¹; Lip GYH³; Joung B.¹

¹Yonsei University, Division of Cardiology, Department of Internal Medicine, Seoul, Korea Republic of

²CHA University, Department of Cardiology, CHA Bundang Medical Center, Seongnam, Korea Republic of

³University of Birmingham, Institute of Cardiovascular Sciences, Birmingham, United Kingdom

Background/Introduction: HIV-infected individuals face an increased risk of stroke or major bleeding compared with non-HIV-infected individuals. However, it is unclear how much stroke risk is attributable to HIV compared to other stroke risk factors in AF patients.

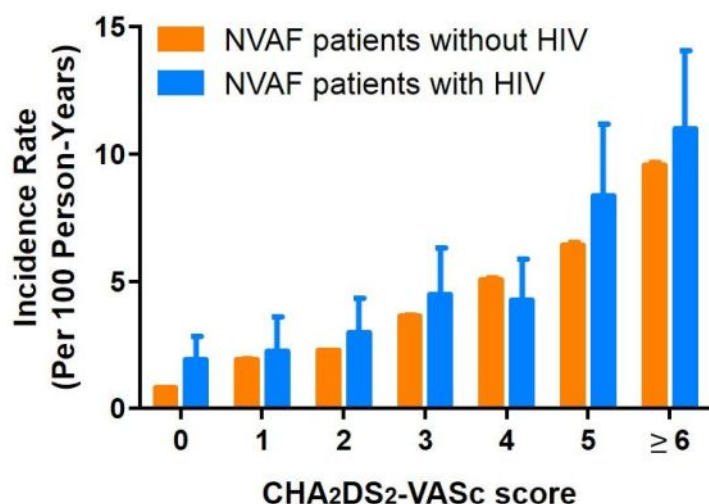
Purpose: In this study we sought to assess the prevalence of HIV among AF patients and the magnitude of increase in stroke risk in AF patients with HIV compared with those without HIV.

Methods: From the Korean National Health Insurance Service (NHIS) database from January 1, 2005 to December 31, 2016, we analyzed 972,571 patients with prevalent non-valvular AF aged 18 years or older.

Results: The overall HIV prevalence in AF patients was 0.23% (2,189 of 972,571). OAC naïve NVAF patients with HIV had increased risks of ischemic stroke with an adjusted hazard ratio (HR) of 1.19 [95% confidential interval (CI), 1.06-1.34], and major bleeding with adjusted hazard ratio (HR) of 1.31 (95% CI, 1.16-1.48) compared with those without HIV. The incidence of ischemic stroke in NVAF patients with HIV and without any non-gender risk factors for stroke was similar to those without HIV with intermediate risk (male CHA₂DS₂-VASc scores of 1) (1.92 vs. 1.92 events per 100 person-years, respectively). Ischemic stroke risk in NVAF patients with HIV increased as other CHA₂DS₂-VASc stroke risk factors were added (per 1 risk factor added, HR 1.24, 95% CI 1.17-1.31). However, the use of OACs in NVAF patients with HIV was suboptimal being only 8.9% at the time of AF diagnosis and 31.8% throughout the study period.

Conclusion: Amongst all AF patients, 0.23% had HIV. The risks of ischemic stroke and major bleeding were significantly higher in NVAF patients with HIV compared to those without HIV. Despite this, the actual use of OACs amongst AF patients with HIV was suboptimal.

Abstract P985 Figure. Incidence rates for ischemic stroke



P987

Mapping persistent atrial fibrillation with a high-density grid-style catheter: procedural characteristics and ablation lesion distribution

Sommer P.¹; Brunelli M.²; Deisenhofer I.³; Chen X.⁴; Brooks S.³; Garcia-Fernandez J.⁵; Gora P.⁶; Huo Y.⁷

¹Heart and Diabetes Center NRW, Bad Oeynhausen, Germany

²Hospital Magdeburg, Magdeburg, Germany

³DHZ Munich, Munich, Germany

⁴Rigshospitalet - Copenhagen University Hospital, Copenhagen, Denmark

⁵University Hospital of Burgos, Burgos, Spain

⁶Abbott, Minneapolis, United States of America

⁷Herzzentrum Dresden, Dresden, Germany

Background: A new high-density mapping catheter with electrodes arranged in a grid pattern, was recently introduced in Europe. The equidistant electrode spacing allows for a number of configurations, including a unique HD Wave Solution configuration in which points are exclusively taken at electrodes with two orthogonal bipoles. Procedural characteristics associated with the use of this catheter for mapping PersAF have not been previously reported.

Purpose: To report on multicenter European experience using a high-density, grid-style mapping catheter in PersAF patients, and to analyze the distribution of lesion sets for de novo and repeat ablation procedures.

Methods: Self-reported procedural data was collected in PersAF cases utilizing a high-density, grid-style catheter during the first eight months of European commercialization. Procedural characteristics including mapping/procedure time, point collection, and lesion sets were recorded. An additional map was created retrospectively for cases in which the HD Wave or Standard configuration was used, such that point collection could be compared between configurations.

Results: Procedural data was collected in 258 cases across 59 centers. Repeat ablations accounted for 55.8% of total PersAF ablations. Considering those undergoing a repeat procedure, patients had an average of 1.5 ± 0.8 previous ablations. Average mapping and procedure times for de novo ablations were 20.7 ± 21.1 and 172.4 ± 62.9 minutes, respectively; 19.0 ± 13.9 and 155.3 ± 52.2 minutes for repeat ablations. Point collection for both HD Wave or Standard configurations was reported in 57.4% of cases. HD Wave collected an average of 38.8% more points overall. The average rate of point collection was 473.7 points/minute for HD Wave; 329.1 points/minute for Standard. Among de novo ablations, 90.4% received lesion sets encircling all four PVs and another 5.3% received lesion sets encircling 1-3 PVs; the most common non-PV lesion sets were Roof Line (30.7%), CTI (23.7%), and Mitral Isthmus Line (19.3%). Among repeat ablations, 31.9% received lesion sets encircling all four PVs and another 41.7% received lesion sets encircling 1-3 PVs; the most common non-PV lesion sets were Roof Line (31.9%), CFE (29.9%), and Mitral Isthmus Line (17.4%).

Conclusions: Mapping with the HD Wave Solution configuration increased the speed of point collection by simultaneously sampling bipolar EGMs in two directions. Mapping and procedure times were in line with those previously reported for PersAF. Roof Lines and Mitral isthmus lines were two of the most commonly created non-PV lesion sets for both de novo and repeat ablations; the percentage of repeat cases in which CFEs were ablated was nearly double that of de novo procedures.

P988

Distribution of reablated antral segments after initial pulmonary vein isolation with use of ablation index

Fueting A.; Ruprecht U.; Buchholz J.; Buschmeier F.; Reinsch N.; Neven K.

Alfried Krupp Hospital, Department of Electrophysiology, Essen, Germany

Introduction: Reconnection of pulmonary veins (PVs) following radiofrequency catheter ablation for atrial fibrillation (PVI) remains common. Ablation Index is a novel ablation quality marker that incorporates contact force, time, and power in a weighted formula. This might lead to improved lesion durability and success rate during follow-up. It is unknown which antral segments are prone to repeat ablation in case of PV reconnection after initial PVI with use of Ablation Index.

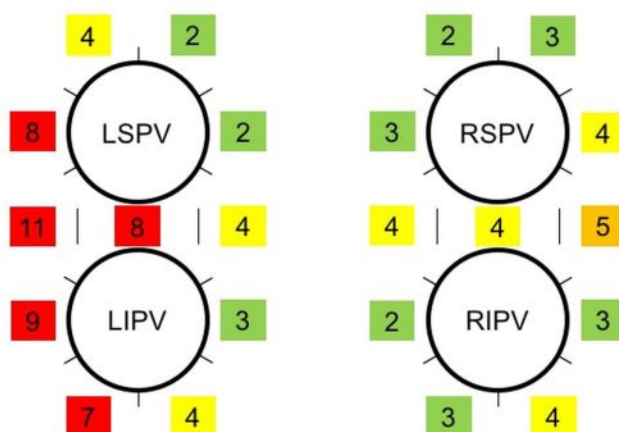
Purpose: This is a prospective registry to investigate the distribution of reablated antral segments after initial PVI with use of Ablation Index.

Methods: Initial PVI was performed using a contact force-sensing surround flow catheter. Radiofrequency was delivered targeting an inter-lesion distance of ≤ 6 mm. Ablation Index targets were 600 for anterior and 450 for roof/posterior/inferior antral segments. Thirty-five consecutive patients (mean age: 68 ± 11 years, 51% males, 49% paroxysmal AF, mean AF duration: 59 ± 64 months) underwent PV reconnection after initial PVI with use of Ablation Index. PV ostia were segmented (Figure) and reablated segments were counted.

Results: Mean interval between initial and repeat procedure was 175 ± 68 days. In total, 274 segments were reablated. Significantly more segments were reablated in the left PVs, compared to the right PVs: 174 vs. 100 ($p = 0,004$). In the left PVs, significantly more anterior and inter-PV (Carina) segments were reablated, compared to other segments: 129 vs. 45 ($p = 0,02$). In the right PVs, there was no significant difference between anterior and inter-PV segments, compared to other segments: 63 vs. 37 ($p = 0,06$) (Figure, numbers are percentage of reablated segments). Mean repeat procedure and ablation times were 142 ± 50 and 25 ± 14 min. Mean fluoroscopy time was 4 ± 2 min, with an effective dose of $0,68 \pm 1,02$ mSv. No complications occurred.

Conclusion: Reablation of antral segments after initial PVI with use of Ablation Index is mainly necessary in the anterior and inter-PV segments of the left PVs. Possibly the Ablation Index of 600 currently used for these segments should be increased, or a modified ablation approach should be chosen, i.e. invagination of the ablation line at the junction of the ridge and the anterior inter-PV segment.

Abstract P988 Figure. PA view of left atrium showing segments



P989

One-year clinical outcome after pulmonary vein isolation with use of ablation index in patients with persistent atrial fibrillation

Reinsch N.; Ruprecht U.; Buchholz J.; Fuetting A.; Buschmeier F.; Neven K.

Alfried Krupp Hospital, Department of Electrophysiology, Essen, Germany

Introduction: Pulmonary vein isolation (PVI) for persistent atrial fibrillation (AF) is associated with less favorable outcomes than for paroxysmal AF. Sinus rhythm without severely symptomatic recurrences of AF is found in around 50% in persistent AF, and up to 70% of patients with paroxysmal AF. Ablation Index is a novel ablation quality marker that incorporates contact force, time, and power in a weighted formula. Recent studies have shown excellent 92% one-year freedom from any atrial arrhythmia success rates of PVI for paroxysmal AF with use of Ablation Index.

Purpose: We hypothesized that PVI for persistent AF with use of Ablation Index could result in higher medium-term success rates than the currently reported success rates.

Methods: Between April and December 2017, a total of 57 consecutive patients (mean age: 51 ± 29 years, 52% male, median AF duration: 31 months [Q25;Q75: 10;70]) with persistent AF underwent Ablation Index guided PVI, using a contact force-sensing surround flow catheter. Radiofrequency energy was delivered, targeting an interlesion distance of ≤ 6 mm. Ablation Index targets were 600 for anterior and 450 for roof/posterior/inferior antral segments. Additional ablation was only performed in case of documented focal or macroreentry atrial arrhythmia. Ablation of fragmented electrograms was not routinely performed. Recurrence was defined as any atrial arrhythmia >30 seconds on 5-day Holter ECGs at 3, 6 and 12 months follow-up, after a 3-month blanking period.

Results: Four experienced operators successfully completed all procedures, isolating all pulmonary veins. The median procedure time was 163 minutes [Q25;Q75: 132;193], median ablation time was 43 minutes [Q25;Q75: 30;59], median fluoroscopy time was 4 minutes [Q25;Q75: 3;6] and the effective dose was 0,59 mSv [Q25;Q75: 0,26;0,99]. Except for two groin hematomas, there were no complications. At 12 months follow-up, 32/57 (57%) patients were still in sinus rhythm and 25/57 (43%) patients had a recurrence of documented atrial arrhythmia.

Conclusions: PVI with use of Ablation Index is a feasible and safe ablation technique in patients with persistent AF. In contrast to reported excellent success rates for PVI with use of Ablation Index in patients with paroxysmal AF, medium-term success rate of PVI with use of Ablation Index in patients with persistent AF has not improved. Possibly, in these patients triggers or arrhythmogenic substrate outside the pulmonary veins play an important role in the recurrence of atrial arrhythmia after initial PVI with use of Ablation Index.

P990

Safety and feasibility of a minimally fluoroscopic approach during pulmonary vein isolation for atrial fibrillation

Reinsch N.; Ruprecht U.; Buchholz J.; Fueting A.; Buschmeier F.; Neven K.

Alfried Krupp Hospital, Department of Electrophysiology, Essen, Germany

Introduction: Currently, the median effective dose of x-ray radiation used during catheter ablation (PVI) for atrial fibrillation (AF) in Germany is 7 mSv. With increasing numbers of PVI procedures, reduction of radiation exposure for both the physician and the patient is of major importance.

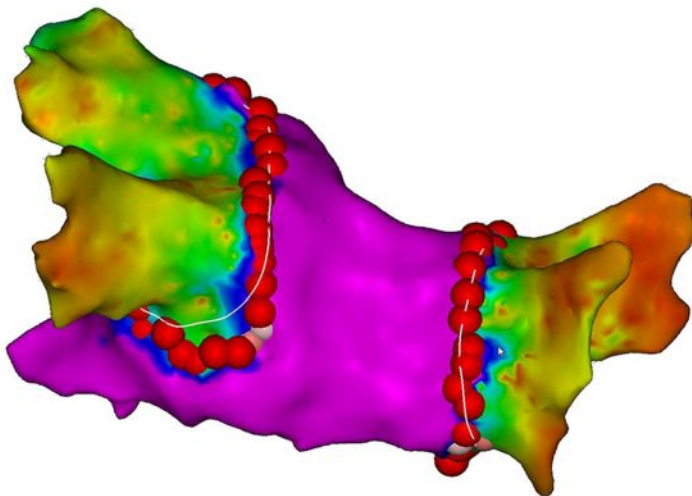
Purpose: Here, we report our experience regarding safety and feasibility of a minimally fluoroscopic approach of PVI using a 3D electroanatomical mapping system (Carto 3, Biosense Webster, Diamond Bar, CA, USA).

Methods: Between December 2016 and October 2018, a total of 553 patients with AF (mean age: 67 ± 11 years, 56% male, 42% paroxysmal AF, median AF duration: 33 months [Q25;Q75: 10;67]), who underwent PVI were included. Total procedure time, fluoroscopy time, effective dose and complications were evaluated. The fluoroscopy protocol included strict collimation with focus on the left atrium, a frame rate of 4 frames/sec, no cine filming, no pulmonary vein angiography, and maximal catheter orientation by using the 3D mapping system. No intra-procedural echocardiography was performed. After double transseptal puncture, a nonfluoroscopic left atrial 3D reconstruction using fast anatomical mapping was performed, using a contact force-sensing surround flow ablation catheter. Irrigated radiofrequency ablation was performed to encircle each pair of ipsilateral pulmonary veins. Entry and exit block of pulmonary veins was demonstrated using a circular hoop catheter.

Results: Four experienced operators successfully completed all procedures. The median procedure time was 171 min [Q25;Q75: 131;190], median fluoroscopy time was 4 min [Q25;Q75: 2;5], and the median effective dose was 0,5 mSv [Q25;Q75: 0,25;1,05]. This is a 86% reduction of effective dose compared to the most recently reported median effective dose in Germany. Fluoroscopy was mainly used to perform transseptal punctures, occasional verification of transseptal sheath position, and seldomly manipulation of the circular hoop catheter. The overall acute complication rate was 2,5% (12 cardiac tamponades, 1 stroke, 1 air embolism).

Conclusions: A structured and strict minimally fluoroscopic approach using a 3D electroanatomical mapping system enables safe and consistent performance of PVI in routine clinical practice. This approach can lead to a very low median radiation exposure, up to -86%, for both patients and operators.

Abstract P990 Figure. Left atrial PA view with ablation tags



P991

Safety and feasibility of pulmonary vein isolation for atrial fibrillation in morbidly obese patients with a body mass index of more than 40 kg/m²

Reinsch N.; Ruprecht U.; Buchholz J.; Fueting A.; Buschmeier F.; Neven K.

Alfried Krupp Hospital, Department of Electrophysiology, Essen, Germany

Introduction: Morbid obesity is an increasingly prevalent disease and is an important risk factor for the development of atrial fibrillation (AF). However, data on safety and efficacy of pulmonary vein isolation (PVI) in morbidly obese patients are rare.

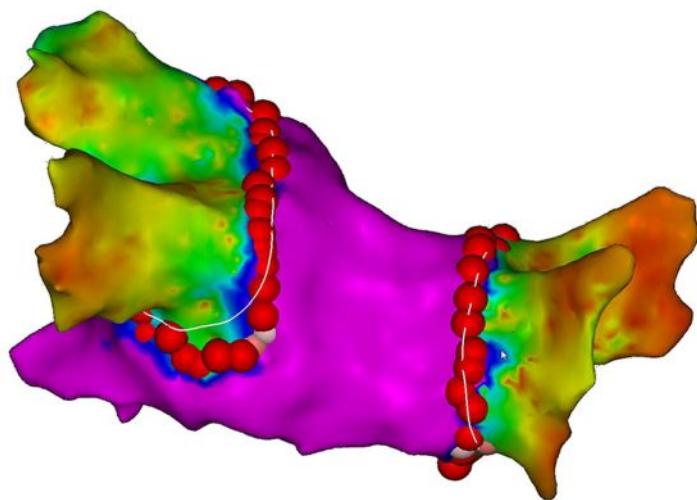
Purpose: This is a prospective registry to investigate the relationship between PVI in patients with a body mass index (BMI) >40kg/m² and periprocedural outcome and complications.

Methods: In patients with a BMI >40kg/m² and drug-refractory recurrent symptomatic AF, a PVI under general anesthesia was performed. Ablation was guided by a 3D electroanatomical mapping system (Carto 3, Biosense Webster, Diamond Bar, CA, USA) and performed using a contact force-sensing surround flow catheter. In all patients, irrigated radiofrequency ablation was performed to encircle each pair of ipsilateral pulmonary veins (Figure). Entry and exit block of pulmonary veins was demonstrated using a circular hoop catheter. Additional ablation was only performed in case of documented focal or macroreentry atrial arrhythmia. Ablation of fragmented electrograms was not routinely performed.

Results: Between March 2014 and September 2018, PVI was performed in 35 consecutive patients (mean age: 60 ± 9 years, 47% males, 33% paroxysmal AF, mean BMI: 42 ± 4 kg/m², maximum BMI: 54 kg/m²). Median overall procedure time was 164 min [Q25;Q75: 143;210]. Median ablation time was 52 min [Q25;Q75: 32;64]. Median fluoroscopy time was 5 min [Q25;Q75: 4;8] with a median effective dose of 2,68 mSv [Q25;Q75: 1,24;13,52]. All targeted pulmonary veins could be bidirectionally isolated. One patient developed an intraprocedural cardiac tamponade, followed by uncomplicated pericardial drainage. No other complications occurred.

Conclusions: PVI in morbidly obese patients with a BMI of more than 40 kg/m² is safe, and can routinely be performed with procedure and fluoroscopy times that are comparable to PVI in patients with a BMI of less than 40 kg/m².

Abstract P991 Figure



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P992

Use of Ablation Index significantly reduces the incidence of cardiac tamponade complicating pulmonary vein isolation for atrial fibrillation

Neven K.; Fueting A.; Ruprecht U.; Buchholz J.; Buschmeier F.; Reinsch N.

Alfried Krupp Hospital, Department of Electrophysiology, Essen, Germany

Introduction: Cardiac tamponade complicating pulmonary vein isolation (PVI) for atrial fibrillation (AF) is a complication that can increase morbidity and mortality, with a reported incidence of 1-2%. Radiofrequency energy delivery is a known cause for tamponade. Ablation Index (AI) is a novel ablation quality marker that incorporates contact force, time, and power in a weighted formula.

Purpose: We hypothesized that use of Ablation Index reduces the incidence of cardiac tamponades.

Methods: A total of 1073 consecutive drug-refractory AF patients (mean age 67 ± 11 years, 59% male, 41% paroxysmal AF) underwent PVI (Figure). 686/1073 (64%) PVIs were performed without Ablation Index (236/686 (34%) with a non-contact force-sensing catheter, 450/686 (66%) with a contact force-sensing catheter) and 387/1073 (36%) PVIs were performed with Ablation Index. Non-Ablation Index PVIs were performed using a total time of 15-30 seconds per ablation point in case non-contact force-sensing catheters were used, and a force-time integral of 400 gr*sec for anterior and 300 gr*sec for roof/posterior/inferior antral segments in case contact force-sensing catheters were used. Ablation Index targets were 600 for anterior and 450 for roof/posterior/inferior antral segments.

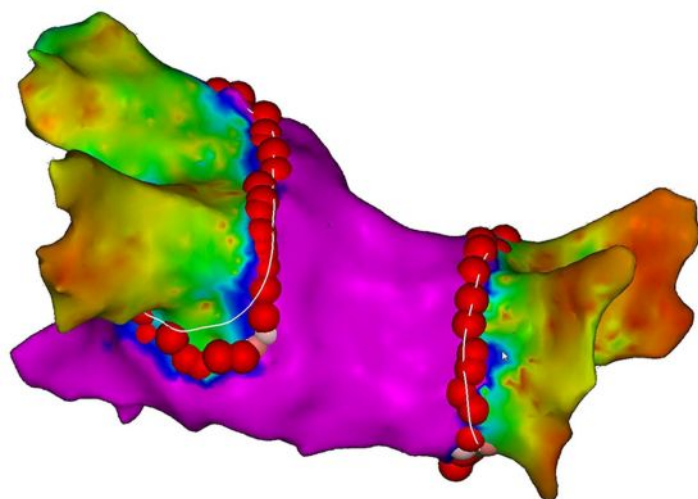
Results: A total of 24/1073 (2,2%) hemodynamically relevant cardiac tamponades requiring pericardial drainage occurred, 17/686 (2,4%) in the non-Ablation Index group and 7/387 (1,6%) in the Ablation Index group ($p = 0,0015$). In the non-Ablation Index group, there were 4/236 (1,7%) tamponades in the non-contact force-sensing catheter group and 13/450 (2,9%) tamponades in the contact force-sensing catheter group ($p = 0,0025$). Procedure, ablation and fluoroscopy times were significantly shorter in the Ablation Index group (Table).

Conclusions: Use of Ablation Index significantly reduces the incidence of hemodynamically relevant cardiac tamponades complicating pulmonary vein isolation by 33%. This reduction is not caused by use of contact force-sensing catheters. Possibly, the shorter procedure and ablation times contributed to the reduction of cardiac tamponades.

Procedural data (mean $\pm$ SD)

	Non-AI group	AI group	p-value
Procedure Time (minutes)	186 $\pm$ 53	164 $\pm$ 51	<0,0001
Ablation Time (minutes)	56 $\pm$ 25	44 $\pm$ 20	<0,0001
Fluoroscopy Time (minutes)	7 $\pm$ 5	5 $\pm$ 3	<0,0001

Abstract P992 Figure. PA view of left atrium showing AI tags



P993

International multicentre cohort study on relative effectiveness of dronedarone and other antiarrhythmic drugs for atrial fibrillation in real world practice (EFFECT-AF)

Khachatryan A.¹; Merino JL.²; De Abajo FJ.³; Botto GL.⁴; Kirchhof P.⁵; Breithardt G.⁶; Stambler B.⁷; Pedrazzini L.⁸; Wieloch M.⁸; Abenheim L.⁹; Grimaldi L.¹⁰

¹Analytica Laser, a Certara company, London, United Kingdom

²University Hospital La Paz, Arrhythmia & Robotic EP Unit, Madrid, Spain

³University Hospital Príncipe de Asturias, Unidad de Farmacología Clínica, Alcalá de Henares, Spain

⁴ASST Rhodense, Rho & Garbagnate Hospitals, Head of Electrophysiology and Clinical Arrhythmology, Milan, Italy

⁵University of Birmingham, Institute of Cardiovascular Sciences, Birmingham, United Kingdom

⁶University Hospital of Munster, Department of Cardiovascular Medicine, Munster, Germany

⁷Piedmont Heart Institute, Atlanta, United States of America

⁸Sanofi, Paris, France

⁹LA Risk Consultants Iip, London, United Kingdom

¹⁰Versailles-Saint Quentin University (CHU Paris IFO), Paris, France

Funding Acknowledgements: Sanofi

Background: This study was requested by European Medicines Agency Committee for Medicinal Products for Human Use in the context of continuous evaluation of benefit/risk of dronedarone (DRO) in patients with atrial fibrillation (AF).

Purpose: The aim of study was to evaluate relative effectiveness and safety of DRO compared with most commonly used anti-arrhythmic drugs (AAD) for preventing AF recurrences.

Methods: International observational multicentre historic-prospective cohort study conducted in hospital and non-hospital cardiology settings in Germany, Spain, Italy and USA. Study population was composed of adult patients with paroxysmal or persistent AF (ppAF), with two cohorts of patients using DRO (50%) or other AAD (50%) [flecainide or propafenone (43%), sotalol (11%), amiodarone (46%)], either as initial anti-arrhythmic treatment or being switched to it. Patients with heart failure (HF) NYHA class IV were excluded. Out of 1009 eligible patients from 170 centres in 4 countries, 693 patients (69%) were recruited in Europe, and 316 patients (31%) in USA. Data were collected by cardiologists (medical data) and by research team via phone interview of patients. AF recurrence was defined as either hospitalisation for AF or emergency room visit for AF or ECG-based report of AF, as recorded in medical charts. All patients were followed for up to 12-18 months, regardless of discontinuation or subsequent switches to other AAD. Proportion of patients lost to follow-up was similar in DRO and other AAD patients: 9.8% vs 9%, respectively.

Results: At baseline, lower proportion of HF (NYHA class III), cardiomyopathy, and higher proportion of thyroid disease was observed among DRO patients. Both in univariate and multivariate models taking into account clinical baseline differences, there were no significant differences in the risk of AF recurrence (primary endpoint) with DRO vs other AAD: crude HR 1.10 (95% CI 0.85-1.42); adjusted HR 1.16 (95% CI 0.87-1.55). There were 2 hospitalisations for liver toxicity events (one in DRO and one in other AAD patients), both classified as moderate. Reported safety events were in accordance with known safety profile of DRO. No new safety concern was identified.

Conclusions: Results of the study suggest similar effectiveness of DRO compared to other AAD in AF recurrence. Number of CV events, such as CV hospitalisation and HF, were numerically lower in patients taking DRO than in those taking other AAD. However, these observations have to be considered in relation to distribution of baseline risk factors and small number of events.

Description of the cohort

Age: Mean (SD)	DRO at index date	Other AAD at index date	p-value
Sex: Female	67 [10]	67 [11]	0.59
Type of AF: Paroxysmal AF	228 (44.7%)	202 (40.5%)	0.17
Persistent AF	384 (75.3%)	321 (64.5%)	<0.01
	99 (19.4%)	145 (29.1%)	

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P994

High-resolution imaging of left atrial anatomy using a novel wide-band dielectric mapping system: first-in-man clinical experience

Maurer T.; Mathew S.; Schlueter M.; Lemes C.; Riedl J.; Inaba O.; Hashiguchi N.; Reissmann B.; Fink T.; Rottner L.; Rillig A.; Metzner A.; Ouyang F.; Kuck KH.

Asklepios Clinic St. Georg, Cardiology, Hamburg, Germany

Funding Acknowledgements: None

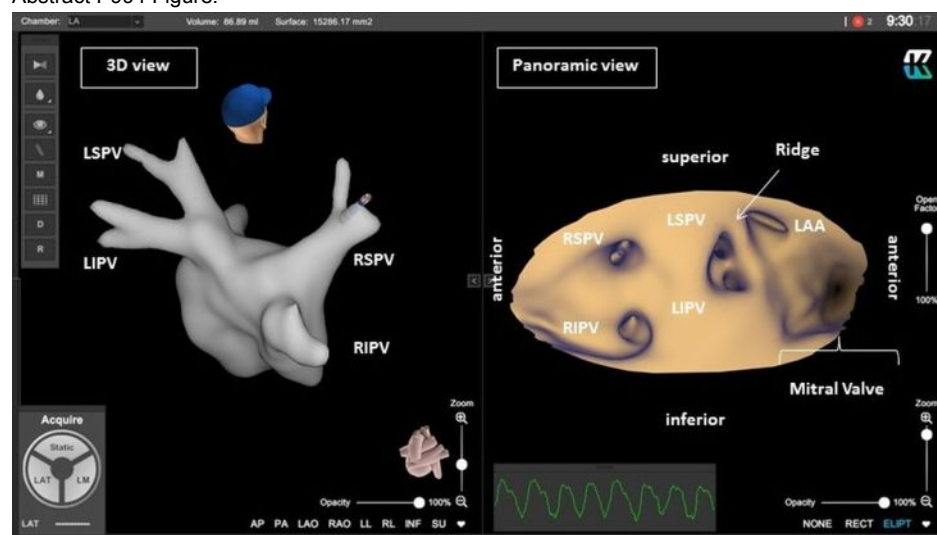
Introduction: Recently, the wide-band dielectric mapping system Kodex was introduced. This study presents the first report of high-resolution imaging of cardiac anatomy using this novel system.

Methods: The study included 20 consecutive patients with symptomatic atrial fibrillation or left atrial tachycardia who were scheduled for an ablation procedure and underwent simultaneous left atrial mapping using the Kodex and Carto 3 systems. Pulmonary vein (PV) angiograms served as a reference to compare the cranio-caudal dimensions of the PV ostia as depicted by either of the two mapping systems.

Results: Complete left atrial imaging was achieved within a median of 9.7 [1st; 3rd quartile, 7.5; 12.8] min. Median procedure time was 97.5 [90; 112.5] min and median total fluoroscopy time was 8.2 [5.7, 10.6] min, of which a median of 1.4 [1.1; 2.3] min was used during the creation of the left atrial map. High-resolution representations of left atrial anatomy were successfully created in all patients. Kodex offers two distinct options for visualizing the cardiac anatomy (Figure 1). Left-hand panel, a conventional 3D image of the heart chamber shows a detailed depiction of the atrial surface (posterior-anterior and slightly superior view of left atrium). Right-hand panel, a novel panoramic view supplies the operator with a unique endocardial perspective of the left atrium, revealing anatomical features previously obscure to the clinical electrophysiologist. Both Kodex and Carto measurements correlated well with fluoroscopy measurements, as reflected by Pearson's correlation coefficients (r) of 0.91 and 0.95, respectively. Bland-Altman plots revealed that, on average, Kodex measurements underestimated fluoroscopy measurements by 0.04 mm (95% limits of agreement of -5.72 and +5.64 mm) and Carto measurements underestimated fluoroscopy measurements by 0.02 mm (95% limits of agreement -3.61 and +3.57 mm).

Conclusion: Anatomical mapping of the left atrium using Kodex bears the potential to create computed tomography-like images without the need for additional periprocedural imaging.

Abstract P994 Figure.



P996

Differences in acute and long-term block after cavo-tricuspid isthmus ablation as a stand-alone procedure versus at the end of an atrial fibrillation ablation: technical and or human factors?

Tanner H.; Haeberlin A.; Servatius H.; Seiler J.; Noti F.; Baldinger SH.; Sweda R.; Lam A.; Roten L.; Reichlin T.

Bern University Hospital, Cardiology, Bern, Switzerland

Background/Introduction

Bidirectional block of the cavo-tricuspid isthmus (CTI) is a well established endpoint after ablation of typical atrial flutter and clinical recurrence rate after CTI ablation is low. However, reports on long-term persistent CTI conduction block using invasive measures in different procedural settings are sparse.

Purpose: To investigate the acute and long-term rate of CTI conduction block as a stand-alone procedure (CTI only) versus combined with an atrial fibrillation ablation (AF plus CTI). Moreover, we compared the type of ablation catheters used with respect to acute and chronic CTI block.

Methods: All patients with CTI only and AF plus CTI procedures were included from our local AF ablation registry if they had a redo procedure with invasive assessment of CTI block (most often an AF ablation after an initial CTI only ablation or a Redo-AF ablation after an initial AF plus CTI ablation). The persistence of bidirectional CTI conduction block was tested using standard pacing manoeuvres in all patients. A comparison of acute and long-term conduction block was performed in both groups as well as a comparison of the ablation catheter used (8mm non-irrigated tip versus irrigated tip).

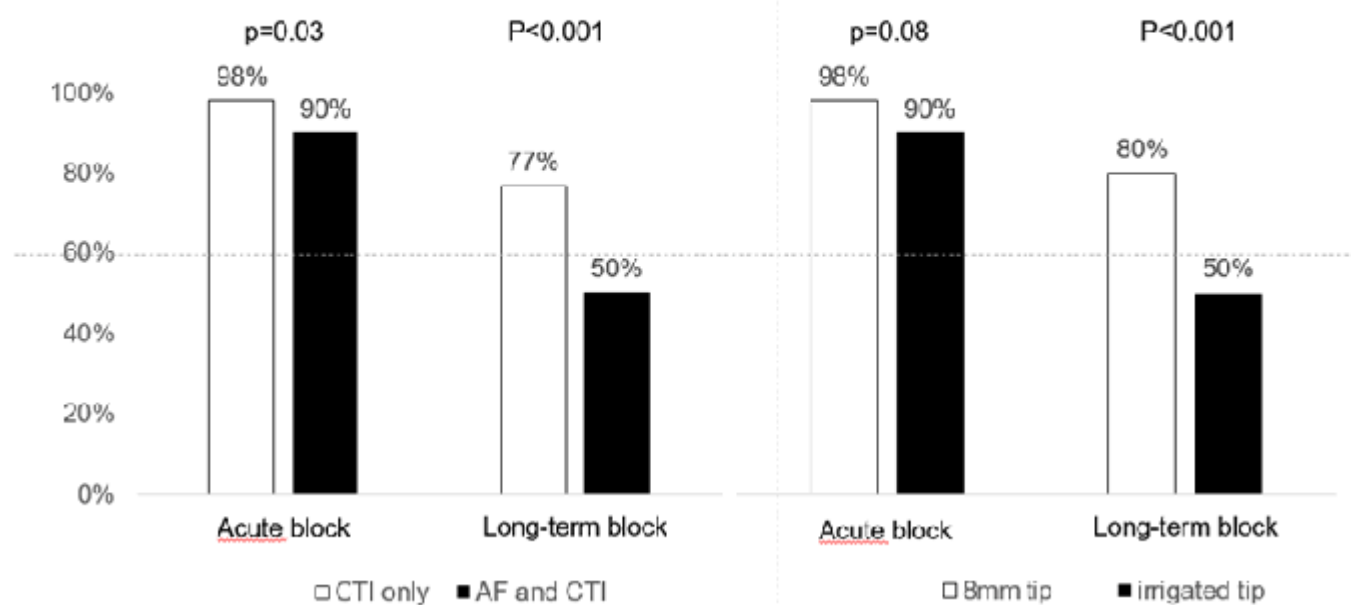
Results: In total, 198 patients were included. CTI only ablation was performed in 110 patients and AF plus CTI ablation in 88 patients. An 8mm tip catheter was used in 74% of all CTI only procedures, and an irrigated tip catheter in 91% of AF plus CTI procedures. Follow-up procedures with assessment of CTI block were done after a median follow-up of 18 months in CTI only patients, and after 10 months in AF plus CTI patients. Both acute and long-term CTI block was achieved significantly more often in the CTI only group compared to AF plus CTI group (98% vs. 90% ($p = 0.03$) and 77% vs. 50% ($p < 0.001$), figure left side). Similar results were found for the comparison of 8mm versus irrigated tip catheters (figure right side).

Conclusion(s)

Bidirectional CTI block is acutely achieved in most patients in both CTI only and AF plus CTI group. However, the percentage of long-term CTI conduction block was significantly higher in the CTI only group. A combination of human factors (exhaustion of the patient and/or the interventional staff members at the end of the AF procedure) and technical factors (higher success rate with the 8mm non-irrigated tip ablation catheter) are likely to explain the difference and both deserve further consideration.

Abstract P996 Figure_EHRA

Figure: Acute and long-term CTI block in CTI only versus AF and CTI (left) and 8mm tip versus irrigated tip (right)



P997

Radiofrequency ablation parameters for a novel multielectrode balloon catheter for treatment of atrial fibrillation

Laughner J.; Garrott K.; Miklos K.; Olynyk D.

Boston Scientific, Saint Paul, United States of America

Funding Acknowledgements: All funding support provided by Boston Scientific

OnBehalf: N/A

Introduction: A novel multi-electrode radiofrequency (RF) balloon catheter has been recently introduced for treatment of atrial fibrillation. This catheter features 18 irrigated, planar electrodes (12 proximal and 6 distal) for energy delivery that can be individually titrated from 6 to 10W and 10 to 60sec. RF energy in this catheter system is delivered in a multipolar fashion between closely spaced (3.3mm edge-to-edge) electrodes on the balloon. Thus, transmural and continuity of lesions for this catheter depend on both resistive heating under electrodes and conductive expansion between electrodes.

Purpose: Here, we assess RF ablation parameters and the resulting lesion dimensions and continuity in an ex vivo tissue model from the multi-electrode RF balloon in order to better inform clinical dosing parameters.

Methods: Hearts were harvested from healthy swine (n = 6, 45-55 kg) and tissue was placed in a warmed (37°C) saline bath (0.35%). Balloon catheters were positioned with proximal electrodes in contact with tissue at 10 grams of force (measured via an integrated digital scale) and starting impedance greater than 150Ω (measured via the system generator). Additionally, balloon catheters were repositioned if the selected electrodes differed by more than 10Ω from each other to ensure even contact with tissue. RF applications were titrated over 10-60 seconds in 10 second increments at 6, 8, and 10W using bipolar electrode pairs. Following RF ablation, lesions (n = 108) were stained with triphenyl tetrazolium chloride and imaged with a digital microscope for dimensional measurements. All data are presented as mean ± 1 standard deviation.

Results: Maximum lesion depth was strongly correlated with applied RF energy (duration x power, Pearson correlation coefficient = 0.88). RF applications less than 240J (6W/10sec to 6W/40sec) resulted in at least 1 non-continuous lesion while RF applications greater than 240J (8W/30sec to 10W/60sec) resulted in continuity between bipolar electrodes for all (n = 6 of 6) applications per power/time group. For continuous lesions, the maximum lesion depth for the lowest applied RF energy (8W/30sec) was 3.1 ± 0.5 mm and for the maximum applied RF energy (10W/60sec) was 5.7 ± 0.4 mm. No steam pops were observed during testing.

Conclusions: Current single-shot ablation tools do not allow for energy titration to specific areas during a pulmonary vein isolation. The multi-electrode RF balloon catheter creates lesions of sufficient depth and continuity for pulmonary vein isolation when RF application is greater than 240J (8W/30sec) based on this ex vivo model. This novel balloon catheter allows for titration of RF energy to specific electrodes to achieve deeper or shallower lesions in areas of varying tissue thickness. In the clinic, this system allows for customizable single-shot ablation that produces continuous lesions while minimizing collateral damage.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P998

Both the magnitude and time course of the local impedance drop during radiofrequency ablation are important to lesion formation in explanted swine hearts

Sulkin MS.; Garrett K.; Jacob IL.

Boston Scientific, EP, Arden Hills, United States of America

Funding Acknowledgements: Boston Scientific

Background: Successful radiofrequency (RF) catheter ablation requires resistive heating of cardiac tissue and a drop in RF generator impedance is commonly monitored to estimate lesion formation. Local impedance (LI) measured entirely with electrodes on an ablation catheter provides an enhanced measurement compared to the RF generator. Pre-clinical data has shown that the magnitude of LI drop is highly correlated to lesion dimensions and clinical data suggests a LI drop greater than 10 Ω results in a loss of pace capture. The relationship of the magnitude and time course of LI drop on lesion formation has not been evaluated.

Purpose: Evaluate how the time course of LI drop impacts lesion dimensions with clinically relevant RF dosing at LI drop magnitudes of 10, 20, or 30 Ω in explanted cardiac tissue.

Methods: Hearts were harvested from healthy swine (n = 6) and ventricular tissue was placed in a warmed (37°C) saline (NaCl 3.5g/L) bath. Ablation catheters with three miniature electrodes incorporated into the tip electrode were orientated perpendicular to the endocardium and calibrated weights (5, 15, or 25g) were attached to the distal shaft. The RF generator was set to 25, 30, 35, or 40W and was immediately stopped when the target LI drop was achieved (10, 20, or 30 Ω). Lesions (n = 60) were stained with triphenyl tetrazolium chloride and lesion dimensions were measured with a digital microscope.

Results: All RF applications (60/60) resulted in a lesion with no evidence of steam pops. Stopping the RF generator at LI drops of 10, 20, and 30 Ω led to statistically larger lesion depths ($p < 0.01$, 10 Ω : 2.0 ± 0.6 mm, 20 Ω : 3.3 ± 0.5 mm, 30 Ω : 5.0 ± 0.9 mm). The median RF duration to achieve 10, 20, and 30 Ω drops was 7.6 sec (Range: 4.0-34.4 sec), 18.3 sec (Range: 5.5-56.0 sec), and 43.0 sec (Range: 12.7-79.6 sec). A sub-analysis of short duration ablations from 10, 20, and 30 Ω groups (< 15 sec) found that fast LI drops were associated with statistically larger lesions between groups ($p < 0.05$, 10 Ω : 1.8 ± 0.3 mm, 20 Ω : 3.0 ± 0.4 mm, 30 Ω : 3.8 ± 0.4 mm). In addition to LI drop magnitude, the duration of ablation had a strong positive correlation to lesion depth within each drop group (10 Ω : $r = 0.69$, 20 Ω : $r = 0.72$, 30 Ω : $r = 0.77$). The magnitude and time course of LI drop were incorporated into a lesion growth model by integrating impedance drop over time. The model had a strong correlation to lesion depth ($r = 0.93$), a small mean-square-error (0.53), and predicted 92% of lesion depths (n = 55 of 60) within 1.0 mm.

Conclusion: Both the magnitude and the time course of LI drop are important to monitor during RF catheter ablation. The magnitude of LI drop, even in short RF ablations, is a reliable measure of lesion formation. The variability in lesion depth within a given magnitude of LI drop is explained by the time course of the drop. When LI drop magnitudes are equivalent, shorter duration ablations tend to create smaller lesions and vice versa.

P999

Pre-clinical experience with a novel, multi-polar radiofrequency balloon for pulmonary vein isolation

Shuros A.¹; Sulkin M.¹; Coe S.¹; Hounshell T.²; Amin A.³

¹Boston Scientific, EP, Arden Hills, United States of America

²Iowa Heart Center, Des Moines, United States of America

³OhioHealth Heart and Vascular Physicians, Cardiac Electrophysiology, Columbus, United States of America

Funding Acknowledgements: Boston Scientific

Background: Single shot radiofrequency (RF) ablation devices were introduced to create contiguous transmural lesions quickly and effectively for pulmonary vein (PV) isolation in the treatment of atrial fibrillation. For this purpose, a novel multi-polar RF balloon was recently introduced and includes a 360° camera system for direct visualization of electrode-tissue contact and an open irrigated balloon that is optimized for device placement proximal to the PV ostium. The balloon also contains sensing electrodes for monitoring real-time electrograms.

Purpose: In a preclinical model, assess 1) the location of the RF balloon during therapy delivery, 2) the ability of the RF balloon to isolate PVs, and 3) acute safety events, including steam pops, and thrombosis under multiple RF applications.

Methods: The RF balloon is 28 mm in diameter and consists of 12 equatorial and 6 forward facing ablation electrodes that can be individually selected to deliver simultaneous RF ablation based on direct contact visualization. Sensing electrodes on the RF balloon were used to document electrical isolation in real-time. Device performance was assessed in a canine model (n = 8, 25-30 kg). During the procedure, the RF balloon was positioned in the left inferior PV (n = 8) under fluoroscopy and intracardiac echocardiography guidance. A series of 60 sec RF applications were delivered to multiple electrodes with a power of 8-10W while being irrigated at 30mL/min. Even if electrical isolation was achieved during RF ablation, a total of n = 2-4 RF multi-polar applications were mandated for the evaluation of acute safety.

Results: The RF balloon was confirmed to be positioned proximal to the PV ostium (n = 8 of 8 PVs) with image guidance and never within the PV prior to RF delivery. Direct visualization of both the ablation and sensing electrodes guided the treatment strategy. Acute electrical isolation was achieved in 100% of PVs within two 60 sec RF applications (n = 8 of 8 PVs). The mean RF duration to acute electrical isolation was 61.3 ± 18.6 sec and the range was from 13.0 to 72.2 sec. There were no incidences of steam pops, char formation, or thrombus.

Conclusions: The combination of RF balloon shape, real-time electrogram monitoring, and direct tissue visualization aid in the proper positioning of the RF balloon. In a pre-clinical model, multi-polar RF ablation was safe and effective at isolating PVs.

P1000

High rate of real time and single shot pulmonary vein isolation during cryoballoon ablation: data from 1017 consecutive patients

Bordignon S.; Chen S.; Perrotta L.; Bologna F.; Konstantinou A.; Weise F.; Schmidt B.; Chun KRJ

Cardioangiologisches Centrum Bethanien, Frankfurt a.M., Germany

Background: Cryoballoon (CB) pulmonary vein isolation (PVI) is an accepted rhythm control strategy for symptomatic atrial fibrillation (AF). Several studies reported the role of the time to real time PVI (TTI) as an important procedural parameter to improve efficacy and safety of CB ablation, however techniques to improve TTI visualization are ill described.

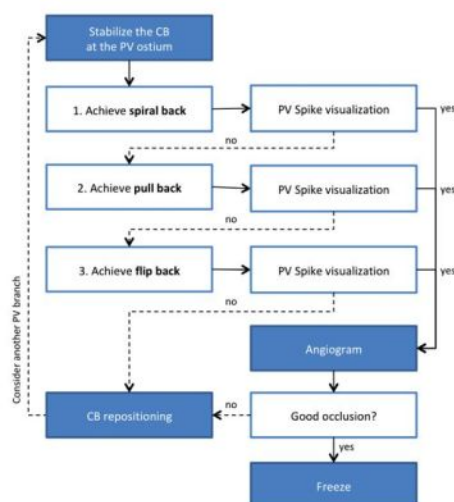
Purpose: To describe our high volume centre approach to improve real time signal visualization and to report the rate of TTI visualization in a big cohort of consecutive patients.

Methods: Data from consecutive CB procedures were collected and analysed. Only procedures performed with an "Advance" CB generation were included. A 20 mm inner lumen octapolar spiral catheter (SC) was systematically utilized. To be noticed, the TTI was recorded only during the first application to avoid the confounder of additional effects of further CB applications (single shot TTI: ssTTI). A CB freezing time of 240 seconds was preferred, an additional bonus freeze was progressively avoided if ssTTI was shorter than 75 seconds. To combine the goals of single shot isolation and PVI real time visualization an approach with sequential CB manoeuvres was developed as shown in figure 1.

Results: Data from 1017 CB procedures performed between May 2012 and February 2018 were analysed: 586/1017 (58%) patients were male, 66 ± 12 years old, 711/1017 (70%) with history of paroxysmal AF (PAF). A total of 3964 PVs were targeted: single shot isolation during the first attempt was achieved in 3422/3964 PVs (86%), specifically in 72%, 86%, 96%, 83%, 87%, 81% of LCPV, LSPV, LIPV, RCPV, RSPV and RIPV, respectively. Using the sequential Achieve manoeuvres a ssTTI was recorded in 3049/3964 (77%). The rate of ssTTI increased over time as shown by the quartile analysis (q1:69%; q2:76%; q3:76%; q4:84%). In the per vein analysis, a ssTTI was recorded in 72%, 86%, 85%, 67%, 84%, 77% of LCPV, LSPV, LIPV, RCPV, RSPV and RIPV, respectively. In 33/3049 PVs with real time TTI a reconnection during the thawing phase was noticed: the time to sustained isolation was significantly shorter than the time to non sustained isolation (48 ± 30 vs 108 ± 53 seconds, $p < 0.001$). The skin to skin procedure time was 69 ± 25 minutes and constantly decreased over time (q1:86 $\pm$ 25; q2:74 $\pm$ 24; q3:63 $\pm$ 19; q4:57 $\pm$ 21 minutes).

Conclusion: CB PVI results in a singles shot isolation rate of 86%. The combination of specific spiral catheter manoeuvres lead to a rate of single shot and real time isolation of 77%. The combination of this information with ablation protocols based on TTI constantly reduced the procedure time leading to a mean procedure time in the last quartile of less than 60 minutes.

Abstract P1000 Figure 1



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1001

Compound motor action potential guided 240s freeze plus bonus protocol for safe and durable left atrial appendage isolation

Chen S.; Schmidt B.; Bordignon S.; Bologna F.; Nagase T.; Chun J.

Cardiology Centre Bethanien (CCB), Frankfurt am Main, Germany

Introduction: Pulmonary vein isolation (PVI) is the cornerstone ablation strategy for treatment of atrial fibrillation (AF). Ablation outside the PVs is sometimes desired particularly in persistent or long-standing AF.

Purpose: This study reported left atrial appendage isolation (LAAI) using cryoballoon (CB) focusing on the procedural data and short-term clinical follow-up.

Methods: Patients with recurrent persistent AF after multiple AF procedures were enrolled. LAAI was performed using second generation CB guided by Compound motor action potential (CMAP) and 240s freeze plus Bonus (ICE-B) protocol.

Results: Ten patients were included, median age was 69.5 (56-73) years, CHA2DS2-VASc score was 3 (1.8-4), LA diameter was 44 (38.8-46.5) mm. All patients had a mean of three AF procedures before LAAI procedure. All patients were under successful CMAP guidance. During the CB LAAI procedure, median time to LAA isolation was 100 (76-270) seconds, minimal freeze temperature was -50 (-57 to -47)°C. A "pull-down" CB maneuver was needed in 30% patients. Median fluoroscopic time was 4.8 (3.4-6.8) minutes, acute LAAI success rate was 100%. No phrenic nerve injury or other major complications were observed. At six-week follow-up, re-mapping of the LAA showed durable isolation of all PVs (100%). Six-month follow-up showed 80% patients were free from AF/AT recurrence.

Conclusion: CMAP and ICE-B guided LAAI using cryo-technology appears feasible and safe, results in durable LAAI, and shows promising clinical results in patient with recurrent persistent AF.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1002

Right atrial refractoriness as a predictor of hybrid therapy outcome in patients with co-existing atrial fibrillation and typical atrial flutter

Novikov P.; Pevzner AV.; Shlevkov NB.; Maykov EB.; Mironov NU.; Sokolov SF.; Golitsyn SP.

Cardiology Research and Production Center, Clinical electrophysiology and endovascular treatment of cardiac rhythm disorders, Moscow, Russian Federation

Background. Hybrid therapy including cavotricuspid isthmus (CTI) radiofrequency ablation (RFA) and continued pharmacological antiarrhythmic drugs is a recognized approach for atrial fibrillation (AF) and typical atrial flutter (AFL) treatment. However, electrophysiological predictors of hybrid therapy are not well studied.

Purpose. To evaluate clinical and electrophysiological predictors of hybrid therapy efficiency in patients with coexisting atrial fibrillation and typical atrial flutter.

Methods. In our prospective single-center study we included 70 patients (59 (84%) men, $56 \pm 10,6$ years) with symptomatic coexisting AF and typical AFL. After stopping all antiarrhythmic drugs, patients underwent successful CTI RFA, achieving bidirectional conduction block through the CTI in all cases. Recurrences of AF after CTI RFA were determined during long-term clinical follow-up on continued individual antiarrhythmic drug therapy, regardless of the initial antiarrhythmic medication. Depending on hybrid therapy efficiency, patients were divided into 2 groups: with AF (group 1) and without AF recurrences (group 2). Two groups were compared by baseline clinical data, echocardiographical data and electrophysiological study (ES) parameters. ES data was obtained directly before CTI RFA, including effective refractory periods in different right and left atrium sites, intraatrial and interatrial conduction time, induction of atrial fibrillation during programmed and rapid atrial stimulation.

Results. During follow-up of 12 (8-24) months, 23 (33%) patients had no documented AF recurrences, 29 (41%) patients had a significant decrease of AF episodes, absence of sustained or symptomatic AF, in 18 (26%) cases hybrid therapy had no effect. Duration of effective refractory period (ERP) in the lateral right atrium area (lat.RA) was the only significant dividing factor between groups ($p = 0,001$). By ROC-analysis results lat.RA ERP ≤ 240 ms predicted effectiveness of hybrid therapy with 81% sensitivity, 71% specificity and 88% positive predictive value (image 1).

Conclusions. Hybrid therapy achieved a full or partial antiarrhythmic effect in 52 of 70 patients (74%) with coexisting atrial fibrillation and typical atrial flutter. Defining the duration of lateral right atrium area effective refractory period before cavotricuspid isthmus ablation may be important to predict hybrid therapy outcome in this cohort of patients.

Abstract P1002 Figure. ROC-analysis of lateral right atrium ERP

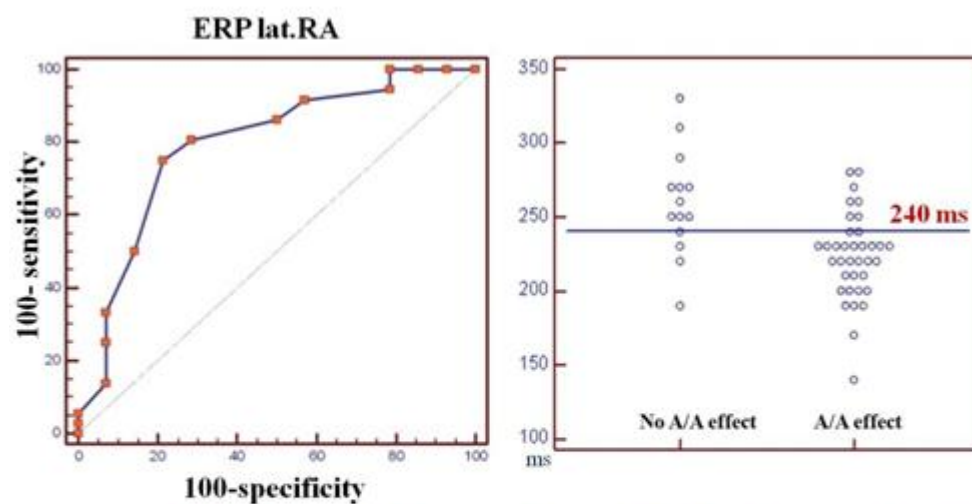


Image 1. ROC-analysis of lateral right atrium ERP, predicting hybrid therapy outcome in patients with coexisting AF and AFL

Comment: ERP- effective refractory period; Lat. RA- lateral right atrium area; Dividing value – 240 ms, sensitivity 81%, specificity 71%, positive predictive value 88%; area under curve 0,793; 95% confidence interval 0.655-0.894

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1003

CHA2DS2-VASc score in the prediction of atrial fibrillation recurrence after electrical cardioversion

Pysarevska KO.¹; Vasylieva LI.¹; Zharinov OJ.²

¹Dnipropetrovsk State Medical Academy, Internal Medicine 3, Dnipropetrovsk, Ukraine

²National Medical Academy of Postgraduate Education, Functional Diagnosis, Kiev, Ukraine

Introduction: CHA2DS2VASc scores is used to predict stroke in atrial fibrillation. Limited data are available for the future recurrence of AF in patients with persistent non-valvular atrial fibrillation (NV-AF) after cardioversion.

Purpose: The aim of the study was to determine whether the CHA2DS2-VASc score is useful for risk prediction of arrhythmia recurrence after electrical cardioversion (ECV) in persistent NV-AF patients.

Methods: The study included 141 patients with persistent NV-AF who were undergone successful ECV. All patients before the electrical cardioversion received antiarrhythmic therapy (in most cases [92,2%] – amiodarone) for 30 days, but the attempt at medical cardioversion was failed. Clinical, laboratory and echocardiographic data were analyzed before ECV and 1, 6 months after procedure. 83 patients maintained sinus rhythm for 6 months, AF recurrence in 1 month after ECV was observed in 58 patients. CHA2DS2VASc score was used to estimate the individual risk of AF recurrence for patients in each group.

Results: The mean age of the patients was 63.4 ± 1.0 years, and 68.1% of the subjects were male. In patients with arrhythmia recurrence the following risk factors included in the CHA2DS2VASc score were significantly higher prevalent: history of vascular disease (50,0% vs. 14,5% $\frac{1}{4}$ p < 0,0001), congestive heart failure (65,5% vs. 37,3% $\frac{1}{4}$ p = 0,007) and hypertension (87,8% vs. 77,1% $\frac{1}{4}$ p = 0,048). Nonsignificant differences were noticed in diabetes mellitus, the history of stroke, age categories, or sex. The prevalence of CHA2DS2VASc ≥ 3 was significantly higher in patients with arrhythmia recurrence versus patients with stable sinus rhythm (65,5% vs 44,6%, p = 0,013). Multivariate regression analysis demonstrated that the CHA2DS2VASc score ≥ 3 independently associated with AF recurrence after successful ECV (OR =2,12, 95% CI = 1,05–4,31; p = 0,013)

Conclusions: The CHA2DS2-VASc score is a useful predictor of arrhythmia recurrence after electrical cardioversion in persistent non-valvular atrial fibrillation patients. The presence of CHA2DS2VASc score ≥ 3 increases the odds ratio for recurrence of AF about two times.

P1004

Predicting maintenance of sinus rhythm in 1 month after electrical cardioversion using scoring model

Pysarevska KO.¹; Vasylieva LI.¹; Zharinov OJ.²

¹Dnipropetrovsk State Medical Academy, Internal Medicine 3, Dnipropetrovsk, Ukraine

²National Medical Academy of Postgraduate Education, Functional Diagnosis, Kiev, Ukraine

Introduction: The problem of patients managing with atrial fibrillation is arrhythmia recurrence after cardioversion. It is important to create a practical model for predicting the maintenance of sinus rhythm (SR) after cardioversion.

Purpose: to create a scoring model which will predict the maintenance of SR in 1 month (m) after electrical cardioversion (ECV) in persistent non-valvular atrial fibrillation (NV-AF) patients (pts).

Methods: ECV was performed in 141 pts with persistent AF. Before the ECV, all patients received antiarrhythmic therapy for 1 month, but medical cardioversion did not occur. Clinical and echocardiographic data were analyzed before ECV, 1 and 6 m after ECV. All pts maintained SR for 1 m. 83 pts maintained SR for 6 m, AF recurrence in 1 m after ECV was observed in 58 pts. Multivariable logistic regression was used to identify independent predictors of SR maintenance. The scoring model for SR maintaining was made using the STATISTICA Score-card module.

Results: Logistic regression showed that the following parameters after 1 m after ECV are associated with maintenance of SR ($p < 0,05$): normal blood pressure (OR: 3,13), indexed volume of left atrium (LA) during left ventricle (LV) diastole (IVs LA) $\leq 43,9$ mL/m² (OR: 2,67), LV end-systolic volume (ESV) $\leq 43,5$ (OR: 4,11), ejection fraction (EF) of LV $> 51,9\%$ (OR: 6,29), increased LA stroke volume (SV) within the 1-st m after ECV $> 22,6\%$ (OR: 3,13), amiodarone therapy (OR: 4,27) and III class of heart failure (HF) (OR: 0,09). Scoring model was created by adding points for each independent parameters. (ROCK analysis – AUC - 0.805; $p < 0.001$). In the case of a patient's total score ≥ 58 , the probability of SR maintaining is very high ($>90\%$), 15 – 58 – high (51-90%), (-6) – 15 – moderate (26-50%), (-39) – (-6) – low (6 – 25%), $< (-39)$ – very low ($<6\%$).

Conclusions: This scoring model is a simple tool with good discrimination and calibration to predict the maintenance of sinus rhythm in 1 month after ECV in patients with persistent NV-AF.

Parameter in 1 month after ECV	Score
1 III Class of HF	No 19 Yes -10
2 Normal blood pressure within the 1-th m	No -5 Yes 4
3 Amiodarone therapy	No -9 Yes 9
4 Increased LA SV,%	$\leq 50\%$ -4 $> 50\%$ 21
5 IVs LA,mL/m ²	$\leq 43,0$ 13 $> 43,0$ -7
6 LV ESV,mL	$\leq 43,8$ 22 $> 43,8$ -9
7 EF of LV,%	$\leq 48,6$ -14 $> 48,6$ 2

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1005

Pulmonary vein isolation using a high power short duration CLOSE protocol: towards a shorter procedure duration

Berte B.; Hilfiker G.; Russi I.; Kobza R.

Lucerne Cantonal Hospital, Lucerne, Switzerland

Introduction: The CLOSE protocol combines Ablation Index (AI) and ≤ 6 mm interlesion distance using standard power settings for the treatment of atrial fibrillation (AF). High Power Short Duration (HPSD) strategies are recently investigated to optimize procedure efficiency and cath lab utilization.

Purpose: To compare safety and efficacy of a conventional CLOSE and a HPSD-CLOSE pulmonary vein isolation (PVI) strategy.

Methods: All consecutive patients referred for PVI were included after informed consent. The first cohort was treated with a standard CLOSE protocol (35 Watts anterior and 25 Watts posterior). and the second cohort with a HPSD-CLOSE protocol (45 Watts anterior and 35 Watts posterior). Procedural parameters and 6-months follow-up were analyzed.

Results: In total, 141 patients [CLOSE: n = 94 (paroxysmal: n = 74); HPSD: n = 47 (paroxysmal: n = 36), similar baseline characteristics] were included. PVI was reached in all but procedure duration [86 ± 21 min vs 107 ± 25 min; $p < 0.0001$] and RF time [23 ± 6 min vs 36 ± 10 min; $p < 0.0001$] was shorter in HPSD vs CLOSE. First pass isolation was similar in HPSD vs CLOSE [left veins: 89% vs 90%; $p = 0.8$ and right veins: 83% vs 80%; $p = 0.9$]. Six-months off-AAD freedom of AF/AT was similar in HPSD vs CLOSE [89% vs 86%; $p = 0.6$]. Major complications were similar (CLOSE 2% vs AI: 2.5%; $p = 1$).

Conclusion: A high-power short duration approach can shorten procedure and ablation time without having a negative impact on safety or efficiency.

P1006**Pulmonary vein isolation using ablation index vs CLOSE protocol with a surround flow ablation catheter**

Berte B.; Hilfiker G.; Weberndorfer V.; Russi I.; Kobza R.

Lucerne Cantonal Hospital, Lucerne, Switzerland

Introduction: Pulmonary vein isolation (PVI) using Ablation Index (AI) incorporates stability, contact force (CF), time, and power. The CLOSE protocol combines AI and ≤ 6 mm interlesion distance. Safety concerns are raised about surround flow ablation catheters.

Purpose: To compare safety and effectiveness of an atrial fibrillation (AF) ablation strategy using AI vs CLOSE Protocol.

Methods: All consecutive patients referred for PVI were included after informed consent. First cluster was treated using AI and second cluster using CLOSE. All other variables remained the same: operators, general anesthesia, esophageal temperature probe, contact force and steerable sheath. Procedural data, safety and recurrence of any atrial tachycardia (AT) or AF >30 seconds were analyzed. All class 1c and III anti-arrhythmic drugs (AAD) were stopped after ablation.

Results: In total, 215 patients [AI: 121 (paroxysmal: n = 97), CLOSE: n = 94 (paroxysmal: n = 74), similar baseline characteristics] were included. PVI was reached in all in similar procedure duration (CLOSE: 107 ± 25 min vs AI: 102 ± 24 min; $p = 0.1$) and similar RF time (CLOSE: 36 ± 11 min vs AI: 37 ± 8 min; $p = 0.4$) but first pass isolation was higher in CLOSE vs AI [left veins: 90% vs 80%; $p < 0.05$ and right veins: 84% vs 73%];

Conclusion: The CLOSE protocol is more efficient than a PVI approach solely using ablation index. In this off-AAD study, 78% were free from AF/AT during a 12 months follow-up. The Smarttouch SF catheter appears to be safe using normal targets in the CLOSE protocol.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1007

Very late recurrence of atrial fibrillation after cryoballoon or radiofrequency catheter ablation: predictors and responsible mechanisms found in a repeated ablation

Vecchio N.; Jarma J.; Galizia Brito V.; Vasquez E.; Alarcon A.; Mondragon I.; Caro M.; Belardi D.; Rivera S.; Albina G.; Scazzuso F.
Cardiovascular Institute of Buenos Aires (ICBA), Buenos Aires, Argentina

Background: The isolation of pulmonary veins by catheter ablation (CA) has become an effective treatment for drug-refractory paroxysmal atrial fibrillation (AF).

Very late recurrence (VLR) is defined as episodes of AF that occur beyond the first year after CA.

Purpose: The aim of the study is to describe the VLR rate after CA. Predictive factors and the electrophysiological mechanisms involved in VLR will also be analyzed.

Methods: A prospective, observational and single-centre study. All patients with radiofrequency (RF) or cryoballoon (CB) ablation for paroxysmal AF, from 2011 to 2016, were included. Patients with AF recurrence in the first 12 months, and those who did not have at least 12 months of follow-up after the first year post CA were excluded.

Results: 434 patients were analyzed (CB 33% and RF 67%). The mean follow-up after the first year was 31 months. The mean age was 58.1 years and 79% were male. 47% presented hypertension, 8.9% diabetes and the mean body mass index (BMI) was 28.3 kg/m². The mean left ventricular ejection fraction (LVEF) was 62.3%. No patient had antiarrhythmic drugs.

The VLR rate was 24.5%, mean of 8.16% per year. A second CA was performed in 70.7% (75 patients). Pulmonary vein reconnection was observed in 90.5% and 23% underwent extrapulmonary foci ablation. (Table 1)

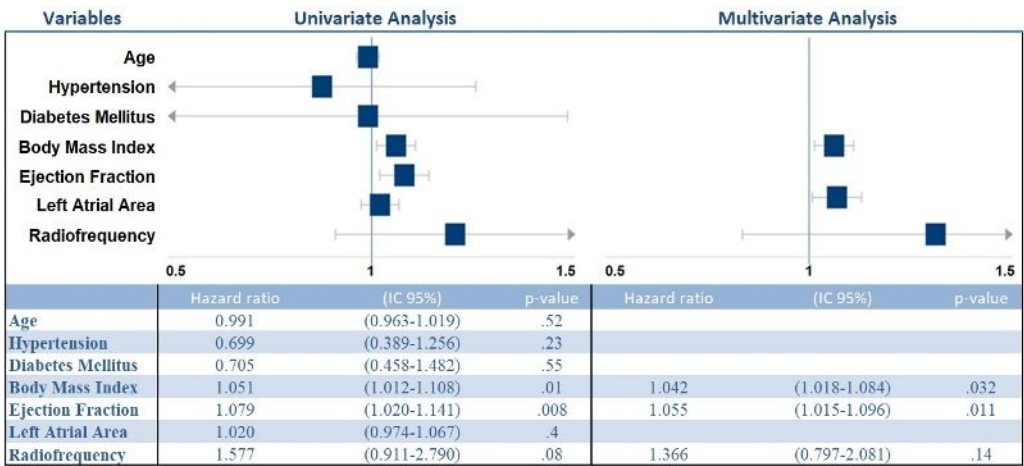
In the multivariate analysis using Cox regression, LVEF ($p = 0.011$) and BMI ($p = 0.032$) were independent predictors of VLR. (Figure 1)

Conclusions: Catheter ablation of paroxysmal atrial fibrillation showed a very late recurrence rate of 8.16% per year. Pulmonary veins reconnection remains the main cause. Ejection fraction and body mass index were independent predictors, while cryoballoon showed a tendency to decrease very late recurrence.

Table 1

Mechanisms involved (75 patients with re ablation)	
Pulmonary Veins Reconnection 68 (90%)	
Right Inferior	57 (76%)
Right Superior	50 (66%)
Left Superior	43 (57%)
Left Inferior	32 (42%)
Extrapulmonary foci 17 (23%)	
Cavotricuspid isthmus	6 (8%)
Homogenization of left atrial low-voltage areas	6 (8%)
Mitral isthmus	4 (5%)
Superior vena cava isolation	3 (4%)

Abstract P1007 Figure 1



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1008**Contact force versus flexible tip: a randomized study on acute reconnection rate after wide antral catheter ablation for paroxysmal and persistent atrial fibrillation**Brunelli M.¹; Schwaar M.¹; Rodenstein C.¹; Isensee C.¹; Goth S.¹; Michael T.²; Heitmann A.²; Schmidt H.³¹Hospital Magdeburg, Electrophysiology Section, Department of Cardiology and Diabetology, Magdeburg, Germany²Abbott Medical, Eschborn, Germany³Hospital Magdeburg, Division of Cardiology, Magdeburg, Germany

Purpose: wide antral pulmonary vein (PV) isolation is the cornerstone of atrial fibrillation (AF) catheter ablation. Spontaneous or adenosine induced reconnections are the expression of insufficient lesion transmural, therefore the use of an ablation catheter with a contact force sensor, which increases lesion quality, should reduce this phenomenon and increase the success of catheter ablation. To test this hypothesis patients undergoing their first procedure are prospectively randomized to ablation with a contact force sensor or a flexible tip catheter, and the reconnection rate is compared. **Methods:** this study aims at 1:1 randomization to 1 of the 2 catheter of 100 consecutive patients with paroxysmal and 100 with persistent AF. Ablation is performed by a single operator (to minimize variability) with the use of a 3-D mapping system and a steerable sheath. A continuous line of radiofrequency (RF) automated lesion (AutoMark™, set at 400/500gs of FTI with the TactiCath and 20/30 seconds with the FlexAbility, for the posterior/anterior wall), is deployed around lateral and septal PVs (20-25 and 30-35 Watts for the posterior/anterior wall, both 41°C). Adenosine (30mg) is given after PV isolation and ≥ 20 minutes waiting time. Patients with persistent AF are treated with left and right linear ablation. **Results:** between June 2017 and September 2018, 168 patients (64 ± 10 years old, 63 (38%) female, 87 (52%) paroxysmal AF, AF duration 34 ± 33 months) were randomized to ablation with the TactiCath (#89 (53%), 54% paroxysmal AF) or the FlexAbility (#79 (47%), 49% paroxysmal AF) catheter. No differences in clinical characteristics were found between groups. After 70 ± 21min all PVs were successfully isolated and all spontaneous and adenosine induced reconnection treated in further 4 ± 8min. No differences in duration of PV isolation were found when the 2 catheters are compared. With the TactiCath, RF time for the septal PVs (29 ± 9 vs. 33 ± 10min) was significantly shorter (P=.0055), but no differences were found for lateral PVs or total RF duration. No differences in the rate of total (27, 30% vs. 27, 38%), lateral (17, 19% vs. 15, 19%) or septal (15, 17% vs. 20, 25%) PV spontaneous and/or adenosine reconnections are found when the TactiCath and FlexAbility are compared. Total RF time, which includes linear ablation in patients with persistent AF, was shorter with the TactiCath (71 ± 19 vs. 80 ± 23 min; P=.0082), but no differences were found in X-Ray or procedural time. **Conclusions:** when compared to a flexible tip, the use of a contact force sensor catheter does not reduce the acute reconnection rate when wide antral catheter ablation is performed by an experienced operator with the use of a steerable sheath, a 3D-mapping system, and specific AutoMark parameter are respected. Nevertheless, a reduction in RF time for isolation of the septal PVs was observed.

P1009

Inter-operator reproducibility of pulmonary vein isolation guided by the ablation index

Lepillier A.¹; Solimene E.²; De Ruvo E.³; Scaglione M.⁴; Anselmino M.⁵; Sebag F.⁶; Pecora D.⁷; Gallagher M.⁸; Rillo M.⁹; Viola G.¹⁰; Rossi L.¹¹; De Santis V.¹²; Landolina M.¹³; Bertaglia E.¹⁴; Stabile G.¹⁵

¹Centre Cardiologique du Nord, Cardiology, Saint Denis, France

²Montevergine Cardiology Clinic, Mercogliano, Italy

³Polyclinic Casilino of Rome, Rome, Italy

⁴Cardinal Massaia Hospital, Asti, Italy

⁵Hospital Città della Salute e della Scienza di Torino, Turin, Italy

⁶Institut Mutualiste Montsouris, Paris, France

⁷Poliambulanza Foundation Hospital Institute of Brescia, Brescia, Italy

⁸St Georges Hospital, London, United Kingdom

⁹Casa di cura Villa Verde, Taranto, Italy

¹⁰San Francesco Hospital, Nuoro, Italy

¹¹Guglielmo da Saliceto Hospital, Piacenza, Italy

¹²Sant'Ambrogio Clinical Institute, Milan, Italy

¹³Maggiore Hospital of Crema, Crema, Italy

¹⁴University of Padova, Padua, Italy

¹⁵Clinica Mediterranea, Naples, Italy

OnBehalf: AIR Study group

Background. Atrial fibrillation (AF) ablation outcome is still operator dependent. Ablation Index (AI) is a new lesion quality marker that has demonstrated to allow acute durable pulmonary vein (PV) isolation followed by a high single-procedure arrhythmia-free survival.

Purpose. This prospective, multi-center study was designed to evaluate the inter-operator reproducibility of acute PV isolation guided by the AI.

Methods. A total of 490 consecutive patients with paroxysmal (80.4%) and persistent (19.6%) AF underwent first time PV encircling and were divided in four study groups according to operator preference in choosing the ablation catheter (a contact force (ST) or contact force surrounding flow (SF) catheter) and the AI setting (330 at posterior wall and 450 at anterior wall or 380 at posterior wall and 500 at anterior wall). Radiofrequency energy was delivered to produce a wide area circumferential ablation around the proximal part of each PV's ostium or around ipsilateral PVs. In all patient radiofrequency was delivered targeting interlesion distance ≤ 6 mm.

Results. Procedure (ST330 129 ± 44 min, ST380 144 ± 44 min, SF330 120 ± 72 min, SF380 125 ± 73 min, $p < 0.001$) and fluoroscopy time (ST330 542 ± 285 s, ST380 540 ± 416 s, SF330 257 ± 356 s, SF380 379 ± 454 s, $p < 0.001$) significantly differed among the four study groups, whereas the rate of first-pass PV isolation (ST330 90 ± 16 %, ST380 87 ± 19 %, SF330 90 ± 17 min, SF380 91 ± 15 min, $p = \text{ns}$) was similar. A complication was observed in 7 (1.4%) patients without any difference among the four study groups.

Conclusions. Ablation protocol respecting strict criteria for contiguity and quality lesion results in high and comparable rate of acute PV isolation among operator with different skill performing ablation with different procedure and fluoroscopy times.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1010

Homogenization of low voltage areas in sinus rhythm for the ablation of persistent atrial fibrillation

Lepillier A.; Piot O.; Copie X.; Lascault G.; Paziaud O.

Centre Cardiologique du Nord, Cardiology, Saint Denis, France

Background: Current ablation strategies for persistent AF have shown a limited success rate with frequent arrhythmia recurrences. STAR-AF 2 trial assessed that PVI-only is as effective as other ablation strategies. Recent studies suggest that the atrial arrhythmogenic sites are related to regions with heterogeneities and increased fibrosis which is detected by reduced bipolar voltage areas.

Purpose: Targeting low voltage areas in addition to PVI may represent an efficient strategy for the ablation of persistent AF.

Methods: We prospectively included patients with symptomatic persistent AF (mean age: 61 +/- 8.8 years, men 78%). The ablation strategy consisted of circumferential pulmonary vein isolation (CPVI). Sinus rhythm was restored by electrical cardioversion. A voltage map was performed in sinus rhythm. Complementary RFA was guided by low voltage areas (0.2-0.4 mV). Success was defined as freedom from AF/ atrial flutter or atrial arrhythmia for a period ranging from 3 months to 12 months or more.

Results: 52 patients were included with persistent AF. The mean duration of the procedure was: 158 ± 37 min and fluoroscopy time: 184 ± 90 sec. Time of RFA was 43.7 +/- 12.7 min. Mean LA volume was 204 +/- 52 mL. Low voltage areas were identified in 41.5 % of pts. AF was not inducible for 80.5 % of pts. After a single procedure at a mean FU of 6 months, 78% of patients were free of symptomatic AF. Predictive factors of recurrence of AF were large left atrial volume (> 205 mL), short AF cycle length (< 165 ms) and reduce LVEF (< 45%). 4 pts presented atrial tachycardia, and re-ablated with success.

Conclusion: These results suggest that PVI with complementary RF ablation guided on low voltage areas is an efficient strategy for symptomatic persistent AF.

P1011

Heparin and low-molecular-weight heparin switch associated with an increase in bleeding complications in patients on apixaban undergoing catheter ablation: The AM-PER ABLATION study

Amara W.¹; Garcia R.²; Mansourati J.³; Taieb J.⁴; Gandjbackh E.⁵; Dompnier A.⁶; Gorka H.⁷; Zannad N.⁸; Da Costa A.⁹; Sacher F.¹⁰; Fromentin S.¹¹; Cheggour S.¹²; Jourda F.¹³; Georger F.¹⁴; Milhem A.¹⁵

¹Centre Hospitalier Intercommunal Le Raincy-Montfermeil, Service de cardiologie, Le Raincy-Montfermeil, France

²University Hospital of Poitiers, Poitiers, France

³University Hospital of Brest, Brest, France

⁴General Hospital of Aix en Provence, Aix en Provence, France

⁵Hospital Pitie-Salpetriere, Paris, France

⁶Hospital of Annecy, Annecy, France

⁷Hospital Louis Pasteur of Chartres, Chartres, France

⁸Regional hospital Center of Metz-Thionville, Metz, France

⁹CHU Saint Etienne Hopital Nord, Saint Etienne, France

¹⁰University Hospital of Bordeaux, Bordeaux, France

¹¹Hospital Belfort-Montbeliard, Montbeliard, France

¹²Centre Hospitalier Henri Duffaut, Avignon, France

¹³Centre Hospitalier, Auxerre, France

¹⁴Centre Hospitalier, Beiziers, France

¹⁵University Hospital of La Rochelle, La Rochelle, France

Funding Acknowledgements: Bristol Myers Squibb

Purpose: The aim of this study was to identify the factors associated with bleeding complications in patients taking apixaban and undergoing a catheter ablation in everyday clinical practice.

Methods: AM-PER ABLATION is a multicenter, observational, prospective study of patients with nonvalvular atrial fibrillation (AF) undergoing a catheter ablation. Eligible patients had been taking apixaban (2.5 or 5 mg twice daily) for ≥ 3 weeks before the procedure, and were followed for 30 days afterwards.

Results: A total of 595 patients (65 [interquartile range 59, 72] years, 67% male, mean CHA2DS2-VASc score 1.85 ± 1.37) were enrolled at 25 academic/nonacademic centers in France; 524 patients (88%) were receiving apixaban 10 mg/day and 71 (12%) 5 mg/day. 323 patients (54%) underwent an AF ablation, and 272 (46%) an atrial flutter (AFL) ablation. The most prevalent concomitant disorders were hypertension (51% of patients), diabetes (15%) and vascular disease (10%). Mean creatinine concentration was 1.06 ± 0.28 mg/dL, median weight was 83 ± 18 kg and mean creatinine clearance (Cockcroft-Gault) was 82 ± 34 mL/min. The management of apixaban in the periprocedural period was left to the investigator's preference.

Overall, 264 patients were switched to unfractionated heparin or enoxaparin (238 for AF ablations and 26 for AFL ablations). The median duration of switch was 29 hours. Complications were reported at 30 days, and included 12 bleeding events (1 tamponade needing drainage, 1 pericardial effusion without drainage, 7 International Society on Thrombosis and Haemostasis [ISTH] nonmajor bleedings for AF ablations and 1 pericardial effusion without drainage, and 2 ISTH nonmajor bleedings for AFL ablations) and 1 embolic event (nondisabling stroke for an AF ablation). Comparing patients with and without a bleeding event revealed a higher rate of heparin or low-molecular-weight heparin (LMWH) switching in patients with a bleeding event (60% vs 35%; $p = 0.02$). A switch to heparin or LMWH was the only factor associated with an increase rate of bleeding (odds ratio 2.5; [CI 95%; 1.1, 7.1; $p = 0.01$).

Conclusion: Heparin or LMWH switch in the periprocedural AF and AFL-ablation period is associated with an increased rate of bleeding complications at 30 days.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1012

High density mapping of atrial tachycardias after previous ablation of persistent atrial fibrillation - More learning, better burning ?

Vogtmann T.; Boye P.; Janssen G.

Kardiologische Gemeinschaftspraxis An Park Sanssouci, Kardiologie, Potsdam, Germany

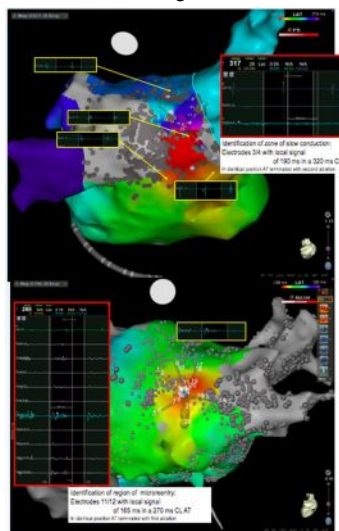
Introduction: Recurrent atrial tachycardias (AT) after ablation of persistent atrial fibrillation (AF) including substrate modification on top of pulmonary vein isolation (PVI) only, are complex and challenging procedures. Key to an effective reablation is the understanding of the individual pathomechanism and therewith identification of proper ablation targets. The aim of this study was to evaluate the potential of 3-D high density mapping to better define the underlying tachy-mechanism and successful ablation strategy.

Methods: 24 consecutive patients (pts) with stable ATs after previous ablations of AF or left atrial atypical flutter were prospectively included. High density activation mapping with the CARTO 3 System (Biosense Webster) using a Penta Ray mapping catheter (2-6-2 spacing) with the Confidence software module for automated mapping (Tissue proximity indication on, strict to moderate settings for position and local activation time settings) aiming for a minimum of 2000 mapping points with minimum density of 1mm was performed. The maps were analyzed and an ablation strategy developed based on the suspected AT mechanism. Acute success was defined as termination of the arrhythmia during ablation following the initial strategy: in focal AT, termination with ≤ 3 ablations in the predefined area. In macroreentry tachycardia, termination during completion of predefined linear target.

Results: 24 pts (13 f/9 m), age 68 ± 8 y with ECG diagnosed AT after ablation of persistent AF were included. At baseline patients had undergone a mean of 2.1 (range 1 to 5) ablation procedures for persistent AF with the first procedure performed 1.8 y (range 3- mon– 8 y) earlier. In 88 % of the pts additional ablations (≥ 3 lines and/or rotor ablation) were added to PVI in earlier procedures. 33 ATs (29 LA, 2 CS, 2 RA) in 24 pts with a mean cycle length of 324 ms (range 210 to 580 ms) were analyzed: 45 % macroreentries (15/33) including 2 RA-ATs, 27 % microreentries (9), 15 % focal (5), including 2 at the CS ostium and 3% (1) micro or focal ATs were identified. 4 AT maps were inconclusive (3 after multiple previous ablations and in patient due to multiple alternating ATs, 1 in retrospective analysis defined focal). All 14 ATs with focal / microreentrant pattern were successfully ablated with ≤ 3 ablations and 11/15 of the macros with the first attempted approach. Total procedure time was 140 ± 40 min (60 to 220 min), fluoroscopy 16 ± 9 min.

Conclusion: High density mapping of recurrent ATs after ablation of persistent AF is an effective tool to reveal the pathomechanism of the tachycardia and develop an effective individual ablation strategy in complex substrates with a high acute success rate of the first attempted approach based on this information.

Abstract P1012 Figure. Macro- and Micro-reentry close RPVs



P1013

Cryoballoon pulmonary vein isolation is effective in both paroxysmal and persistent atrial fibrillation

Teodorovich N.¹; Zehavi N.²; Kogan Y.¹; Biletsky V.¹; George J.¹

¹Kaplan Medical Center, Cardiology, Rehovot, Israel

²Hadassah-Hebrew University, Jerusalem, Israel

Background: Catheter ablation with pulmonary venous isolation is performed for sinus rhythm maintenance in patients with atrial fibrillation. We aimed to identify clinical and procedural factors that influence outcome of cryoballoon pulmonary venous isolation.

Patients and methods: Consecutive 143 patients undergoing cryoballoon PVI in our institution were enrolled (age 37-82, mean 64.4 ± 8.9 years, 39.2% female, 65% persistent AF, mean CHA2DS2VASc score 2.3 ± 1.5). Full PVI was achieved in 87.8%. The median follow up was 16 months.

Results: At follow up 74.8% were in sinus rhythm on last follow up visit. After 3 months blanking period, 30.1% of patients experienced at least one clinical AF event, defined as the cardioversion or hospitalization or ED visit for AF or presence of AF at the follow up visit.

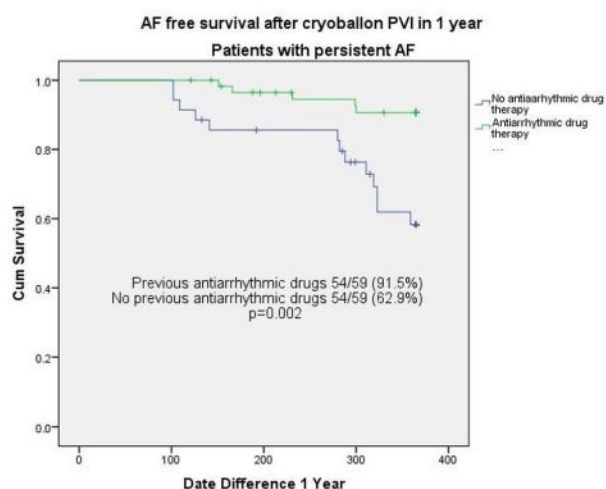
Persistent AF was associated with adverse outcomes. Kaplan Meier analysis demonstrated freedom of clinical AF events in 98.0% vs 80.9%, p = 0.006 after 1 year and 98.0% vs 72.3%, p < 0.0001 after 2 years in paroxysmal AF and persistent AF, respectively. In the persistent AF group, freedom from clinical AF events was 91.5% vs 62.9%, p = 0.002 after 1 year and 78.0% vs 62.9%, p = 0.081 at 2 years in patient on versus off previous antiarrhythmic drug therapy. The multivariate analysis demonstrated that age, female sex and absence of previous antiarrhythmic drug therapy were only independent predictors of clinical AF events in patients with persistent AF (table). CHA2DS2VASc score and its components, HB, renal function, LVEF, LA size, previous cardioversion, rhythm at start of PVI, beta blockers, operator experience and all procedural parameters (i.e. time to effect & isolation, minimal temperature and warming time and achievement of full PV isolation were not predictive of outcome.

Conclusion: Cryoballoon PVI is very effective in maintaining sinus rhythm in paroxysmal AF and has a significant efficacy in persistent AF. Antiarrhythmic drug therapy together with PVI achieves excellent maintenance of sinus rhythm after 1 year in persistent AF. Procedure efficacy is independent of patients' comorbidities, LV systolic function, left atrial size, procedural parameters and full PV isolation.

Multivariate outcome predictors in PsAF

	HR	CI	P value
Age	1.07	1.03-1.12	0.002
Female Sex	2.0	1.03-4.0	0.039
No Previous Antiarrhythmic Drug Therapy	4.65	2.27-9.51	<0.0001

The multivariate predictors of freedom of clinical AF events in patients with persistent AF undergoing cryoballoon PVI. Abstract P1013 Figure. KM analysis: freedom of AF in PsAF



P1014

Pericardial fat and the risk of atrial tachy-arrhythmia recurrence post pulmonary vein isolation: a computed tomography study

Goldenberg G.¹; Golovchiner G.¹; Neeland I.²; Omelchenko A.¹; Kadmon E.¹; Barsheshet A.¹; Yavin H.¹; Nassar M.¹; Kornowski R.¹; Hamdan A.¹

¹Rabin Medical Center, Petah Tikva, Israel

²University of Texas Southwestern Medical School, Dallas, United States of America

Background: Obesity is increasingly recognized as a novel risk factor that contributes significantly to the frequency of atrial fibrillation (AF). There has been a growing interest in assessing the impact of local fat deposits and the appearance of AF. Pericardial fat and epicardial fat have been hypothesized to exert local and systemic pathogenic effects nearby cardiac structures.

Objectives: The aim of this study was to evaluate the impact of pericardial fat volume on the outcome of patients who underwent a first pulmonary vein isolation (PVI) using cryoablation.

Methods: One hundred and four consecutive patients (63 ± 8, 73 male) with AF (73 paroxysmal, 31 persistent) who underwent contrast enhanced ECG-gated computed tomography (CT) before PVI were included. Thirty-four patients in normal sinus rhythm who underwent ECG-gated CT to rule out coronary artery disease served as a control group. Epicardial, pericardial and peri-atrial fat volumes were quantified by CT.

Results: Patients with persistent AF had significantly higher total fat volume (258 ± 103.2 ml) compared to paroxysmal AF (204 ± 72.6ml) and normal subjects (76 ± 21 ml); $P < 0.001$. Recurrence of AF occurred in 23/106 patients (21.6%), redo procedures occurred in 10/106 (9.4%) at a mean follow-up time of 19.5 ± 8.48 months. As compared with those whom had successful AF ablation, patients with post ablation recurrence of AF or redo procedures had increased epicardial (115.6 ± 41 ml vs. 81.6 ± 16.2 ml; respectively, $P < 0.001$), pericardial (100.5 ± 34.2 ml vs. 73.5 ± 43 ml; respectively, $P < 0.001$), peri-atrial (65.6 ± 21.6 ml vs. 48 ± 20.3ml; respectively, $P < 0.001$), and total fat volume (278.6 ± 87 ml vs. 202.6 ± 79 ml; respectively, $P < 0.001$).

Conclusions: Pericardial fat, as assessed by contrast enhanced CT, was associated with the severity of AF and procedural outcomes after PVI. Assessment of pericardial fat tissue may be useful to stratify the risk of recurrence after PVI.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1015

Does the presence and indication of cardiac device influence the outcome of radiofrequency pulmonary vein isolation for atrial fibrillation?

Purnode PH.; Deceuninck O.; Xhaet O.; De Roy L.; Dormal F.; Blommaert D.

CHU UCL Namur, Cardiology - Mont-Godinne, Yvoir, Belgium

Background

Radiofrequency Pulmonary Vein Isolation (PVI) with or without defragmentation is a well-accepted therapy for patients suffering from Paroxysmal and Persistent Atrial Fibrillation (AF). In our institution, we perform pulmonary vein isolations since more than 18 years.

Purpose

We reviewed our database of PVI, focusing on patients with devices. We suggest that the presence of cardiac implant could influence the success rate of PVI.

Methods and results

This is a retrospective analysis of 943 consecutive PVI performed between January 2010 and October 2018 for Paroxysmal and Persistent AF. We evaluated the percentage of all patients free from AF at 12 months FU. Table 1 shows the success rate and compares the group of patients with devices and without devices. For patient with devices and persistent AF, the percentage free from AF was 58% and for patients without devices, the percentage free from AF was 81% ($p < 0.001$). In the group of patients with a device and paroxysmal AF, the percentage free from AF was 65% and for the group of patients without a device, the percentage of patients free from AF was 87% ($p < 0.001$). For persistent AF, the percentage of patients free from AF was respectively 39% for sick sinus syndrome (SSS), 90% for atrioventricular block (AVB) and 71% for ICD indication ($p = 0.01$). In the group of patients with paroxysmal AF, the percentage of patients free from AF after PVI was 47% for SSS indication, 75% for AVB and finally 85% for ICD indication ($p = 0.07$). Those results are mostly influenced by the SSS patients group with a higher risk of recurrence.

Conclusion: According to our data we find a significant relationship between the success rate of AF after PVI and the presence of an implanted device at 12 months FU. The recurrence rate of AF was clearly higher for patient with a SSS especially for persistent AF. Sick sinus syndrome seems to be the unique reason of a poor success rate, not the presence of a device.

Table 1

	Pers. AF		Parox. AF	
	Pts. nbr.	% free from AF	Pts. nbr.	% free from AF
Without device	375	81% (305/375)	488	87% (426/488)
With device	40	58% (23/40)	40	65% (26/40)
PMK for SSS	23	39% (9/23)	19	47% (9/19)
PMK for AVB	10	90% (9/10)	8	75% (6/8)
AICD	7	71% (5/7)	13	85% (11/13)

PVI success rate for patient with or without device and based on device indication (Sick Sinus Syndrome (SSS) and Atrio-ventricular Block (AVB))

P1016

Regional left atrial function assessment using tissue doppler imaging following left atrial appendage exclusion as part of minimally invasive thoracoscopic surgical ablation

Khan H.¹; Di Salvo G.²; Kralj-Hans I.²; Boyalla V.²; Haldar S.²; Jones DG.³; Hussain W.³; Jarman J.²; Salukhe T.²; De Souza A.²; Bahrami T.³; Cowie M.¹; Markides V.²; Wong T.²

¹Imperial College London, London, United Kingdom

²Royal Brompton Hospital, London, United Kingdom

³Harefield Hospital, London, United Kingdom

Background: Left atrial appendage (LAA) exclusion is performed more frequently during minimally invasive thoracoscopic surgical ablation (TSA) in atrial fibrillation (AF) management. The impact of LAA exclusion on left atrial (LA) function is not fully understood in patients with long-standing persistent AF (LSPAF).

Methods: De-novo patients with non-valvular LSPAF were randomized to catheter ablation (CA) or TSA (1:1) as part of the CASA AF trial (NCT02755688). Patients underwent pulmonary vein isolation (PVI), and isolation of posterior wall in both procedures. LAA was excluded in TSA using Atriclip® system. CA also had an additional inferolateral mitral valve isthmus (MVI) ablation. Echocardiography was performed at baseline and 3 months following ablation. Regional wall analysis (RWA) was performed using Tissue Doppler imaging (TDI) on 4 LA walls (anterior, inferior, septal and lateral) below the mitral valve annulus. The LA function was divided into Reservoir (SSR), Conduit (ESR) and contractile function (ASR) (Figure 1).

Results: 38 patients (CA = 19, TSA = 19), 65.4 (±9.9) years old, male = 30 (79%) had ablation. Baseline function in AF was similar for both groups. RWA between baseline and 3 months showed reduction ASR in inferior LA segment (5.6 ± 2.2 vs 7.5 ± 2.4 , $p < 0.05$) in CA group when compared to TSA group. All the other RWA did not show a significant difference between baseline and 3-month follow-up for CA and TSA groups (Table 1). The global LA function at baseline and 3 months follow up was similar between the two groups (Figure 2)

Conclusion: LAA exclusion as part of TSA improves global LA ASR to the same extent as CA. There is no evidence from our groups that LAA exclusion has a detrimental effect on LA function measured by TDI. There is evidence to support reduced LA inferior ASR in CA group likely due to the addition of MVI line. However, this does not impact global ASR.

Abstract P1016 Figure. LA TDI Graph

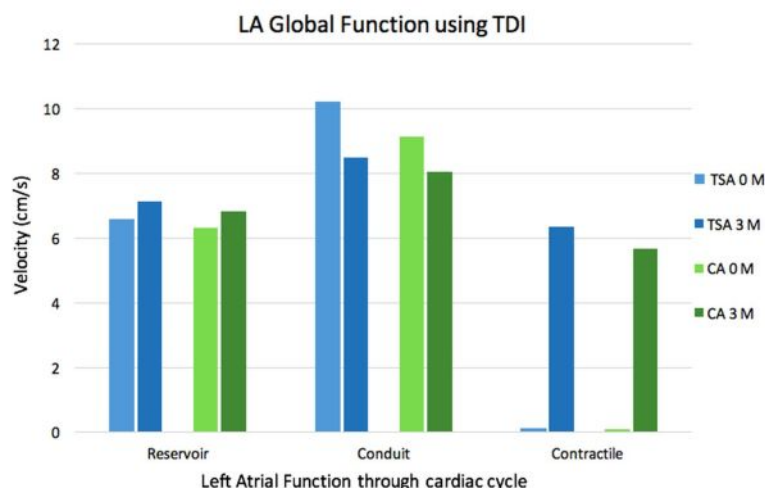


Figure 2: Global Left Atrial Function using TDI at baseline and after 3 month following TSA and CA.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1017

Ablation index (AI) values can predict transmural lesions in cardiac MRI 3 months after pulmonary vein isolation

Forkmann M.; Ajmi I.; Fischer T.; Mitlacher M.; Tose Costa Paiva B.; Vevecka A.; Schwab C.; Brachmann J.; Busch S.; Mahnkopf C.
Hospital Coburg, Department of Cardiology, Coburg, Germany

Aims

Ablation index (AI) is a novel lesion quality marker that utilizes contact force, time, and power in a weighted formula. Furthermore, only a single AI target value has been suggested despite regional variation in left atrial wall thickness. We aimed to study the minimum AI-values to determine a scar on the cardiac-MRI after 3 Months post-ablation.

Methods and results

Ten consecutive patients with atrial fibrillation underwent contact force-guided PVI, and the minimum and mean AI values for each segment were identified according to a 12-segment model. All patients underwent cardiac-MRI study at 3 months, regardless of symptoms, to identify myocardium lesions (scar) and 7 day Holter. Baseline characteristics are by all patients similar. The mean age was 58 ± 11 years, 55 % male, mean left ventricle ejection fraction 55 %, hypertension diagnosed by 80 % patients in the study. No AF-recurrence was registered in all patients 3 months post PVI. The minimum AI values needed to determine a lesion in each PV segment are represented in table 1 (LSPV, left superior vein; LIPV left inferior vein; RSPV, right superior vein; RIPV, right inferior vein).

Conclusion: Different minimum AI values for each PV segment are required to show transmural lesions in cardiac MRI images 3 months post-ablation. Higher AI values are required for inferior/anterior/posterior right segments comparing to the left anterior/posterior segments.

Table 1

Segment	Left superior	LSPV	LIPV	Left	LIPV	LSPV	Right	RSPV	RIPV	Right	RIPV	RSPV
		anterior	anterior	inferior	posterior	posterior	superior	anterior	anterior	inferior	posterior	posterior
Min AI 333		287	335	259	253	256	347	329	374	447	378	400

Min AI, minimum ablation index; LSPV, left superior vein; LIPV left inferior vein; RSPV, right superior vein; RIPV, right inferior vein

P1018**Left atrial pressure and left atrial fibrosis predict outcome of catheter ablation of atrial fibrillation**Schrieck J.¹; Gramlich M.¹; Stimpfle F.¹; Duckheim M.¹; Scheckenbach C.²; Gawaz M.¹; Seizer P.¹¹Department of Cardiology, Medical University Tuebingen, Tuebingen, Germany²Department of Paediatric Cardiology, University Tuebingen, Tuebingen, Germany**Background**

Left atrial pressure (LAP) and left atrial fibrosis have been shown to be strong predictors for recurrence of atrial fibrillation (AF) after catheter ablation (CA).

Purpose

The purpose of this study was to investigate the relationship of LAP and atrial fibrosis and their role for prediction of ablation outcome.

Methods

One hundred twenty consecutive patients with paroxysmal (22%) or persistent AF (78%) scheduled for first CA of AF were included. LA pressure was determined invasively after transseptal puncture. 3D left atrial bipolar voltage mapping (NavX, St. Jude Medical, or CARTO-3, Biosense Webster) was performed by a PV spiral mapping catheter before ablation. Fibrosis was quantified by the percentage of areas of low voltage (<0.5 mV bipolar voltage amplitude). Patients were intended to be mapped in sinus rhythm (68%), otherwise during AF (32%). Therefore, electrical cardioversion was performed at least 15 min before voltage mapping. In patients with atrial fibrosis <10% only PVI was performed, and linear ablation only in case of inducible persistent atrial flutter (8%). In patients with fibrosis >10% besides PVI additional substrate-based ablation was performed according to the investigators discretion in 46% of pts. Median follow up was 13 months.

Results

The extent of atrial fibrosis correlated with mean LAP, a-wave, v-wave and inversely with outcome of catheter ablation (table). In the low atrial fibrosis group patients with freedom of AF after CA had significant lower a-waves and v-waves than patients with AF recurrence, 5.6 ± 3.3 vs 8.3 ± 3.5 mmHg, and 7.4 ± 3.7 vs 12.0 ± 4.4 , respectively. In the intermediate (fibrosis 10-30%) and the high grade fibrosis patients (fibrosis >30%), all left atrial pressure values did not significantly differ between patients with and without AF recurrence anymore.

Conclusions

Left atrial pressure correlated well with the extent of atrial fibrosis, however, in addition to the strong prediction of atrial fibrosis for AF recurrence after CA, a-wave and v-wave amplitude predicted AF recurrence in the low atrial fibrosis group. The prediction of LAP values for AF recurrence after CA was diminished by higher grades of fibrosis. Therefore, not only the grade of fibrosis, but also left atrial pressure peak values may play a role for the extend of ablation necessary to cure AF.

table

atrial fibrosis	mean LAP (mmHg)	a-wave	v-wave	outcome no AF
<10%	5.0 ± 3.4	5.5 ± 3.3	8.0 ± 5.0	83%
10-30%	6.6 ± 2.7	7.0 ± 2.6	9.4 ± 4.5	52%
>30%	9.5 ± 6.4	10.2 ± 6.2	16.2 ± 13.2	50%

left atrial fibrosis and atrial pressure

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1019

Favourable long-term results of contact force-controlled robotic-navigated left atrial linear ablation and circumferential pulmonary vein isolation in patients with persistent atrial fibrillation

Schrieck J.; Gramlich M.; Duckheim M.; Stimpfle F.; Heinzmann D.; Mueller K.; Mueller I.; Goetz N.; Jorbenadze R.; Gawaz M.; Seizer P.

Department of Cardiology, Medical University Tuebingen, Tuebingen, Germany

Introduction

Linear ablation lines in the left atrium are challenging or even decremental, since they are often not permanent by conventional transcatheter manual radiofrequency ablation. We hypothesized that contact force-controlled, robotic-navigated linear catheter ablation can overcome these problems and may demonstrate the real clinical benefit of this ablation strategy.

Methods

In 179 patients (pts), age 62 ± 9 years, with persistent AF and enlarged left atrial diameter ($n = 67$), persistent AF and atypical atrial flutter ($n = 12$), long-standing persistent AF (duration range 1-13 years) ($n = 53$) or patients after PVI with recurrence of atypical atrial flutter or persistent AF ($n = 47$), linear robotic-navigated catheter ablation (SenseiX, Hansen Medical) was performed supported by integrated 3D-Mapping (NavX Velocity). After circumferential pulmonary vein isolation an anterior roof line and an anterior mitral line were performed using consistent, point-by-point contact force-controlled irrigated RF ablation with 30-35 Watt. For each RF application a stable catheter tip position with a sufficient contact force in the range of 20-40g was required using the IntelliSense System. Cavotricuspid isthmus was ablated in case of documented or inducible typical atrial flutter ($n = 64$).

Results

In 98.9% and 97.2% of pts a bidirectional conduction block was achieved at the left atrial roof line and anterior mitral line, respectively. Furthermore, complete PVI was achieved in 97.2% of patients. During FU of 1-8 years, re-ablations were performed in 60 pts (33.5%). Re-isolation of any pulmonary veins were performed in most re-ablation procedures (72%), however, gaps in roof line or mitral line only were detected in 16 pts (26.7%) or 18 pts (30.0%) of re-studied pts, respectively, and could be closed with reablation except three pts. After a FU of three years, single procedure success without antiarrhythmics accounted for only 49.7%, however, after multiple procedures 70.6% of pts off antiarrhythmics and 72.4% on antiarrhythmics have stable sinus rhythm.

Conclusion: Contact force-controlled, robotic-navigated point by point RF ablation simplifies the creation of ablation lines in the anterior left atrium with an higher efficacy, consistency and permanence as to our knowledge have ever been reported for catheter-based ablation. Such efficient linear left atrial ablation seems to be translated in a rather high long term efficacy in patients with risk factors for substrate-based persistent AF.

P1020

Left ventricular systolic function dynamics and reverse remodeling after atrial fibrillation ablation in patients with heart failure with reduced ejection fraction

Gasimova NZ.; Mikhaylov EN.; Orshanskaya VS.; Kamenev AV.; Tatarskii RB.; Najmushin MA.; Abramov ML.; Lebedeva VK.; Vander MA.; Simonova KA.; Lebedev DS.

Federal Almazov Medical Research Centre, Cardiology, Saint Petersburg, Russian Federation

Background. Atrial fibrillation (AF) catheter ablation (CA) is an effective treatment modality. Although the efficacy of AF CA and the impact of the procedure on prognosis in patients with heart failure with reduced ejection fraction (HFrEF) have been reported, data on the impact of AF ablation on left ventricular (LV) size, function and structure is lacking.

Purpose. To evaluate the effect of AF CA on left ventricular ejection fraction (LVEF) and left heart chambers' structure remodeling in patient with HFrEF.

Methods. There were 30 patients enrolled into a single-center observational study (a mean age 54.5 ± 10.5 years, 23 males), with LVEF $<40\%$. The patients underwent radiofrequency CA for AF refractory to antiarrhythmic drugs. Baseline clinical data and results of diagnostic tests were obtained during personal visits and/or remotely via secure telemedical services.

Results. At baseline, paroxysmal AF was present in 12 (40%) patients, persistent – in 18 (60%) patients. During a mean follow-up of 3 years (0.5 - 6 years) redo ablation was performed in 9 patients (30%) with the average number of 1.3 procedures per patient. At 6 months 24 (80%) patients were free from AF. After a last CA procedure 16 (53%) patients were free from AF at last follow-up control. The mean time to a first recurrence following CA was 15.6 ± 13.3 months. At last follow-up echocardiography revealed significant reverse remodeling of left atrium and LV (See Table). There was no difference in improvement in LVEF and LV volumes between patients with paroxysmal and persistent AF (mean Δ LVEF $+18\%$ vs $+17\%$; $p = 0.72$, Δ LVEDV -7 vs -8 ml; $p = 0.63$; Δ LAVI -13 vs -13 ml/m²; $p = 0.98$; Δ LA size -5 mm vs -6 mm; $p = 0.72$, respectively).

Conclusion. AF CA in patients with HFrEF is associated with a significant improvement in LV systolic function and reverse remodeling of left cardiac chambers in both paroxysmal and persistent AF patients. Durable long-term antiarrhythmic effect often requires repeated procedures.

Echocardiography dynamics

Echocardiography index	Before procedure	After procedure	p
LVEF, %	$31,4 \pm 6,7$	$47,6 \pm 14,3$	$p < 0.0001$
LA size, mm	$50,3 \pm 6,3$	$44,3 \pm 5,4$	$p < 0.0001$
LAVI, ml/m ²	$54,7 \pm 14,7$	$40,6 \pm 10,8$	$p = 0.005$
LVEDV, ml	$181,4 \pm 48,7$	$144,9 \pm 36,1$	$p = 0.002$
LVESV, ml	$123,43 \pm 43,1$	$71,05 \pm 26,1$	$p < 0, 0001$
LVEDD, mm	$61,5 \pm 7,0$	$58,2 \pm 6,7$	$p = 0.027$
LVEDS, mm	$50,3 \pm 8,8$	$42,3 \pm 7,4$	$p = 0.296$

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1021

Comparison of general anesthesia and conscious sedation in paroxysmal atrial fibrillation catheter ablation: a prospective randomized study

Moravec O.; Skala T.; Taborsky M.

University Hospital, Department of Internal Medicine I - Cardiology, Olomouc, Czech Republic

Background: Catheter ablation of paroxysmal atrial fibrillation (AF) can be performed under general anesthesia or conscious sedation. The influence of sedation level on procedural characteristics and ablation outcome is not entirely known.

Methods: We have randomized 150 patients to paroxysmal AF catheter ablation under general anesthesia (group 1, n = 77) or conscious sedation (group 2, n = 73). A point-by-point radiofrequency (RF) catheter ablation with isolation of all pulmonary veins and elimination of adenosine-mediated dormant conduction was done in all patients. Antiarrhythmic medication was discontinued before ablation in all patients. During twelve months of follow-up all patients underwent four times 7-day ECG monitoring and at the end of follow-up any episode of atrial fibrillation after ablation was considered as procedure failure.

Results: There was no difference between both groups in AF recurrence (28,6% vs. 31,5%, p = 0.695). Group 2 had longer procedure time (160 min $\pm$ 32,1 vs. 132min $\pm$ 31,5., p < 0.001), longer time of RF energy application (40 $\pm$ 15 vs. 29 $\pm$ 11 min., p<0.001) and longer fluoroscopy time (6,2 min $\pm$ 5,3 vs. 4,3min $\pm$ 2,2, p<0.001).

Conclusion: Catheter ablation of paroxysmal atrial fibrillation performed under general anesthesia is associated with shorter procedure time, shorter time of RF energy application and shorter fluoroscopy time compared to ablation under conscious sedation. However, it is not associated with better ablation outcome.

P1022

Two-year follow-up of new tailored approach for persistent and long persistent atrial fibrillation -Early Area Defragmentation (EADF)-

Ohe M.; Haraguchi G.; Kumanomido J.; Obuchi A.; Ito S.; Fukumoto Y.

Kurume University School of Medicine, Kurume, Japan

Background

Pulmonary vein isolation (PVI) has been well established and widely performed for atrial fibrillation (AFib). However, it is still insufficient to maintain sinus rhythm (SR) in persistent and long persistent atrial fibrillation (Per-AFib) compared with paroxysmal atrial fibrillation (P-AFib). Therefore, more effective approaches should be developed.

Purpose

The purpose of this study was to develop a new tailored approach, Early area defragmentation (EADF), and prospectively investigate the efficacy and prognosis (2-years AFib free survival) .

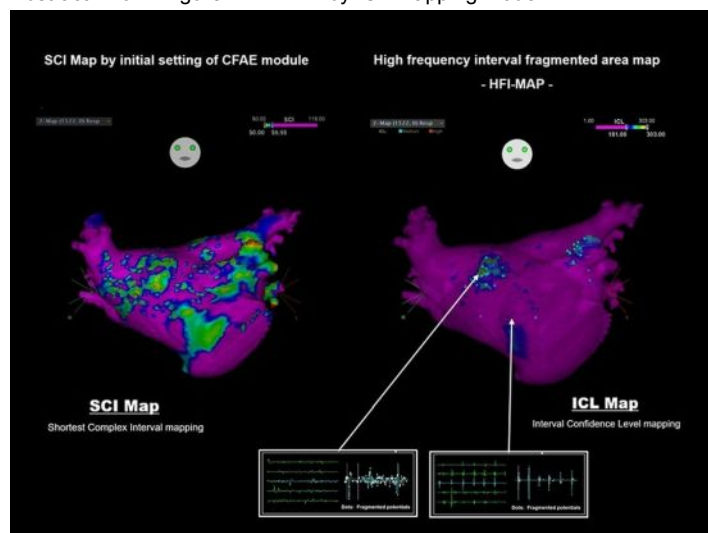
Methods: We acquired atrial potential more than 2,000 points from both atriums. We analyzed high frequency interval fragmented area map (HFI-MAP) by using interval confidence level (ICL) mapping mode of CARTO system. We performed PVI in all cases, and after confirmation of bidirectional block, we examined a new tailored approach, "EADF", which was able to identify the fragmented areas based on HFI-MAP and to ablate them in both atriums to achieve the disappearance of fragmented potentials (defragmentation). We also investigated the prognosis of EADF.

Results

We enrolled 77 patients in this study. After 2-years follow-up, 72.7% of them were able to maintain SR. Out of 77 patients, there were 21 recurrences of AFib (recurrence rate after 2-years; 27.3%). Eleven out of 21 recurrences, we were able to maintain SR by using antiarrhythmic drugs. During EADF session, we could terminate Per-AFib in 58.4% (45 of 77 patients) without cardioversion.

Conclusion: HFI-MAP could detect the high frequency fragmented areas. EADF based on HFI-MAP adding to PVI was very successful to maintain SR in patients with Per-AFib.

Abstract P1022 Figure. HFI-MAP by ICL mapping mode



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1023

Correlation of endoscopical esophageal findings and cumulative ablation index values at posterior left atrial wall: a preliminary single-center experience

Berkovitz A.; Halbfass P.; Pavlov B.; Sonne K.; Nentwich K.; Ene E.; Deneke T.

Heart Center Bad Neustadt, Electrophysiology, Bad Neustadt a.d. Saale, Germany

Introduction: Adequate catheter contact, ablation energy and duration are important parameters for lesion formation and success in AF ablation. These parameters also predict the risk of post-procedural esophageal lesions induced by RF-ablation at posterior LA wall. Ablation Index (AI) is a novel parameter defining energy application at single ablation lesions, calculated by integration of catheter stability, ablation time, energy and contact force at a single ablation site.

Methods: PVI was performed according to our standard protocol encircling ipsilateral pulmonary veins with wide circumferential ablation lines. Energy was reduced to 25 Watts whenever ablating at posterior wall. AI was recorded and evaluated as a sum of the AI values of all ablation sites at posterior LA wall (cumulated AI).

Endoscopic evaluation was performed 1 to 3 days after the procedure to document any endoscopically detected esophageal lesion (EDEL) induced by RF ablation.

Patients with EDEL were compared to patients without EDEL regarding procedural parameters including added AI values at posterior wall.

Study cohort undergoing ablation using the AI module were compared to patients undergoing atrial fibrillation ablation with RF catheters without using AI regarding incidence of postprocedural EDEL.

Results: In the cohort of patients with AI we compared 29 patients with EDEL with 182 patients without EDEL. Lesions were type I (erythema or erosion) in 22 and type II (ulcer) in 7 patients. In the group of patients with EDEL the cumulated AI and ablation time at posterior left atrial wall were higher without significant difference compared to patients without EDEL. In patients with versus patients without EDEL mean cumulative AI at posterior wall was 14.174 versus 13.747 ($p = 0.77$) and mean ablation time at posterior wall was 9.5 versus 9.0 minutes ($p = 0.67$).

Incidence of EDEL in the group of patients undergoing AF ablation using AI was lower compared to patients undergoing RF AF ablation without guidance by AI, without statistical significance. (EDEL in 29 of 211 patients (13.7%) versus 124 of 683 patients (18%), $p = 0.25$).

Conclusion: Ablation Index may be a useful parameter to increase efficacy of local ablation on the one hand without increasing the risk for esophageal complications on the other hand. The cumulated AI of ablation at the posterior wall in patients with and without EDEL in our series with predefined AI sets modified for ablation at the posterior wall did not differ significantly. 13.7% of the patients showed thermal esophageal lesions, most of them erythema or erosions $< 5\text{mm}$ (68.1%) and no fistula or esophageal perforation. Compared to a historic patient cohort undergoing RF AF ablation without using AI the incidence of postprocedural EDEL was lower, without statistic significance. Further larger studies are necessary to evaluate the impact of AI guided ablation on safety endpoints like ablation-induced esophageal injury.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1025

Two-year follow-up of one-stage left unilateral thoracoscopic epicardial and transcatheter endocardial ablation for persistent and long-standing persistent atrial fibrillation

Varnavas V.; De Asmundis C.; Sieira J.; Stroker E.; Coutino HE.; Terasawa M.; Abugattas JP.; Salghetti F.; Maj R.; Guimaraes OT.; Iacopino S.; Brugada P.; Gelsomino S.; Chierchia GB.; La Meir M.

University Hospital (UZ) Brussels, Heart Rhythm Management Centre, Brussels, Belgium

Aims

The purpose of this study was to analyze the efficacy and complication rates of the one-stage left unilateral thoracoscopic hybrid procedure in a series of patients with persistent and long-standing persistent atrial fibrillation (AF) in a two-year follow-up.

Methods and results

Fifty-one consecutive patients (34 males, 65.7 ± 8 years) having undergone hybrid isolation of pulmonary veins (PVs) and posterior wall of left atrium (LA) by means of left unilateral hybrid thoracoscopic ablation for symptomatic persistent ($n = 22$, 43%) and long-standing persistent atrial fibrillation (AF) ($n = 29$, 57%) were analyzed. At a mean follow-up of 25.7 ± 9.2 months (median 27; range 12–40) the success rate without antiarrhythmic therapy was achieved in 68.6% of patients.

Procedure-related major complications were observed in 2 patients (4%) including, diaphragmatic perforation and late pericardial tamponade requiring, mini left-sided thoracotomy and pericardial drainage respectively. The success rate did not significantly differ between persistent and long-standing persistent AF (respectively, 68,2% and 69%; $P = 0.89$) (Picture). Patients with AF relapse during the blanking period were 3.8 times more likely to have AF recurrence after 3 months from the ablation procedure (Table).

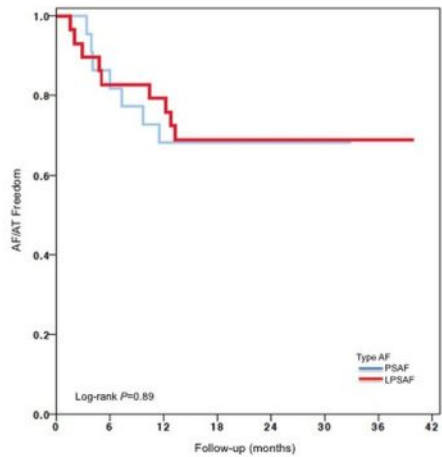
Conclusion: The hybrid one-stage left unilateral thoracoscopic procedure exhibits encouraging results in the setting of both persistent and long-standing persistent AF after a two-year follow-up, at a low rate of adverse events.

Cox regression analysis of AF/AT relapse

Variable	HR	95.0% CI	P-value
Univariate analysis			
Age	1.006	0.945 - 1.070	0.85
Gender (male)	0.661	0.254 - 1.724	0.40
Type AF	1.177	0.605 - 2.292	0.63
Body mass index (kg/m^2)	1.071	0.979 - 1.173	0.13
CHA ₂ DS ₂ -VASc Score	1.185	0.836 - 1.679	0.34
Left atrial diameter (mm)	1.900	0.946 - 3.813	0.07
AF/AT before discharge or recurrence during the BP	4.622	1.731 - 12.346	0.002
Multivariate Analysis			
Left atrial diameter (mm)	1.560	0.720 - 3.380	0.26
AF/AT before discharge or recurrence during the BP	3.823	1.381 - 10.584	0.01

AF, atrial fibrillation; SR, sinus rhythm; AT, atrial tachycardia; HR, hazard ratio; CI, confidence interval; BP, blanking period.

Abstract P1025 Figure. Kaplan-Meier curve for AF/AT-freedom



P1026

Preliminary use of a novel local impedance technology in atrial fibrillation ablation

Solimene F.¹; Segreti L.²; Schillaci V.¹; Bongiorno MG.²; La Rocca V.³; Shopova G.¹; Di Cori A.²; Barletta V.²; Casati F.⁴; Auricchio C.⁴; Malacrida M.⁴; De Simone A.³

¹Montevergine Cardiology Clinic, Mercogliano, Italy

²Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy

³Casa di cura San Michele, Maddaloni, Italy

⁴Boston Scientific, Milan, Italy

Funding Acknowledgements: No external funding was obtained for this project

Background: Transthoracic impedance measurement as surrogate of local impedance (TI) was proposed as marker for tissue contact during ablation procedures. A new dedicated algorithm measured local tissue impedance (LI) from a local electric field generated at the tip of ablation catheter.

Purpose: We report our preliminary clinical evaluation of this algorithm in a specific subset of consecutive atrial fibrillation ablation cases.

Methods: The 3-D left atrial geometry was created from the basket mapping catheter IntellaMap Orion and the RHYTHMIA Mapping System (Boston Scientific). A novel ablation catheter (Intellanav MiFi OI catheter, Boston Scientific) with dedicated algorithm (DirectSense -DS-) was used to measure LI at the distal electrode of this catheter. Each targeted spot was characterized in terms of LI, TI and their variations during ablation procedure. Ablation endpoints were PVI and, where possible, restoration to SR.

Results: A total of 791 RF applications were assessed from 20 consecutive patients at 3 Italian centers. Acute ablation success was achieved in all patients with no complications. No steam pops were reported. The mean tissue impedance was $105.8 \pm 13\Omega$ for LI vs $92.6 \pm 9\Omega$ for GI ($p < 0.0001$). Both DS and TI revealed a significant impedance drop after RF delivery (ablated tissue impedance equal to $93.1 \pm 11\Omega$, $p < 0.0001$ for DS and $89.1 \pm 8\Omega$, $p < 0.0001$ for TI, respectively). Both absolute LI drop values and LI percentage drop were significantly larger than TI variations ($12.6 \pm 8\Omega$ vs $3.5 \pm 5\Omega$ for absolute drop, $p < 0.0001$; 12% vs 4% for percentage drop, $p < 0.0001$; respectively). Effective lesion in terms of impedance variation was more easily detectable at each spot through LI than conventional TI (82% vs 22% of the cases characterized by more than 5% impedance drop, $p < 0.0001$; 33% vs 4% of the cases by more than 15Ω of absolute impedance drop, $p < 0.0001$). Duration of single RF delivery was correlated with absolute impedance drop values measured from the LI ($r = 0.08$; 95%CI: -0.14 to -0.02; $p = 0.009$) whereas timing of RF application showed no correlation with absolute impedance drop values measured from the TI ($r = 0.005$; 95%CI: -0.066 to 0.075; $p = 0.8951$)

Conclusions: Both percentage LI drop and absolute LI drop seem to be a viable indicator for proximity of the catheter tip to myocardium and lesion efficacy rather than conventional transthoracic impedance measurement.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1027

Prospective evaluation of silent cerebral lesions and cognitive function after pulmonary vein isolation with an irrigated gold tip catheter - REDUCE TE Pilot study

Shah D.¹; Szeplaki G.²; Kautzner J.³; Van Driel VJHM⁴; Bourier F.⁵; Kuniss M.⁶; Bulava A.⁷; Nolker G.⁸; Khan M.⁹; Lewalter T.¹⁰; Klein N.¹¹; Schmidt B.¹²

¹University Hospital of Geneva, Cardiac Electrophysiology Unit, Geneva, Switzerland

²Semmelweis University, Budapest, Hungary

³Institute for Clinical and Experimental Medicine (IKEM), Prague, Czech Republic

⁴Haga Ziekenhuis, Den Hague, Netherlands

⁵DHZ, Munich, Germany

⁶Kerckhoff-Klinik, Bad Neuheim, Germany

⁷Eseke Budjovice Hospital, Ceske Budejovice, Czech Republic

⁸HDZ, Bad Oeynhausen, Germany

⁹OLVG, Amsterdam, Netherlands

¹⁰Peter Osypka Herzzentrum, Munich, Germany

¹¹Universitätsklinikum, Leipzig, Germany

¹²Cardiology Centre Bethanien (CCB), Frankfurt am Main, Germany

Background: Stroke is one of the most feared complications during catheter ablation (CA) of atrial fibrillation (AF). While symptomatic thromboembolic (TE) events are rare, magnetic resonance imaging (MRI) may identify asymptomatic (i.e. silent) cerebral lesions (SCL) following pulmonary vein isolation (PVI). According to previous reports, their incidence after PVI using radiofrequency ablation ranges between 1.7-24% although clinical implications are unclear.

In the REDUCE-TE Pilot study, a novel gold-tip externally-irrigated ablation catheter (AICathFlux eXtra Gold; manufacturer VascoMed, Binszen, Germany) was investigated during PVI in patients with paroxysmal AF with focus on the incidence of SCL.

Methods: REDUCE-TE Pilot was a prospective multi-centre, single arm observational study. Patients with symptomatic PAF with an indication for CA were eligible. Patients had to be on stable oral anticoagulation (OAC) according to clinical routine with either a vitamin K antagonist (VKA) (INR 2-3) or a direct OAC. Main exclusion criteria were a CHA2DS2-VASc ≥ 5 , prior ischemic stroke or transient ischemic attack, previous PVI, contraindication for DW-MRI, LA >55 mm, and LVEF $<35\%$. The study included one baseline and one pre-ablation-assessment. A cerebral diffusion-weighted (DW)-MRI and a post-ablation follow-up were performed within 1-3 days after the ablation. Study participation ended with a 3-month follow-up visit. The primary endpoint was the occurrence of new SCLs after PVI assessed by cerebral DW-MRI. Secondary endpoints included neurocognitive status, procedural success rate, and peri-procedural complications including symptomatic TE.

Results: A total of 104 patients (69% male, 61.5 ± 9.7 years age, LVEF $57.3 \pm 6.5\%$, CHA2DS2-VASc 1.7 ± 1.2) were enrolled and underwent PVI. Oral anticoagulation consisted of a VKA in 56%, whereas 41% of patients were taking NOACs. Peri-procedural anticoagulation management was left to the investigator's discretion. Post-procedural DW-MRI examination was performed in $n = 97$ patients. In 9 of them, 11 SCLs were detected by MRI (incidence 9.3%, 95% confidence interval [CI] 4.3%-16.9%). Eight patients showed 1 lesion, whereas one patient showed 3 new lesions. In a per-protocol analysis excluding patients with violation of in- or exclusion criteria or violation of INR criteria, the incidence of SCLs was only 7.1% (CI 2.6-14.7%). Univariate analyses did not detect any significant predictor for new SCLs. Non-significant trends were observed for low ACT values during ablation and INR at ablation out-of-range 2-3. There was no evidence of significant deterioration of neuro-cognitive function after PVI.

Conclusion: The REDUCE-TE Pilot study showed a low incidence (9.3%) of new SCLs after PVI using the AICath Flux eXtra Gold catheter without evidence of deterioration in neuro-cognitive function. Maintenance of effective anticoagulation throughout the procedure seems to be important for preventing new SCLs.

P1028

High density electroanatomic mapping for atrial tachycardia at first repeat ablation for primary long-standing persistent atrial fibrillation

Fiala M.¹; Bulkova V.¹; Rybka L.¹; Toman O.¹; Cernosek M.¹; Manousek J.¹; Spinar J.²

¹Center of Cardiovascular Care, Department of Cardiology, Brno, Czech Republic

²Masaryk University, Faculty Hospital Brno, Department of Internal Cardiology Medicine, Brno, Czech Republic

Background: Fast identification of atrial tachycardia (AT) originating from localized sources following complex longstanding persistent atrial fibrillation (LSPAF) ablation may help to speed up the repeat procedure and improve long-term outcome.

Purpose: This randomized study aimed at investigating the immediate efficacy, safety, and procedure-related characteristics of first repeat ablation for primary LSPAF with the use of Carto Confidense (CDD) mapping system and Pentaray catheter (Biosense Webster) or standard electroanatomic (SEA) mapping with NaviStar catheter (Biosense Webster).

Methods: Patients with first repeat ablation for primary LSPAF (n = 50) were randomized to CDD mapping (n = 25, 64 ± 7 years, females 28%) vs. SEA mapping (n = 25, 63 ± 10 years, females 22%). In the CDD group, each AT (primarily recurrent or converted from primarily recurring AF) was mapped selectively, in the SEA group, single left and/or right atrial electroanatomic map was created during the initial arrhythmia, and all other possible ATs were identified with standard entrainment or activation remapping.

Results: In CDD vs. SEA groups, recurrent AF was either terminated directly into sinus rhythm (SR) (2 vs. 2) or could not be terminated by ablation at all (2 vs. 2), and thus 21 (84%) vs. 21 (84%) patients were included and mapped for primary persistent AT (15 vs. 12), or AT induced by pacing from initial SR (3 vs. 3), or AT converted during repeat ablation from primary recurrent persistent AF (3 vs. 6). Only macroreentry (peri-mitral, roof-dependent, peri-tricuspid) sources were present in 8 vs. 7 patients, only localized sources were present in 7 vs. 8 patients, the remaining patients had both types of AT sources. Ablation restored SR in 20 (95%) vs. 20 (95%) patients, subsequent non-inducibility was attained in 17 (81%) vs. 14 (67%) patients. There were no significant differences in total procedure time (231 ± 76 vs. 234 ± 58 minutes), fluoroscopy time (14 ± 3 vs. 15 ± 6 minutes), or RF delivery time (56 ± 36 vs. 58 ± 27 minutes). No serious complication occurred.

Conclusion: Despite potential to shorten mapping time specifically for localized AT sources, preliminary results did not show significant reduction in major procedure-related characteristics. Whether trend to higher non-inducibility rate may herald better long-term outcome in the CDD group will be answered after longer follow-up.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1029

Arrhythmia recurrence despite complete PVI after cryoballoon ablation: results of ultra-high density mapping guided reablation

Dorwarth U.; Straube F.; Hartl S.; Wankler M.; Hoffmann E.

Bogenhausen Hospital - City Hospital Munich, Munich, Germany

Background: In case of arrhythmia recurrence after a first cryoballoon PVI detailed mapping of PV conduction and possible AF mechanisms beyond the PVs is mandatory.

Purpose: The aim of the study was to analyse mechanisms and substrate in arrhythmia recurrence after a single cryoballoon PVI and to evaluate clinical outcome after ultra-high density (UHD) electroanatomic mapping (EAM) - guided reablation.

Methods: Consecutive patients with arrhythmia recurrence following a single cryoballoon ablation for parox. or persis. AF underwent multi-electrode (64) UHD mini-basket catheter EAM and RF ablation. Mapping included determination of PV conduction, quantification and distribution of left atrial (LA) substrate (dense scar < 0.1mV, moderate scar 0.1 - 0.5mV) and mapping of atrial tachycardia (AT) and extra-PV triggers. Programmed atrial stimulation including isoproterenol testing was applied.

Results: In 67/95 (71%) patients undergoing UHD-EAM all PVs were still isolated (332/368 PVs (90%)) after a single cryo PVI. Median time interval between cryoablation and second procedure was 26 months (IQR 13-43). In these 67 patients with permanent PVI, age was 70 ± 9 yrs, LA diameter 45 ± 5 mm, LA volume 176 ± 38 cc. The recurrent arrhythmia was parox. AF in 10%, pers. AF in 45% and new onset AT in 45% of patients. Mapping took 33 ± 12 min for acquisition of $11,890 \pm 9,018$ electrograms. The overall LA area mapped was 100 ± 22 cm². LA fibrotic area was 28 ± 20 cm² (28%) (dense scar, 11 ± 14 cm² (11%), moderate scar 17 ± 13 cm² (17%)). Scar tissue was predominantly found at the LA anterior wall (37%), followed by septum (26%), roof (17%), post. wall (11%) and lat. wall (10%). Mapping-based catheter ablation included ablation of 4 spontaneous or induced right and 49 left ATs with surrounding substrate in 35 (52%) patients, atrial ectopy in 2 (3%), AVNRT in 1 (1%), RA isthmus ablation in 7 (10%) patients and substrate ablation only in 32 (48%) patients. There were no MACCE observed. Freedom from AF/AT without antiarrhythmic drug therapy was 40% (mean FU 12.6 mo).

Conclusions: Ultra-HD electroanatomic mapping after a single cryoballoon PVI demonstrated permanent complete PV isolation in the majority of patients and allowed distinct characterization of new onset ATs and extensive LA fibrosis, predominantly located at the anterior wall. UHD-EAM based individualized ablation of AT and substrate showed a moderate success rate in this sick and complex AF patient group during one year follow-up. Further studies are necessary to define the optimal lesion sets and the extent of RF ablation promoting better results without compromising safety.

P1030

Outcome of cryoballoon ablation in persistent atrial fibrillation: lessons from pre-procedural imaging and detailed analysis of left atrial anatomy

Straube F.¹; Pongratz J.¹; Hartl S.¹; Brueck B.¹; Weitensteiner V.¹; Tesche C.¹; Helmberger T.²; Wankel M.¹; Dorwarth U.¹; Hoffmann E.¹

¹Heart Center Munich-Bogenhausen - Munich Municipal Hospital Group, Munich, Germany

²Munich Municipal Hospital Group, Radiology, Neuroradiology and Nuclear Medicine, Munich, Germany

Introduction/Background: In persistent atrial fibrillation (AF) left atrial (LA) dimensions are often enlarged and the role of the left atrial appendage is unclear. Cryoballoon ablation for pulmonary vein isolation (PVI) is a treatment option for symptomatic patients. Predictors of recurrence after cryoballoon PVI for persistent AF are uncertain.

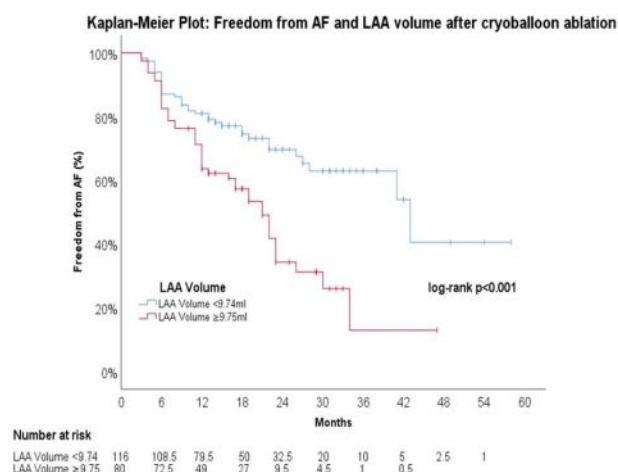
Purpose: The objective was to identify clinical and preprocedural cardiac computer tomography angiography (CCTA) imaging derived predictors of recurrence after cryoballoon PVI.

Methods: Prospective observational single center study with a blinded retrospective CT analysis. Patients undergoing second-generation cryoballoon ablation for symptomatic persistent AF were included in the analysis. LA, pulmonary vein (PV) and left atrial appendage (LAA) morphology and dimensions were assessed. Predictors of atrial arrhythmia recurrence during follow-up were determined by Cox regression.

Results: From 2012 to 2016, in total 488 patients suffering from symptomatic persistent AF underwent second-generation cryoballoon PVI. CCTA was available for 324 (66.4%) patients, and 196 (60.4%) were of sufficient quality for LAA measurements. Mean age was 65.7 ± 9.5 years, LA was 46 ± 7 mm, LA volume was 129 ± 36 ml. LAA morphology was classified as "windsock", "chicken-wing", "cactus" or "cauliflower" in 103 (52.6%), 43 (21.9%), 20 (10.2%), and 30 (15.3%) patients, respectively. Median follow-up time was 19 months. Symptomatic AF reoccurred in 82 (41.8%) patients. Features of PV anatomy were not predictive. Independent predictors of recurrence were LAA volume (HR 1.082; 95% CI, 1.032 to 1.134; $p = 0.001$) and mitral regurgitation $\geq$ II (HR, 2.49; 95% CI 1.207 to 5.126; $p = 0.013$). LA volume was identified as a dependent predictor due to strong positive correlation with LAA volume. LA volumes ≥ 110.35 ml (sensitivity: 0.81 and specificity: 0.40, area under the curve = 0.62) and LAA volumes ≥ 9.75 ml (sensitivity: 0.56 and specificity 0.70, area under the curve = 0.64) were associated with AF recurrence. There was no significant correlation of recurrence with either "windsock-", "chickenwing-", "cactus-" or "cauliflower-" type of LAA (log-rank; p -value = 0.832).

Conclusion: In persistent AF, strongest predictors for recurrence after cryoballoon PVI were the LAA volume and the presence of mitral regurgitation. LA volume was less predictive and correlated with LAA volume. LAA morphology does not predict the outcome of cryoballoon ablation. Further studies should focus on treatment strategies for persistent AF patients with recurrences after cryoballoon PVI who demonstrate large LAA or mitral regurgitation.

Abstract P1030 Figure.



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1031

Impact of left atrial appendage morphology on the recurrence of atrial fibrillation after cryoballoon ablation: is chicken-wing morphology a predictor of success?

Straube F.¹; Pongratz J.¹; Hartl S.¹; Brueck B.¹; Weitensteiner V.¹; Tesche C.¹; Helmberger T.²; Wankel M.¹; Dorwarth U.¹; Hoffmann E.¹¹Heart Center Munich-Bogenhausen - Munich Municipal Hospital Group, Munich, Germany²Munich Municipal Hospital Group, Radiology, Neuroradiology and Nuclear Medicine, Munich, Germany

Introduction/Background: Cryoballoon ablation is highly effective to create durable pulmonary vein isolation in symptomatic paroxysmal or persistent AF patients. Treatment strategies for those patients with recurrences after cryoballoon ablation are discussed. The impact of the LAA anatomy on the outcome of cryoballoon pulmonary vein isolation is totally unknown.

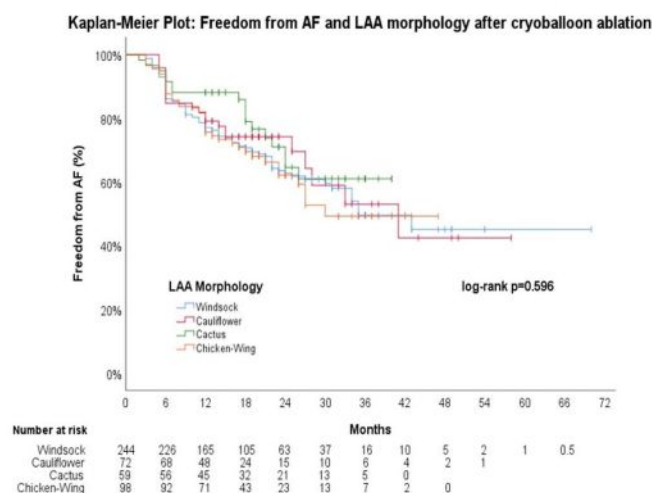
Purpose: The objective was to identify predictors of recurrence after cryoballoon pulmonary vein isolation (PVI) with focus on LAA-anatomy.

Methods: We conducted a prospective observational single center study with a blinded retrospective analysis of cardiac computer tomography angiography images. Left atrial (LA), pulmonary vein (PV) and LAA morphology and dimensions were assessed. Clinical and CT imaging derived predictors of atrial arrhythmia recurrence during follow-up were determined by Cox regression. Freedom from AF was evaluated by Kaplan-Meier analysis. Cut-off values were calculated by ROC-analysis.

Results: From 2012 to 2016, in total 1,103 patients underwent second generation cryoballoon PVI. CCTA was available for 725 (65.7%) patients. Of those, 473 (65.2%) were of sufficient quality for LAA measurements and were included. Mean age was 66.3 ± 9.5 years, paroxysmal AF was present in 277 (58.6%) participants. LAA morphology was classified as "windsock", "chicken-wing", "cactus", and "cauliflower" in 244 (51.4%), 98 (20.7%), 59 (12.5%), and 72 (15.2%) patients, respectively. Median follow-up time was 19 (IQR = 14) months, symptomatic AF reoccurred in 166 (35.1%) patients. Features of PV anatomy were not predictive. Independent predictors of recurrence were LA volume (HR 1.012; 95% CI, 1.008 to 1.016; $p < 0.001$), female gender (HR 1.648; 95% CI, 1.196 to 2.271; $p = 0.002$) and mitral regurgitation $\geq$ II (HR, 2.27; 95% CI 1.189 to 4.333; $p = 0.013$). LAA volume and type of AF were identified as dependent predictors due to strong positive correlation with LA volume. LA volumes ≥ 122.7 ml (sensitivity: 0.53 and specificity: 0.69, area under the curve = 0.63) and LAA volumes ≥ 11.25 ml (sensitivity: 0.39 and specificity 0.79, area under the curve = 0.59) were associated with AF recurrence. There was no significant correlation of recurrence with either "windsock-", "chicken-wing-", "cactus-" or "cauliflower-" morphology (log-rank; p -value = 0.596).

Conclusion: LAA volume was strongly correlated to LA volume and is a dependent predictor of recurrence after cryoballoon PVI. Main independent predictors were: LA volume, female gender and mitral regurgitation. LAA morphology does not predict failure of cryoballoon ablation.

Abstract P1031 Figure.



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1032

Clinical benefit from ultrasound-guided femoral venipuncture for catheter ablation of atrial fibrillation

Wichterle D.; Peichl P.; Stojadinovic P.; Yamagata K.; Cihak R.; Kautzner J.

Institute for Clinical and Experimental Medicine, Prague, Czech Republic

Background: Complications of catheter ablation for atrial fibrillation (AF) are frequently related to vascular access.

Purpose: We analyzed the vascular complication rates in procedures, in which the ultrasound-guided venipuncture (USGV) was used and compared them to historical controls (CTRL).

Methods: The study cohort included 2110 consecutive patients (age: 61 ± 10 years; males: 66%; paroxysmal AF: 67%; BMI: 29 ± 5 kg/m²; CHA2DS2-VASc: 1.9 ± 1.4 ; repeat procedure: 26%) who underwent catheter ablation for AF on uninterrupted anticoagulation therapy in our centre between January 2013 - May 2018. Both femoral veins were cannulated with 2 and 2 sheaths (7, 11, and 2x 8.5 French) in the majority (>95%) of procedures. Major complications were defined as those requiring intervention (surgery, thrombin injection, or transfusion), or hematoma/bleeding with haemoglobin drop >30g/l, or condition prolonging hospitalization and/or resulting in re-hospitalization. They were extracted from institutional tracking system for complications of invasive procedures and by review of medical reports within the first 3 months of follow up.

Results: A total of 1103 and 1007 patients belonged to USGV and CTRL groups, respectively. There were 13 (1.3%) vs. 23 (2.1%) major complications related to vascular access, respectively (Yates corrected Chi-square $P = 0.22$). Surgical intervention was needed in 1 (0.1%) vs. 6 (0.5%) patients, respectively (Fisher exact test $P = 0.13$). The results were not influenced by the differences in baseline clinical characteristics between both groups.

Conclusions: In our centre with overall low rate of vascular complications, ultrasound-guided venipuncture was associated with statistically non-significant reduction of major vascular complications after catheter ablation for AF. The beneficial trend was seen particularly in reduction of surgical interventions.

P1033

Atrial fibrillation ablation after asd closure: outcome, safety and feasibility

Kottmaier M.; Lund S.; Reents T.; Bourier F.; Koch-Buettner K.; Telishevska M.; Berger F.; Risse E.; Kornmayer M.; Brooks S.; Lengauer S.; Grebmer C.; Deisenhofer I.; Hessling G.

German Heart Center of Munich, Department of Electrophysiology, Munich, Germany

Background: The prevalence of atrial fibrillation (AF) is significantly higher in patients with atrial septal defect (ASD) compared to patients without congenital heart disease even after surgical or interventional ASD closure. The aim of this study was to investigate feasibility, safety and outcome of AF ablation in patients after ASD closure.

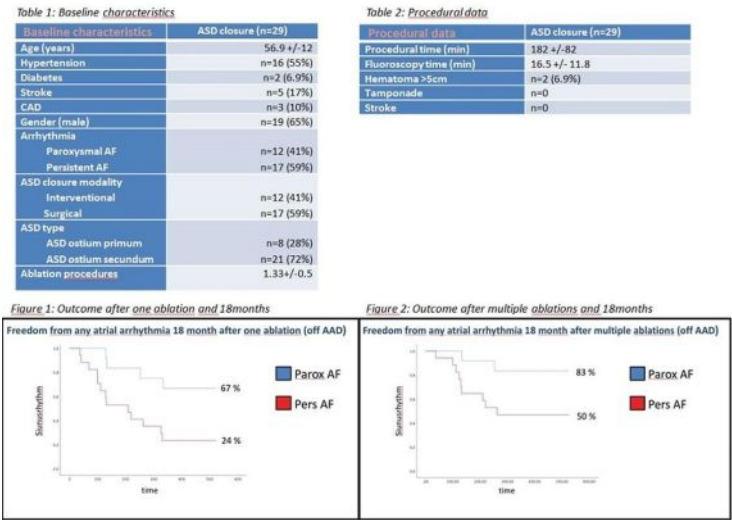
Methods: We studied 29 patients that had surgical or interventional ASD closure and underwent radiofrequency (RF) ablation for persistent or paroxysmal AF. Baseline characteristics are given in Table 1. Patients with paroxysmal AF (n = 12/41%) underwent pulmonary vein isolation (PVI), patients with persistent AF (n = 17/59%) underwent PVI plus ablation of complex atrial electrograms (CFE).

Results: No major complications occurred (Table 2). Single procedure success after 18 month (without antiarrhythmic drugs (AAD)) was 67% for patients with paroxysmal AF as compared to 24% for patients with persistent AF (Figure 1). Multiple procedure success (mean procedure number 1.3 ±0.5) was 83% in patients with paroxysmal AF and 50% in patients with persistent AF (Figure 2).

Disussion:

AF ablation in patients after surgical or interventional ASD closure is feasible and safe. Success rates in patients with paroxysmal AF are encouraging and comparable to patients without congenital heart disease. For persistent AF, success rates are reduced which might be due to a different and/or more extensive biatrial substrate.

Abstract P1033 Figure.



P1034

Pulmonary vein reconnection observed with multielectrode mapping late after second-generation cryoballoon or contact force-sensing radiofrequency catheter ablation for atrial fibrillation

Nagy Z.; Kis Z.; Som Z.; Csakany L.; Major T.; Foldesi C.; Kardos A.

Gottsegen Gyorgy Hungarian Institute of Cardiology, Budapest, Hungary

Background: Late pulmonary vein reconnection (PVR) determines recurrence of paroxysmal atrial fibrillation (AF) after pulmonary vein isolation (PVI) procedures. The PVR rate was reported to be lower following the second-generation cryoballoon (CB) as compared to contact-force sensing radiofrequency (CF-RF) ablation using circular mapping catheters. Purpose: In this single-center, retrospective study, the incidence/pattern of late PVR following an index PVI using the second-generation CB versus open-irrigated, CF-RF catheter were examined with multielectrode mapping catheters (PentaRay). Methods: A total of 44 [26 (59.1%) women, mean age = 60 ± 8.3 years] pts underwent a redo ablation due to AF recurrence after an index PVI accomplished with CB ($n = 22$ pts, index PVI 20 ± 12 months prior redo procedure) or CF-RF ($n = 22$ pts, index PVI 15 ± 8 months prior redo procedure). All repeated procedures were achieved in sinus rhythm using bipolar voltage map with multielectrode mapping catheter and the CARTO 3 Confidense Module (mean number of points = 633 ± 171). We examined the reconnection pattern of the antral lesion sets. Low-voltage scar was defined if bipolar voltage was <0.2 mV. CF-RF ablation was performed during all redo procedures. Results: Among 85 PVs in the CF-RF group, 33 (38.8%) showed conduction gaps in 21 pts (1.6 per patient). Whereas among 86 PVs in the CB group, 31 (36%) showed a PVR in 22 pts (1.4 per patient) ($p = 0.79$). Irrespective of the ablation technique, the left atrial appendage-left superior PV ridge, the inferior part of the left inferior PV and the infero-posterior part of the right inferior PV showed conduction gaps more likely, while the right superior PVs were less frequently reconnected. In the CB group late PVR was associated with higher nadir temperature ($-50.6 \pm 5.5^\circ\text{C}$ vs $-42.4 \pm 8.9^\circ\text{C}$, $p = 0.034$), while in the CF-RF group the mean CF was lower in the reconnected PVs as compared to those PVs which remained isolated (10.9 ± 2.8 g vs 19 ± 5.1 g, $p < 0.05$). Conclusion: In our single-center analysis no difference was observed in the PV reconnection patterns and the antral lesion sets following an index PVI performed by CB or CF-RF catheter.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1035

A multicenter registry of catheter ablation for atrial fibrillation with the second generation cryoballoon: From the BREAK-AF Study

Yoshizawa T.¹; Shizuta S.¹; Komasa A.¹; Sasaki Y.²; Kobori A.²; Furukawa Y.²; Iseda T.³; Morita J.³; Hiroshima K.³; Ando K.³; Kimura T.¹

¹Kyoto University Hospital, Cardiovascular medicine, Kyoto, Japan

²Kobe City Medical Center General Hospital, Department of Cardiology, Kobe, Japan

³Kokura Memorial Hospital, Cardiology, Kokura, Japan

Background: prior studies reported relatively short-term outcomes of cryoballoon ablation (CBA) for paroxysmal atrial fibrillation (PAF). However, the longer-term outcomes of CBA for PAF is still unknown.

Purpose and Method: BREAK-AF study was a multicenter retrospective registry of CBA for AF. The purpose of this study was to evaluate the rates of acute complications and long-term clinical outcomes of CBA for PAF. We enrolled consecutive patients undergoing CBA from Sep. 2014 to Mar. 2018 in 3 large cardiovascular centers in Japan.

Results: the study population consisted of 1143 patients undergoing CBA for PAF; average age 65.7 ± 11.1 , female 33.4%, CHADS2 score 1.1 ± 1.1 , ejection fraction 64.4 ± 6.7 , LAD 37.3 ± 5.8 mm. Major procedural complications within 30 days occurred in 57 patients (5.0%): Death 1 (0.1%), systemic embolism 2 (0.2%), acute gastric dilation 3 (0.3%), persistent phrenic nerve palsy 25 (2.2%), cardiac tamponade 15 (1.3%), and vascular injury 8 (0.7%). Early arrhythmia recurrence within 90 days occurred in 233 patients (20.4%). During a median follow up of 18.2 months, the event-free rate from recurrent atrial tachyarrhythmias (RATs) after the blanking period of 90 days post ablation was 86.9% at 12 month and 83.8% at 18-month.

Conclusion: CBA for PAF was associated with over 80% of arrhythmia-free rate during 18 months of follow-up, with the acceptable acute complications rate.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1036

Silent cerebral thromboembolism in different catheter ablation technologies for atrial fibrillation: comparison of cryoballoon versus irrigated radiofrequency ablation system

Aso A.; Nakamura T.; Fukuda S.; Fukuyama Y.; Shibao K.; Araki M.; Ura Y.; Meno K.; Yakabe D.; Omura S.; Mori T.; Takenaka K.; Numaguchi K.; Murasato Y.

National Hospital Organization Kyushu Medical Center, Fukuoka, Japan

Background: Cerebral thromboembolism (CE) is one of the most feared complications in catheter ablation, and silent CE in ablation for atrial fibrillation (AF) is not rare. Prior our study has reported lower incidence of silent CE in AF radiofrequency (RF) ablation using irrigated-tip catheter than conventional 4 or 8mm-tip catheter. In addition, the incidence of silent CE in AF ablation under direct oral anticoagulant (DOAC) was equivalent to continuous therapeutic warfarin. Recently pulmonary vein isolation (PVI) using cryoballoon (CB) has emerged as an alternative technique to RF ablation because some studies suggested that the efficacy for PVI by CB was equivalent to RF. However, incidence of silent CE in CB ablation under the use of DOAC is unknown.

Purpose: We aimed to evaluate the incidence new silent CE in AF ablation using CB system compared with irrigated RF system under the use of DOAC.

Methods: 264 consecutive patients with paroxysmal or persistent AF (127 using CB system, 137 using RF system) who underwent the first AF ablation were taking DOACs: dabigatran, rivaroxaban, apixaban or edoxaban more than one month prior to the procedure. In all patients DOAC was held on the morning of the procedure and resumed just after hemostasis. Throughout AF ablation procedure, heparin was administered to maintain activated clotting time (ACT) between 300 and 400 seconds. Head magnetic resonance imaging (MRI) was performed in all patients within 24 hours after the procedure.

Results: In 12 (9.4%) patients using CB and in 18 (13.1%) patients using RF, diffusion weighted imaging of head MRI showed new embolic lesions without neurological symptom ($P = 0.44$). There were no significant differences in clinical data, coagulation parameters such as D-dimer before procedure. Although the amount of heparin during the procedure in group CB was significantly less than in group RF (15952 ± 3068 U vs. 19067 ± 5135 U; $P < 0.0001$), amount of heparin per hour in group CB was more than in group RF (8107 ± 1676 U/h vs. 5722 ± 1452 U/h; $P < 0.0001$) because procedure time in group CB was shorter than in group RF (122.2 ± 29.4 min vs. 202.3 ± 36.9 min; $P < 0.0001$). Mean ACT in both groups was maintained high level (338.9 ± 23.2 sec. vs. 341.5 ± 19.2 sec.; $P = 0.323$). In univariate analysis, minimum ACT during procedure, as before puncture of interatrial septum, were significantly correlated with the incidence of silent CE ($P = 0.023$).

Conclusions: The incidence of silent CE in AF ablation using CB system was lower than RF system, although it was not a significant difference between different ablation techniques for AF. In AF ablation, the use of CB may be preferred rather than RF as ablation system in regard to risk reduction of thromboembolic complications.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1037

Left atrial global longitudinal strain is an independent predictor for atrial fibrillation recurrences following radiofrequency catheter ablation as opposed to lateral or septal wall strain

Agelaki M.¹; Manolakou P.¹; Grapsa I.²; Koudounis P.¹; Serafeim P.¹; Christou A.¹; Zografos T.¹; Papadopoulos T.¹; Nihoyannopoulos P.³; Katsivas A.¹

¹Hellenic Red Cross Hospital, 1st Cardiology Department, Athens, Greece

²Barts Health NHS Trust, Cardiology Department, London, United Kingdom

³Hammersmith Hospital, Echocardiography Department, London, United Kingdom

Background/Introduction

Recent studies have indicated that left atrial strain measured by 2D speckle-tracking echocardiography may help identify patients at risk for atrial fibrillation (AF) recurrence after pulmonary vein isolation using radiofrequency catheter ablation (RFA).

Purpose: The purpose of this study was to assess the role of regional left atrial strain, lateral wall strain (LA-LS) and septal wall strain (LA-SS), in comparison to global longitudinal strain (LA-GLS) as prognostic markers for AF recurrence after RFA.

Methods: 104 patients (80% male, mean age 50 ± 12) with paroxysmal AF undergoing RFA had their LA-LS, LA-SS, LA-GLS and left atrial volume index (LAVi) assessed by transthoracic echocardiography at baseline. All patients were assigned to groups according to their CHA2DS2-VASc score and LAVi.

Results: After the 12 month follow-up period, 30 patients (29%) had presented with AF recurrence. No difference in age, gender or LAVi was found in this group of patients compared to patients with no recurrence, except for the higher CHA2DS2-VASc score (1.13 ± 1.20 vs 0.70 ± 0.87 , $p = 0.044$). LA-LS (20.69 ± 8.35 vs 26.16 ± 6.63 , $p = 0.001$) and LA-GLS (22.94 ± 5.43 vs 28.41 ± 4.31 , $p < 0.001$) were considerably lower in patients with AF recurrence, but no significant difference was found in LA-SS (32.77 ± 8.34 vs 34.76 ± 8.21). ROC curve analysis confirmed that LA-LS (AUC 0.750, $p = 0.0001$) and LA-GLS (AUC 0.744, $p = 0.001$) but not LA-SS (AUC 0.577, $p = 0.25$) showed a significant prognostic value for AF recurrences. ROC curve comparison found no significant difference between LA-LS and LA-GLS ($p = 0.61$), as opposed to LA-SS and LA-LS ($p = 0.039$) or LA-SS and LA-GLS ($p = 0.0025$). Moreover, LA-LS and LA-GLS displayed significant linear correlation ($r = 0.588$, $p < 0.001$). Multivariate logistic regression analysis for age, sex, CHA2DS2-VASc score, LAVi, LA-LS, LA-SS and LA-GLS showed that LA-GLS alone was an independent predictor for AF recurrences (OR 0.722, 95% CI 0.607-0.859, $P < 0.001$), whereas LA-LS showed no statistical significance ($p = 0.792$).

Conclusions

LA-GLS seems to be an independent predictor for atrial fibrillation recurrences after pulmonary vein isolation. LA-SS showed no statistical correlation to AF recurrences. LA-LS appears to have a significant prognostic value and correlates well with LA-GLS, but its significance does not persist in multivariate analysis including LA-GLS.

P1038

Atrial fibrillation type and renal dysfunction as important predictors of left atrial thrombus in atrial fibrillation - Proposal of a new score

Gawalko M.¹; Kaplon-Cieslicka A.¹; Budnik M.¹; Peller M.¹; Gorczyca I.²; Michalska A.²; Bodys A.¹; Uliniski R.¹; Zochowski M.¹; Babiarz A.¹; Scislo P.¹; Kochanowski J.¹; Filipiak KJ.¹; Opolski G.¹

¹Medical University of Warsaw, 1st Department of Cardiology, Warsaw, Poland

²Swietokrzyskie Cardiology Center, 1st Department of Cardiology and Electrotherapy, Kielce, Poland

Background: In non-valvular atrial fibrillation (AF), the CHA2DS2-VASc score is recommended for the assessment of thromboembolic risk. However, it might not include all relevant predictors of left atrial appendage (LAA) thrombus formation.

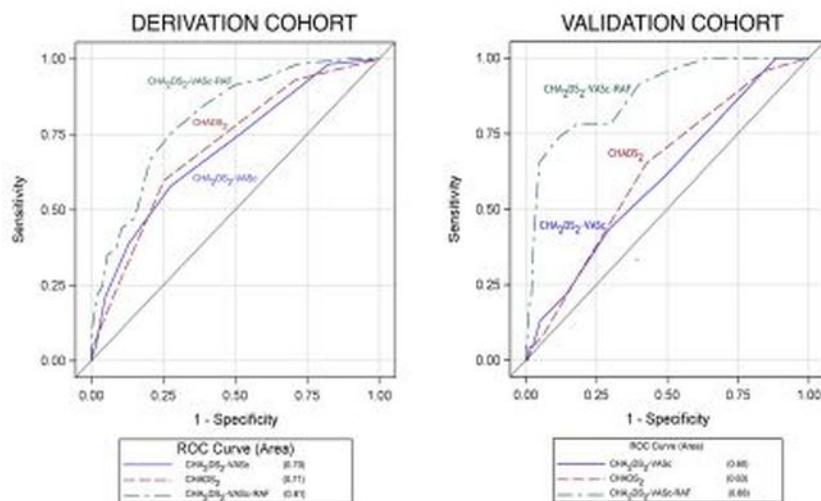
Purpose: To identify predictors of LAA thrombus in AF patients and to enhance the prognostic value of the CHA2DS2-VASc score.

Methods: The study included 1033 consecutive AF patients (derivation cohort) referred for catheter ablation or direct current cardioversion, in whom transesophageal echocardiography (TOE) was performed prior to the procedure. Logistic regression analysis was used to identify predictors of LAA thrombus on TOE. New predictors were included in the CHA2DS2-VASc score. Receiver operating characteristic (ROC) curves were constructed to compare the new score with the CHA2DS2 and the CHA2DS2-VASc score both in the derivation and the validation (n = 320) cohort.

Results: In the derivation cohort, median age was 60 years, median CHA2DS2-VASc score was 2, 45% patients received vitamin K antagonists (VKA), and 44% - non-VKA oral anticoagulants (NOAC). On TOE, LAA thrombus was present in 59 (5.7%) patients. In univariate analyses, predictors of LAA thrombus were: older age, diabetes, heart failure, prior stroke, transient ischemic attack or peripheral embolism, respiratory disease, AF type (persistent/"permanent" vs paroxysmal) and renal dysfunction. In multivariate analysis, aside from variables encompassed by the CHA2DS2-VASc score, LAA thrombus predictors included AF type and renal dysfunction. These predictors were consequently incorporated into the CHA2DS2-VASc score. In ROC analysis, area under the curve (AUC) for the new score (CHA2DS2-VASc-RAF score) was significantly higher (0.81) than for the CHA2DS2 and the CHA2DS2-VASc score (0.71 and 0.70, respectively). In the validation cohort, the CHA2DS2-VASc-RAF score also performed significantly better (AUC of 0.88) than the CHA2DS2 and the CHA2DS2-VASc score (AUC of 0.63 and 0.60, respectively).

Conclusion: In a real-world population of AF patients with majority treated with OAC, LAA thrombus was found in approximately 6%. Two variables not included in the CHA2DS2-VASc score (AF type and renal dysfunction) proved to be strong, independent predictors of LAA thrombus, and might improve thromboembolic risk stratification.

Abstract P1038 Figure. Derivation and validation cohort



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1039

Which is the optimal Ablation Index value to allow pulmonary vein isolation: Results from AIR study

Schillaci V.¹; Lepillier A.²; De Ruvo E.³; Castro A.⁴; Grimaldi M.⁵; Badenco N.⁶; Del Greco M.⁷; De Simone A.⁸; Pisano E.⁹; Abbey S.¹⁰; Lamberti F.⁴; Pani A.¹¹; Zucchelli G.¹²; Sgarito G.¹³; Stabile G.¹⁴

¹Montevergine Cardiology Clinic, Electrophysiology, Mercogliano, Italy

²Centre Cardiologique du Nord (CCN), Paris, France

³Polyclinic Casilino of Rome, Rome, Italy

⁴Sandro Pertini Hospital, Rome, Italy

⁵Regional General Hospital F. Miulli, Acquaviva Delle Fonti, Italy

⁶Hospital Pitie-Salpetriere, Paris, France

⁷Santa Maria Del Carmine Hospital, Rovereto, Italy

⁸Casa di cura San Michele, Maddaloni, Italy

⁹Vito Fazzi Hospital, Lecce, Italy

¹⁰Nouvelles Cliniques Nantaises, Nantes, France

¹¹Alessandro Manzoni Hospital, Lecco, Italy

¹²Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy

¹³Ospedale Civico, Palermo, Italy

¹⁴Clinica Mediterranea, Naples, Italy

Background. Ablation Index (AI) is a new lesion quality marker that has demonstrated to allow acute durable pulmonary vein (PV) isolation followed by a high single-procedure arrhythmia-free survival. Unknown is the best AI value to ensure effective and safe PV isolation.

Objectives. We compared the efficacy and the safety of two AI value during acute PV isolation guided by the AI.

Methods. A total of 490 consecutive patients with paroxysmal (80.4%) and persistent (19.6%) AF underwent first time PV encircling and were divided in two groups according to operator preference in choosing the AI setting (330 at posterior wall and 450 at anterior wall or 380 at posterior wall and 500 at anterior wall). Radiofrequency energy was delivered to produce a wide area circumferential ablation around the proximal part of each PV's ostium or around ipsilateral PVs. In all patient radiofrequency was delivered targeting interlesion distance ≤ 6 mm.

Results. In 258 patients a 330-450 AI value was used, whereas in the remaining 232 patients a 380-500 value was used. With both AI setting a comparable rate of first pass PV isolation was reached: $90 \pm 16\%$ vs $88 \pm 16\%$, respectively, $p = 0.88$. Procedure time (123 ± 63 min vs 131 ± 65 min, $p = 0.15$), fluoroscopy time (5 ± 6 min vs 7 ± 7 min, $p = 0.06$), ablation time (29.9 ± 13.4 min vs 30.4 ± 13.6 min, $p = 0.66$), mean impedance drop ($9.2 \pm 5 \Omega$ vs $9.9 \pm 5 \Omega$, $p = 0.26$), and mean contact force at ablation site (10.7 ± 5 g vs 10 ± 4 g, $p = 0.15$) did not significantly differ among the two study groups. Neither the complication rate, 1.5 vs 1.7% ($p = 0.88$), differed between the two groups. Conclusions. Ablation protocol respecting strict criteria for contiguity and quality lesion results in high rate of acute PV isolation also using a lower AI value both at the anterior and posterior aspect of PV.

P1040

Acute efficacy of contiguous versus discontinuous point-by-point radiofrequency energy isolation of pulmonary veins in patients with paroxysmal atrial fibrillation: a randomized study

Aldhoon B.¹; Peichl P.²; Osmancik P.³; Konecny P.²; Kautzner J.²; Wichterle D.²

¹Worcestershire Acute Hospitals NHS Trust, Worcester, United Kingdom

²Institute for Clinical and Experimental Medicine, Prague, Czech Republic

³Faculty Hospital Kralovske Vinohrady, Cardiology Department, Prague, Czech Republic

Background: Durable pulmonary vein (PV) isolation (PVI) determines the clinical success of catheter ablation for atrial fibrillation (AF). Secondary analysis of EFFICAS-II study suggested that contiguity of radiofrequency (RF) lesions resulted in more durable PVI. In the randomized study, we investigated whether completely discontinuous deployment of ablation lesions adversely affected the acute efficacy of PVI.

Methods: Thirty-six consecutive drug-refractory paroxysmal AF patients (aged 59 ± 11 , 58% males) were randomized 1:1 to either discontinuous (D-PVI) or contiguous (C-PVI) encircling point-by-point lesions around ipsilateral PV. A contact force sensing catheter targeting a final interlesion distance (ILD) < 6 mm and ablation index 400-450 (for anterior wall) and 300-350 (for posterior wall) was used. Study endpoint was defined as failure of first-pass PVI or acute PV reconnection during minimum 30 minutes of waiting time followed by adenosine challenge. This was analysed in per-PV-circle fashion.

Results: Three operator from 2 centres were involved in the study. Clinical characteristics of patients did not differ between the groups. Total RF time was comparable in D-PVI vs C-PVI group (1681 ± 366 vs 1758 ± 485 seconds, $p = 0.59$). The mean and maximum ILD was higher in D-PVI vs C-PVI group (5.2 ± 0.5 vs 4.8 ± 0.5 , $p = 0.001$ and 8.2 ± 1.7 vs 7.5 ± 0.9 , $p = 0.05$, respectively). First-pass PVI failed in none of PV-circles in the D-PVI group and in 2 PV-circles in the C-PVI group. During the 30-minute waiting time, one PV-circle reconnection was observed after adenosine testing in the D-PVI group and two spontaneous PV-circle reconnections occurred in the C-PVI group. Total endpoint rates were 1/36 (3%) vs 4/36 (11%), $p = 0.34$ in the D-PVI vs C-PVI groups.

Conclusions: Discontinuous deployment of RF lesions is not associated with lower procedural PVI efficacy when strict guidelines are applied for interlesion distance and ablation index. Development of oedema around each ablation site does not prevent effective lesion formation at adjacent positions.

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1041

Impact of the mean left atrial pressure on the clinical outcome of patients after catheter ablation for atrial fibrillation

Bandino S.; Wichterle D.; Peichl P.; Stojadinovic P.; Cihak R.; Kautzner J.

Institute for Clinical and Experimental Medicine (IKEM), Cardiology, Prague, Czech Republic

Background: Mean left atrial pressure (mLAP) can be easily measured during catheter ablation for atrial fibrillation (AF). Its impact on the post-ablation clinical outcome has not yet been fully elucidated.

Purpose: We hypothesized that elevated mLAP is independently associated with worse arrhythmia control after the ablation for AF.

Methods: This retrospective study included patients who underwent their first-time radiofrequency catheter ablation for AF and in whom mLAP was measured invasively immediately after transseptal puncture. Patients were followed during regular visits at 3 and 6 months, and every 6 months thereafter. Good arrhythmia control at the last clinical visit was defined as either absence of arrhythmia or significant reduction in arrhythmia burden. This was not achieved when patient was treated with antiarrhythmic drugs (AADs) and/or required electrical cardioversion since the previous clinical visit.

Results: Between November 2012 and August 2018, 699 patients (age: 61 ± 10 ; males: 65.5%; paroxysmal AF: 67.2%; CHA2DS2-VASc: 2.0 ± 1.3 ; pulmonary vein isolation only: 72.8%) were enrolled. The mLAP was 9.2 vs. 11.3 mmHg in patients with paroxysmal vs. persistent AF ($P < 0.0001$) and 9.4 vs. 10.7 mmHg in males vs. females ($P < 0.001$). During median follow up of 340 (interquartile range: 209-549) days, good arrhythmia control without AADs was achieved in 63.6 vs. 47.2% of patients with paroxysmal vs. persistent AF ($P < 0.0001$) and in 62.4% vs. 50.2% of males vs. females ($P < 0.01$). All baseline characteristics that were univariately and multivariately associated with the clinical outcome are shown in Table.

Conclusion: Elevated mLAP is associated with worse arrhythmia control after AF ablation independently of other established risk factors, including female gender, persistent AF, longer duration of AF, left atrium enlargement and left atrial volume index.

Table

	Decrease in good arrhythmia control without AADs			
	Univariate analysis		Multivariate analysis	
Age per 1 year increase	-0.6%	<0.001	NS	
Female gender	-12.2%	<0.01	-10.4%	<0.01
Persistent AF	-16.5%	<0.0001	-10.0%	<0.05
Creatinine per 1 μ mol/L increase	-1.1%	<0.05	NS	
AF duration per 1 year increase	-1.1%	<0.01	-1.1%	<0.01
LA volume per 1 ml/m ² increase	-0.8%	<0.0001	-0.6%	<0.0001
mLAP per 1 mmHg increase	-1.6%	<0.0001	-0.9%	<0.05

P1042

Early referral of patients impacts clinical outcome after catheter ablation for atrial fibrillation

Stojadinovic P.; Wichterle D.; Peichl P.; Cihak R.; Kautzner J.

Institute for Clinical and Experimental Medicine (IKEM), Cardiology, Prague, Czech Republic

Background: Clinical outcome of patients after catheter ablation for atrial fibrillation (AF) depends on many factors, among others on timing of the patient referral to the expert centre.

Purpose: We hypothesized that duration of AF history, i.e. surrogate of referral time, is an independent predictor of successful ablation and that learning effects in performing ablation procedure continuously persist even in established, high-volume centre.

Methods: We retrospectively analysed 3155 consecutive patients (age: 60 ± 10 yrs; males: 68%; paroxysmal AF: 68%; AF duration: 4.2 ± 4.8 yrs; left atrial diameter: 42 ± 6 mm; QRS duration: 99 ± 18 ms) who underwent the first catheter ablation for AF (pulmonary vein isolation alone: 69%) in the period of 2006-2017 and who were followed for 37 ± 32 months. The cross-sectional endpoint of good arrhythmia control (GAC), which was assessed by a single judge, was defined as either absence of arrhythmia or highly significant reduction in arrhythmia burden. Factors associated with GAC, either overall or without antiarrhythmic drugs (AADs), were investigated by multivariate analysis.

Results: When periods of 2006-7 vs. 2016-17 were compared, the GAC was achieved in 76.8% (overall) and 53.1% (off-AADs) of pts vs. 85.9% and 64.2% of pts, respectively. In parallel, AF duration (referral time) shortened from 6.2 ± 6.6 to 3.7 ± 4.3 yrs. All factors that were multivariately associated with the clinical outcome are shown in Table.

Conclusions: Early referral and learning effects (possibly together with technological advances) over time improve the clinical outcome of patients after catheter ablation for AF. This observation remained significant even after multivariate adjustment to several traditional risk factors.

Results

	Percentage impact of individual factors on good arrhythmia control (GAC)			
	GAC overall		GAC without AADs	
Persistent AF	-13%	$P < 0.00001$	-16%	$P < 0.00001$
Female gender	-9.9%	$P < 0.00001$	-12.8%	$P < 0.00001$
Age (per decade)	n/a	n/a	-3.4%	$P < 0.001$
AF duration (per 1 year)	-0.37%	$P < 0.01$	-0.75%	$P < 0.0001$
LA diameter (per 1 mm)	-0.66%	$P < 0.00001$	-0.82	$P < 0.00001$
QRS duration (per 10 ms)	-0.77%	$P < 0.05$	-1.89%	$P < 0.0001$
Substrate ablation	-3.8%	$P < 0.05$	-5.7%	$P < 0.05$
Procedure period (per year)	+0.65%	$P < 0.01$	+0.55	$P < 0.05$

Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1043

The fourth generation of the cryoballoon for pulmonary vein isolation in atrial fibrillation: initial feasibility results, procedural characteristics, and the safety profile

Straube F.; Hartl S.; Dorwarth U.; Pongratz J.; Brueck B.; Wankel M.; Hoffmann E.

Heart Center Munich-Bogenhausen - Munich Municipal Hospital Group, Munich, Germany

Background/Introduction: The second-generation cryoballoon is an established tool for pulmonary vein isolation in atrial fibrillation (AF). Time-to-isolation (TTI) guided ablation protocols have been developed to ensure durable PVI, and to reduce total cryoablation time. The novel fourth generation cryoballoon (CBG4) with a shortened distal tip, possibly increasing the feasibility to determine the TTI, was introduced in our lab 10/2018.

Purpose: The aim of this feasibility and safety study was to determine the procedural characteristics of the device.

Methods: Consecutive symptomatic AF patients scheduled for pulmonary vein isolation were prospectively included into the observational single-centre study. PVI was performed using the 28 mm CBG4 over-the-wire with the latest edition of the 20 mm spiral-mapping catheter. A time-to-isolation guided protocol with a fixed cryo cycle length of 180s, and a TTI cut-off of ≥ 45 s requiring an additional 180s safety application. An esophageal sinusoidal temperature probe was used. Phrenic nerve (PN) stimulation was controlled by palpation and ICE visualisation. For premature termination due to esophageal temperatures $\leq 15^{\circ}\text{C}$, PN impairment or balloon temperatures $\leq 55^{\circ}\text{C}$, double stop technique was applied. Procedural results and complications until discharge were documented.

Results: A total of 58 PVs were targeted with the CBG4 in 15 patients (68 ± 11 years, paroxysmal AF 47%). Mean left atrial dwelling time, mean fluoroscopy time, and median dose area product were 61 ± 11 min., 15 ± 5 min., and 1212 cGyxcm², respectively. PVI was achieved in 58/58 (100%) of PVs with the 28 mm CBG4. In 1/58 (1.7%) PV the spiral-mapping catheter had to be changed to a stiff wire to isolate the PV with the CBG4 because of an instable balloon position at the ostium of LSPV. Single shot isolation was achieved in 46/58 (79%) of PVs. The mean number of applications was 8.0 ± 2.0 per patient, and 2.1 ± 1.1 per vein. The mean ablation time per freeze was 171 ± 26 s. TTI was determined in 52/58 (89.7%) of PVs, and mean TTI was 49 ± 24 s. No balloon dislodgement of the CBG4 due to instability during balloon positioning occurred. Arrhythmia recurrences until discharge occurred in 2/15 (13%) of patients. PN injury occurred in two patients: one transient PN impairment with immediate resolution, one persistent PN palsy until discharge. One patient suffered from inflammatory syndrome treated conservatively without sequelae. No major adverse cardiac or cerebrovascular event occurred until discharge.

Conclusion: The CBG4 with a short distal tip seems to be safe and effective, and allows determining the time-to-isolation in 9 of 10 pulmonary veins. In the rare case of instability of the balloon at the PV ostium, the exchange of the spiral-mapping catheter to a stiff wire facilitates PVI.

P1044

Assessment of autonomic nerve modulation after cryoballoon pulmonary vein isolation in patients with paroxysmal atrial fibrillation: results of pilot study

Novikov I.; Maykov E.; Sokolov S.; Novikov P.; Mironov N.; Golitsyn S.

National Medical Research Cardiology Center, Clinical electrophysiology department, Moscow, Russian Federation

Funding Acknowledgements: No funding

Background: The condition of the autonomic nervous system (ANS) can play an important role in the atrial fibrillation recurrence rate after catheter ablation. Earlier, several studies have shown contradicting results about the duration of the ANS modulation after balloon pulmonary vein isolation.

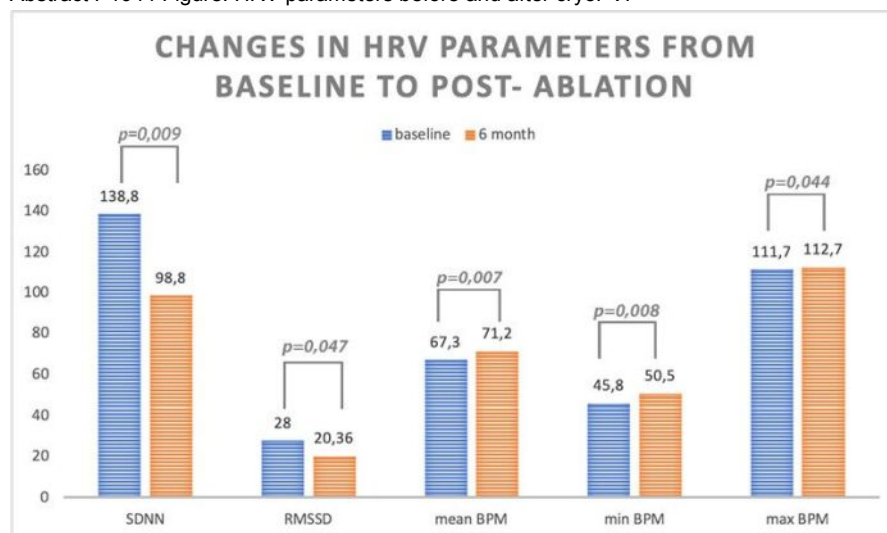
Purpose: Aim our pilot study was the assessment of ANS modulation after 6-month single procedure cryoablation follow-up.

Methods: The patients with drug-refractory paroxysmal atrial fibrillation underwent pulmonary vein isolation using 2 generation cryoballoon catheter were enrolled in this pilot study. Follow-up was based on outpatient clinic visits including Holter electrocardiograms assessment of hearts rhythm variation: SDNN, RMSSD, mean, minimal and maximal beats per minute (BPM). Results

Among 13 patients underwent balloon cryoablations (64% male, mean age $55,0 \pm 9,8$ years, 97% of pulmonary vein have been successful isolated). Six month after cryoballoon pulmonary vein isolation SDNN, RMSSD was significantly different from baseline parameters ($138,8 \text{ ms} \pm 21,3$ vs $98,8 \text{ ms} \pm 33,5$, $p = 0,009$; $28,0 \text{ ms} \pm 11,7$ vs $20,36 \text{ ms} \pm 7,57$, $p = 0,047$), the mean, minimal and maximal BPM was statistically higher after ablation ($p = 0,007$, $p = 0,008$, $p = 0,044$ corresponding). At the end of 6-month follow-up period 12/13 patients had no clinical recurrence of atrial tachycardia.

Conclusion: Our pilot study demonstrated that balloon cryoablation leads to modulation of the ANS which persists at least for 6 months after cryoablation. The effect of parasympathetic dysfunction on the recurrence of atrial fibrillation requires further investigation.

Abstract P1044 Figure. HRV parameters before and after cryoPVI



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1045

Biophysical and procedural factors impact on chronic pulmonary vein isolation using second generation cryoballoon ablation

Topchyan AH.; Davtyan KV.; Kalemberg AA.; Simonyan GY.

National Research Center for Preventive Medicine, Moscow, Russian Federation

Background: Data is limited to the impact of procedural and biophysical factors in chronic pulmonary vein isolation (PVI) performed by second-generation cryoballoon ablation (CBA).

Purpose: The aim of this study is to assess the role of procedural and biophysical characteristics of index CBA using second generation cryoballoon (CB) on PVI durability.

Methods: Total 143 PVs in 37 consecutive patients, who underwent a redo procedure in Mdn 5 (IQR:3-10) months after index CBA, were analyzed.

Results: Recurrent PV activity was observed in 46 PVs (32.2%) (LSPV-11, LIPV – 14, RIPV – 11, RSPV – 10) and the chronic PVI rate was 67.8% (n = 97). A colder nadir balloon temperature (-48.90 ± -6.79 vs $-44.52 \pm -5.11^\circ\text{C}$, $p < 0.0001$), a higher prevalence of PV occlusion (85.56% vs 69.56%, $p = 0.025193$) and a lower necessity of additional applications (8.25% vs 26.08%, $p = 0.000125$) were observed in chronic PVI group. A nadir balloon temperature cutoff value was $< -40^\circ\text{C}$ with an area under the curve (AUC) 0.652959. In the logistic multivariate analysis, only balloon nadir temperature was a significant predictor of durable PVI (table 1).

Conclusion: A colder temperature (cut-off value -40°C) and PV occlusion can be a reliable predictor for durable PVI.

Table 1.

	coeff	s.e.	Wald	p-value	exp(b)	lower	upper
intercept	-4.63603	1.619849	8.191113	0.00421	0.009696		
PV_occl	-0.67822	0.639368	1.125234	0.288794	0.507518	0.144951	1.77698
temp	0.123688	0.034145	13.12175	0.000292	1.131663	1.058407	1.20999
appl_add	-0.99255	0.533047	3.467183	0.062598	0.370629	0.130379	1.053586

Multinomial logistic regression analysis of procedural and biophysical variables showing significant differences between isolated and reconnected PVs in the univariate analysis. PV_occl. - pulmonary vein occlusion, temp - balloon nadir temperature, appl_add - the necessity of >1 applications for achieving acute pulmonary vein isolation during the index procedure.

P1046

Novel ultra-low temperature cryoablation catheter improves ablation strategy to treat long standing persistent atrial fibrillation blocking the mitral isthmus

Iliodromitis K.¹; Boersma LVA²; Cabrita D.³; De Potter T.¹

¹Olv Hospital Aalst, Electrophysiology, Aalst, Belgium

²St Antonius Hospital, Cardiology, Nieuwegein, Netherlands

³Adagio medical, Adagio medical, Laguna hills, United States of America

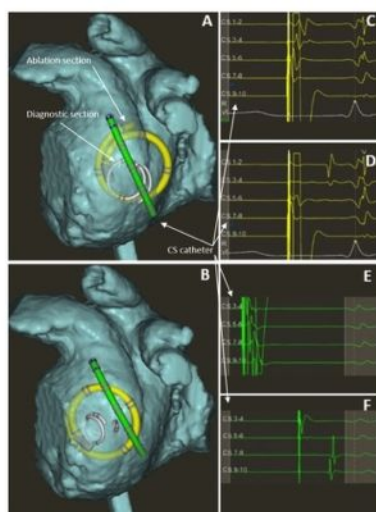
Introduction: Pulmonary vein (PV) isolation (PVI) with single-shot devices utilizing cryoenergy is an established therapy for medical refractory paroxysmal atrial fibrillation (AF). Ablation of non-PV targets, such as left atrial linear lesions (LL) may be necessary for long standing persistent AF (LSPsAF). This is more time-consuming and complex to perform, strongly operator-dependent, and may create pro-arrhythmic substrate, if incomplete. We report the first two clinical cases treated for LSPsAF using a novel single-shot ablation catheter.

Methods: Two patients with LSPsAF (duration: 47 ± 25 months; age: 58 ± 8 years; left atrial size: 43 ± 0 mm), were treated with an 8.5Fr ultra-low temperature cryoablation (ULTC) catheter system. The catheter includes an ablation and diagnostic section of 11 and 9 cm long, respectively. Those sections can adopt multiple shapes using predefined stylets. The system utilizes near critical nitrogen as ULTC energy source, theoretically reaching -196°C , along its entire ablation section. Esophageal injury was mitigated using a compliant intra-esophageal warming balloon. Apart from PVI and a posterior wall (PW) "box" lesion, we performed the ablation of the left atrial mitral isthmus (MI) in both patients. Cryo-adherence kept the catheter stable at all target locations during ablation. The diagnostic extension of the ablation catheter was used to validate conduction block in real-time at each location. All lesions were performed with a single ablation catheter. Acute procedural success was defined as sustainable antral PVI, PW isolation and MI bidirectional block (BDB), after a 30-minute waiting period.

Results: Both patients showed durable bilateral PVI, PW isolation and MI block. MI block occurred at 16 and 25 seconds from the beginning of the first application. Total ablation times for PVI, PW and MI were 8 ± 1 , 2 ± 0 and 5 ± 3 minutes, respectively. From the beginning of the first cryo-application, catheter dwell times during PVI, PW and MI ablation, were 27 ± 6 , 8.5 ± 0.5 and 10.5 ± 3.5 minutes respectively. Total fluoroscopy and procedure durations were 10.1 ± 0.8 and 94.5 ± 27.5 minutes respectively. MI BDB was confirmed with differential pacing after a waiting period of 30 minutes. No procedure related death, fistula, tamponade, ST-segment-elevation, or phrenic nerve palsy occurred.

Conclusions: Acute ablation results with the ULTC single shot catheter system show excellent safety, efficiency and efficacy outcomes. The formed linear lesions at various left atrial regions are effective and durable for the treatment of LSPsAF.

Abstract P1046 Figure.



P1047

Feasibility of single position endoscopic laser balloon ablation for atrial fibrillation: the open 8 approach

Ilidromitis K.; Silva E.; De Potter T.

Olv Hospital Aalst, Electrophysiology, Aalst, Belgium

Introduction: Ablation without shaft repositioning may make the endoscopic laser ablation system (EAS) more like a single shot approach. We tested the feasibility of wide circumferential ablation (WCA, no carina ablation, no shaft repositioning) in an "open 8" pattern for pulmonary vein isolation (PVI).

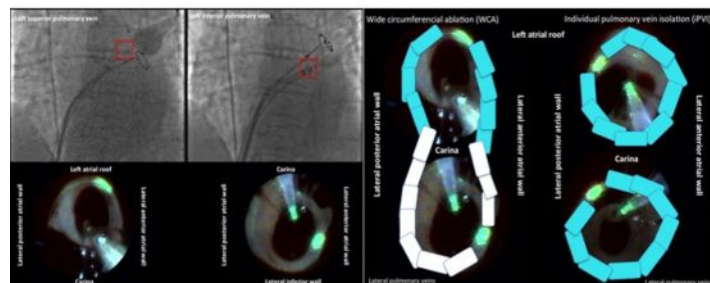
Methods: Forty-eight patients (n = 48, age 64.6 ± 12 years) with paroxysmal and persistent atrial fibrillation (AF) were referred to our center for PVI with the EAS. WCA for the lateral and septal pulmonary veins was attempted in all patients. If not feasible, individual full circular isolation of each pulmonary vein (iPVI) was performed. Additional lesions were applied, if acute complete electrical isolation was not achieved on first encirclement. Any documented episode of AF after a one-month blanking period was registered as a recurrence.

Results: Bilateral WCA was feasible in 21 out of 48 patients (43.8%). Additional lesions for complete electrical isolation after first pass ablation were less in WCA compared to iPVI ($p = 0.02$). WCA was accomplished faster, with less applied energy at both lateral ($p < 0.01$) and septal side ($p < 0.01$). The mean follow up of the patient population was 232 ± 150 days. AF recurrence occurred later in patients treated with WCA (315 ± 124 vs. 110 ± 88 days, $p = 0.008$).

Conclusions: WCA with the EAS is safe, at least moderately feasible and highly effective if achieved. Compared to iPVI it may be less time consuming, results in less energy application and suppresses AF more effectively.

	Wide circumferential ablation	Individual circular isolation	p-value
Energy for bilateral isolation (kJ)	12.5 ± 1.3	16.6 ± 2.4	<0.01
Energy for lateral side (kJ)	6.4 ± 1.4	8 ± 2.3	<0.01
Energy for septal side (kJ)	6 ± 1.4	8.6 ± 1.6	<0.01
Additional lesions for acute isolation	2	12	0.02
Total duration (min)	28.3 ± 5.2	41.5 ± 12	<0.01
Duration of the lateral side (min)	14.6 ± 5	18.4 ± 7	<0.01
Duration of the septal side (min)	13.4 ± 3.7	23 ± 9.7	<0.01
Recurrence after ablation (days)	316 ± 124	111 ± 88	<0.01
Recurrences (n)	5	11	ns

Abstract P1047 Figure.



P1048

Impact of radiofrequency wide circumferential pulmonary vein isolation on left atrial geometry in patients with recurrent atrial fibrillation

Iliodromitis K.; Silva Garcia E.; Geelen P.; Katbeh A.; Penicka M.; De Potter T.

Olv Hospital Aalst, Electrophysiology, Aalst, Belgium

Introduction: Restoration of sinus rhythm with radiofrequency catheter (RF) ablation in patients with paroxysmal and persistent atrial fibrillation (Afib) results in left atrial (LA) remodeling. However, limited knowledge exists regarding the net effect of wide circumferential RF pulmonary vein isolation (PVI) on the LA geometry.

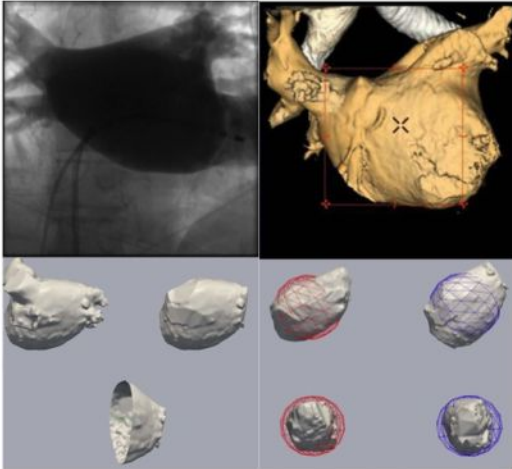
Methods: Over a 4 year period, all patients that underwent at least two point-by-point wide circumferential PVI procedures for paroxysmal or persistent Afib in our center were included (n = 82). In all patients a 3D rotation angiography (RA) of the left atrium was performed immediately before ablation, at index and repeat ablation(s). LA geometry in terms of volume, sphericity, surface and anterior-posterior diameter were assessed in all patients between first-second and second-third PVI.

Results: 71 patients (31 paroxysmal Afib, 40 persistent Afib) underwent a 3D-RA before their first and second PVI, whereas 19 patients underwent a 3D-RA before their second and third PVI. There was a statistical significant reduction of the LA volume and the surface of the LA in all 71 patients. Patients with paroxysmal Afib also showed statistical significant increase of the LA sphericity, whereas patients with persistent Afib showed only a trend towards increased sphericity, without reaching statistical significance. The group of the 19 patients, who underwent a third PVI, showed no differences of their LA geometry after electrical mapping of the gaps and focal RF re-isolation.

Conclusions: Wide circumferential RF pulmonary vein isolation itself seems to result in remodeling of the LA, irrespective of long-term maintenance of sinus rhythm, in both patients with paroxysmal and persistent Afib

LA-Dimensions of all patients (n = 71)	1st RA	2nd RA	p-values
LA sphericity (%)	82 ± 2	83 ± 2	0.004
LA volume/BSA (ml/m ²)	65.6 ± 14	62.2 ± 15	<0.001
LA surface/BSA (mm ² /m ²)	7436 ± 1115	7036 ± 1124	<0.001
LA-Dimensions of patients with paroxysmal Afib (n = 31)	1st RA	2nd RA	p-values
LA sphericity (%)	82.3 ± 2.1	83.1 ± 2	0.009
LA volume/BSA (ml/m ²)	62 ± 11	59 ± 12	0.006
LA surface/BSA (mm ² /m ²)	7181 ± 900	6851 ± 948	0.001
LA-Dimensions of patients with persistent Afib (n = 40)	1st RA	2nd RA	p-values
LA sphericity (%)	82.4 ± 2.8	83 ± 2.4	ns (0.089)
LA volume/BSA (ml/m ²)	68.4 ± 16	64.7 ± 16	0.005
LA surface/BSA (mm ² /m ²)	7633 ± 1232	7178 ± 1237	0.005

Abstract P1048 Figure.



P1049

Value of routine use of intracardiac echocardiography and routine ultrasound guided venipuncture in the setting of catheter ablation for atrial fibrillation

La Greca C.; Pecora D.; Simoncelli U.; Sorgato A.; Cuccia C.

Poliambulanza Foundation Hospital Institute of Brescia, Cardiology, Brescia, Italy

Background: Catheter ablation (CA) for atrial fibrillation (AF) is a complex procedure that is associated with higher risk of complications.

Purpose: To investigate how the routine use of intracardiac echocardiography (ICE) and the routine ultrasound guided (USG) venipuncture may effect the complication rate of the procedure.

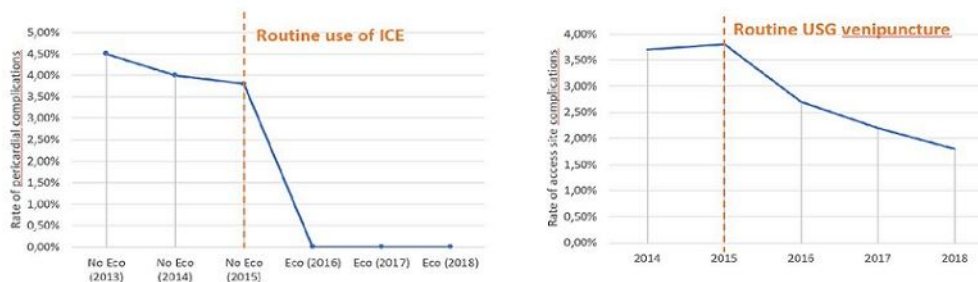
Methods: We analysed data from 242 patients who underwent a procedure of CA for AF from July 2009 to July 2018. From year 2015 our centre started routine use of ICE and routine USG venipuncture. We compared outcomes before and after the routine introduction of ICE and USG venipuncture.

Results: The overall rate of complications was 12.00% (29/242). No death or atrioesophageal fistula occurred. Five patients (2.07 %) experienced pericardial complications. One patient had a cerebrovascular embolic event (0.41%); one patient had complications related to general anaesthesia. Access complications were the most frequent complication (23/242, 9.5%).

We observed a reduction in the number of overall complications since the routine introduction of ICE and of USG venipuncture (16.25% vs 1.21%, $p = 0.001$). Specifically, we observed a reduction in access site complications (13.3% vs 4.679%, $p = 0.03$), although this reduction was not confirmed when considering only access site complications requiring interventions or resulting in prolongation of hospital staying or hospital readmission (3.70% vs 1.87%, $p = 0.646$). Even if we didn't observe a significant difference, there was a reduction in pericardial complications (3.3% vs 0.0%, $p = 0.082$). Moreover, we observed a significant reduction in fluoroscopy time (38.58 ± 62.70 vs 15.80 ± 7.87 , $p = 0.007$), and in skin to skin time (176.46 ± 41.36 vs 164.14 ± 29.77 , $p = 0.043$).

Conclusions: the routine use of ICE and USG venipuncture delivers a trend to reduction in the number of complications after CA for AF, and, moreover, improves efficiency, reducing fluoroscopy and skin to skin time.

Abstract P1049 Figure. Rates of complications



Subject: Poster session 2 -- Atrial Fibrillation - Treatment

P1050

Long-term outcomes in paroxysmal and persistent atrial fibrillation using high density voltage mapping with ablation of low voltage bridges

Bailin S.; Kocheria C.; Aung T.

University of Iowa, Iowa City, United States of America

Background: Ablation of atrial fibrillation (AF) has focused upon the isolation of pulmonary veins and short term outcomes have been acceptable and reported to be 70-80% in paroxysmal AF (PAF) and approximately 50% in patients with Persistent AF (PrAF). Long term results demonstrate considerable AF recurrence during follow-up. We hypothesize that progressive atrial fibrosis with increasing endocardial fragmentation may account for this observation. It is known that the level of atrial fibrosis is correlated with the disease severity and may be determined by mapping endocardial voltage. We have previously identified low voltage bridges (LVB) connect higher voltage regions together and ablation of these LVBs result in significant changes in endocardial activation such that focal ablation of LVB can isolate pulmonary veins and clear endocardial fragmentation. Short term success with this approach was previously reported. In the present analysis we present the 5 year sinus rhythm survival in a pilot study of 29 PAF and 26 PrAF

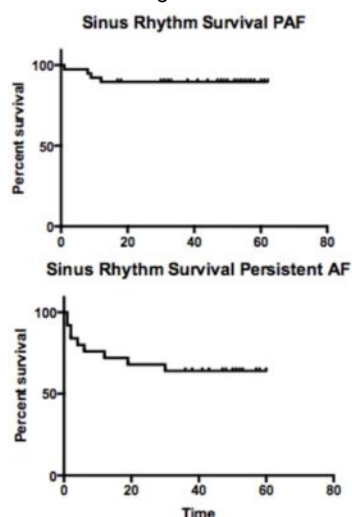
Purpose: To assess long-term sinus rhythm maintenance in patients with atrial fibrillation treated by substrate modification by low voltage bridge ablation.

Methods: 55 patients underwent AF ablation targeting LVB (29 PAF and 26 PrAF). Utilizing a reflexion HD duodecapolar mapping catheter (SJM) and voltage reconstruction using ESI Navix (SJM), LVB were identified following adjustment of high and low voltage levels as previously described. LVB ablation was performed and resulted in isolation of the PV and defragmentation of the atrial endocardium. Patients were evaluated with holters and event monitors yearly or as symptoms arose. Results were analyzed with Kaplan-Meier plots.

Results: All patients had successful isolation and defragmentation of the atrium. In patients with PrAF, 88% converted to Sinus Rhythm (SR) during ablation. An average of 1.3 ablations were performed per patient, the majority of which was performed for left atrial flutters. 20% of patients were on antiarrhythmic drugs during follow-up. At 5 years, 89% of PAF and 67% of PrAF remained in SR.

Conclusions: High density voltage mapping can identify LVB which when targeted for ablation result in isolation of the PVs and defragmentation of the endocardium. This pilot study suggests that AF recurrence is minimized by this approach during an observation period of 5 years. A randomized trial will be needed to confirm these findings, but these results suggest ablation of endocardial fragmentation guided by focal ablation LVB is a promising approach to AF ablation.

Abstract P1050 Figure.



P1051

Comparing phase and electrographic flow mapping for persistent atrial fibrillation

Tamboli M.¹; Alhusseini M.¹; Moosvi N.¹; Rogers A.J.¹; Swerdlow M.¹; Leef G.¹; Rillig A.J.²; Brachmann J.³; Sauer W.⁴; Ruppersberg P.⁵; Narayan S.M.¹; Baykaner T.¹

¹Stanford University Medical Center, Stanford, United States of America

²Asklepios Clinic St. Georg, Hamburg, Germany

³Klinikum Coburg, Coburg, Germany

⁴University of Colorado Health, Denver, United States of America

⁵Ablacon, Denver, United States of America

Background: Increasing number of methods are being used to map atrial fibrillation (AF), yet the sensitivity of identifying potential localized AF sources of these novel methods are unclear.

Purpose: We report a comparison of two approaches to map AF based upon (a) electrographic flow mapping (EGF) and (b) phase mapping in a multicenter registry of patients in whom ablation terminated persistent AF.

Methods: 53 consecutive patients with persistent AF in whom ablation terminated AF in an international multicenter registry were enrolled. EGF and phase mapping were applied to the multipolar simultaneous electrograms recorded from a 64-pole basket catheter in the chamber where AF termination occurred. We analyzed if the mapping methods were able to detect localized sources at the AF termination site. We also analyzed global results of mapping AF for each method, patterns of activation of localized sources.

Results: Patients were 64.3 ± 9.4 years old and 69.8% were male. Sites at which ablation terminated AF demonstrated localized sources with phase mapping in $n = 44$ (83%) and with EGF mapping in $n = 43$ (81%) of patients. Methods were complementary, and in only $n = 2$ (3.7%) neither method identified a source (Table). At AF termination sites, phase mapping identified localized AF sources to be 100% rotational in pattern; whereas EGF identified terminations sites to be 51% rotational and 49% with focal activation ($p < 0.01$). Figure shows two similar examples in which electrographic flow and phase mapping showed concordant results at an AF termination site. Globally, EGF identified more localized sources than phase mapping (5.3 ± 2.8 vs 1.8 ± 0.5 sources per patient, $p < 0.001$), with a higher prevalence of focal (compared to rotational) activation pattern (49% vs 2%, $p < 0.01$).

Conclusions: Electrographic flow mapping is a novel AF mapping method, that can detect sites of AF termination, agreeing with phase mapping of AF. Combination of these mapping methods may provide a complimentary approach to AF, and studies should further examine differences in the activation patterns of localized sources between the two methods.

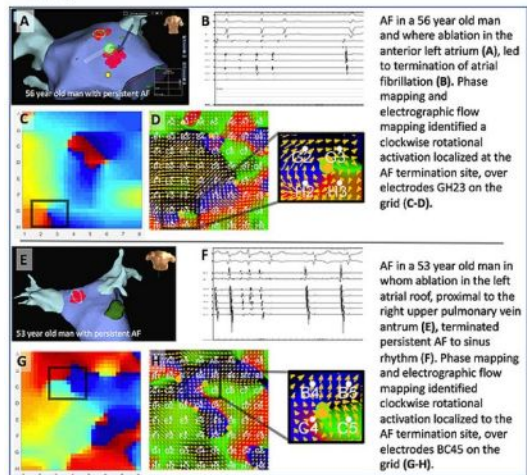
Table

		Phase Mapping			
		Rotational activation	Focal activation	No sources detected	Total
Electrographic Flow Mapping	Rotational activation	22	0	3	25
	Focal activation	14	0	4	18
	No sources detected	8	0	2	10
	Total	44	0	9	53

Determination and type of localized sources by phase and EGF mapping at sites of AF termination.

Abstract P1051 Figure.

Figure. Examples of two patients in whom electrographic flow and phase mapping showed concordant results



P1052

Atrial fibrillation predictors in patient with embolic strokes of undetermined source

Ramos Maqueda J.; Navarro Valverde C.; Garcia Medina D.; Pavon Jimenez R.; Leal Del Ojo J.; Molano Casimiro F.

University Hospital Virgen de Valme, Seville, Spain

Background and Purpose: Occult Atrial fibrillation (AF) is responsible for a significant proportion of embolic strokes of undetermined source (ESUS). Anticoagulant treatment in these patients is not superior to aspirin with regard to the prevention of recurrent stroke and is associated with a higher risk of mayor bleeding. Therefore looking for subgroups of patients who benefit most from long term monitoring to find AF is necessary. The aim of this study is to find AF predictors in patients who has suffered an ESUS.

Methods: Observational analysis including consecutive patients older than 40 years with the diagnosis of ESUS, without known AF or structural heart disease. A 24 hours holter electrocardiogram (ECG) and a transthoracic echocardiogram (TTE) was performed during their hospital admission. The patients were followed up every 6 to 12 months with either 24 hours holter or an 12 lead ECG to detect AF.

Results:

95 patients were included in this study. The mean age was 67 ± 11 years, 71.6% were male, 37.8% were hypertensive and 17.4% were diabetics. The mean CHA2DS2-VASc score was 2.4 ± 1.8 . After a mean follow-up of 11.8 (6 - 24) months AF was detected in 10 patients (11.7%). The primary analysis comparing patients who developed AF in the follow up and patients who did not, showed balanced baseline characteristics between both groups (Table 1). First degree AV block (OR= 8.7, p= 0,003), > 1000 atrial premature beats/24 h (OR= 6.5, p= 0,01), and left atrial diameter > 45mm (OR= 14.4, p= 0,04) were independent predictors of AF.

Conclusions:

Electrocardiographic parameters (First degree AV block and atrial premature beats/24 h > 1000) and echocardiographic features (Left atrial diameter > 45mm) are potentially strong and useful predictors for poststroke AF.

		No Atrial fibrillation detected in the follow up n = 85	Atrial fibrillation detected in the follow up n = 10	p Value
Baseline demographic data	Age, years	67.2 $\pm$ 11.2	72 $\pm$ 7.4	0.19
	Male	72.9 (62)	60 (6)	0.39
	Hypertension	68.2 (58)	70 (7)	0.9
	Diabetes	32.9 (28)	20 (2)	0.54
	CHA2DS2-VASc score	2.3	2.9	0.36
	Follow up	11.9 $\pm$ 5.9	10.8 $\pm$ 4.2	0.55
Electrocardiographic predictors on Baseline Holter Monitor	First degree AV block	12.9 (11)	50 (5)	0,003
	> 1000 APBs/24 h	10.5 (9)	40 (4)	0.01
Echocardiographic predictors	Left atrial diameter > 45mm	4.7 (5)	40 (4)	0,004

Subject: Poster session 2 -- Atrial Fibrillation - Stroke Prevention

P1053

Left atrial appendage morphology predicts cardio-embolic stroke due to atrial fibrillation

Adukauskaitė A.¹; Barbieri F.¹; Senoner T.¹; Plank F.¹; Knoflach M.²; Boehme CH.²; Hintringer F.¹; Mueller S.¹; Dichtl W.¹; Feuchtner G.³

¹Innsbruck University Hospital, Internal Medicine III, Innsbruck, Austria

²Innsbruck University Hospital, Neurology, Innsbruck, Austria

³Innsbruck University Hospital, Radiology, Innsbruck, Austria

Background. In atrial fibrillation (AF) population initiation of anticoagulation therapy for primary stroke prevention might be challenging, therefore we are looking for new markers in stroke risk stratification.

Purpose. Since left atrial appendage (LAA) accounts for 98% of the thrombus sources in non-valvular AF, we aimed to investigate new LAA morphological parameters and their association with cardio-embolic (CE) stroke.

Methods. Based on cardiology indications a cardiac computed tomography angiography (CTA) was performed in 158 patients (56 CE and 102 controls (age median 65 (54-73), 48,7 % females)), matched for sex and BMI, and analyzed retrospectively. LAA morphology was classified into 5 types: Cactus, Cauliflower, Chicken-wing, Windsock and the new "Seahorse", having a distinctive "Z" shape of a 1 dominant lobe with 2 obvious bends: one being a sharp LAA tip angulation of $\leq 90^\circ$ and the second one appearing in the body of the dominant lobe and having the opposite bending angle as the tip angulation. Further measurements included: LAA tip angulation ($\leq 90^\circ$, $91-110^\circ$, $> 110^\circ$), LAA lobe number, LAA ostium size (length, width, area) and angulation, left atrium wall thickness (LAWT).

Results: Predictors for CE stroke/TIA on multivariable analysis after adjusting for age and hypertension are: Windsock LAA (OR 5,18; CI: 1,52-17,64, $p = 0,008$), greater lobe number (OR 1,44; CI: 1,03-2,0, $p = 0,034$), larger LAA ostium area (OR 1,95; CI: 1,42-2,68, $p = 0,000$) and greater LAW in the middle part (OR 1,48; CI: 0,99-2,22, $p = 0,055$), hence appear as "high-risk" parameters. A greater degree of LAA tip angulation ($> 110^\circ$, $p = 0,004$), LAA ostium width ($p = 0,000$) and length ($p = 0,000$) are also associated with CE stroke. On the contrary, a newly proposed Seahorse type shows a borderline significance of being rather protective (OR 0,48; 0,19-1,26, $p = 0,048$).

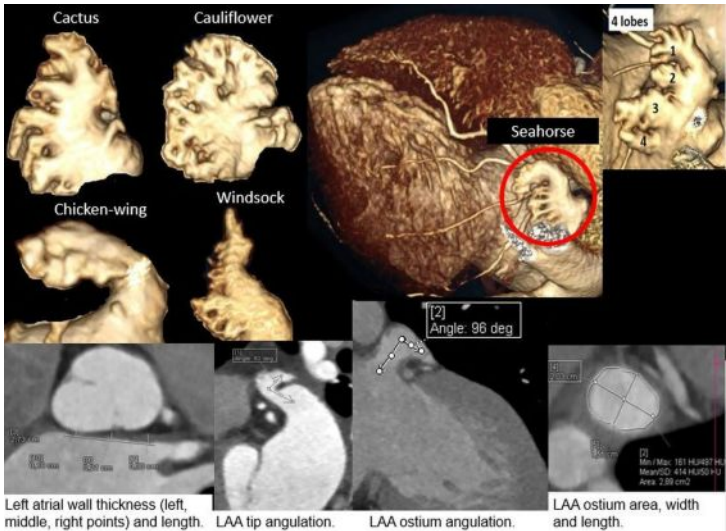
Conclusions: In case a CTA is already available, these "high-risk" LAA morphological parameters could eventually provide some additional information evaluating a thromboembolic risk in decision making, whether or not an anticoagulation therapy for primary stroke prevention in AF patients is indicated.

LAA in CE stroke versus non-stroke

Parameter	CE stroke, n = 56	Non-stroke, n = 102	p value
Windsock (%)	17 (30,4)	11 (10,8)	0,002
Seahorse (%)	9 (16,1)	31 (30,4)	0,048
Lobe number	3 (2-4)	2 (2-3)	0,020
LAA ostium area (cm ²)	4,73 (3,37-6,51)	2,90 (2,46-3,78)	0,000
LAWT in the middle part (mm)	2,3 (1,7-2,9)	1,5 (1,2-2,4)	0,002

Results given in median $\pm$ IQR. CE-cardio-embolic stroke.

Abstract P1053 Figure. CTA measurements of the LAA.



Subject: Poster session 2 -- Atrial Fibrillation - Stroke Prevention

P1054

Progression and clinical manifestations in screening-detected atrial fibrillation: a five-year follow-up of the STROKESTOP study

Liljegren F.; Svennberg E.; Frykman-Kull V.; Engdahl J.

Karolinska Institute, Department of Cardiology, Danderyd Hospital, Stockholm, Sweden

Funding Acknowledgements: None

Introduction: Atrial fibrillation (AF) is the most common cardiac arrhythmia. The progression from paroxysmal to permanent AF is usually estimated to 4-17% yearly and predictors for progression are not unified. AF is often asymptomatic, but due to data from screening and pacemaker studies silent AF has been highlighted and might account for 1/3 of all AF. The progression rate and possible symptom progression for screening-detected AF has not been studied before.

Purpose: The primary aim was to examine AF progression and symptoms after five years in patients with screening-detected AF in the STROKESTOP study. The secondary aim was to investigate potential predictors to developing permanent AF.

Methods: All participants from the STROKESTOP study with screening-detected AF were included in this prospective cohort study (n = 218). Deceased patients, patients with dementia and/or patients receiving institutional care were excluded (n = 31). Of 187 invited patients 120 (64%) participated. They were interviewed at their visit regarding symptoms, usage of OAC treatment and clinical events during follow-up and instructed to record ECG using a handheld ECG recording twice daily for two weeks.

Results: The median age of the patients was 81.0 ± 0.6 years and 56 (47%) of the participants were women. At study entry, 39/218 (18%) were diagnosed with permanent AF compared to 49/120 (41%) after five years ($p < 0.001$). Among patients with paroxysmal AF at study entry, 33/98 (34%) had progressed to permanent AF after five years. Among participants 48% reported symptoms possibly secondary to AF after five years. None of the components of CHA₂DS₂-VASc were predictive of AF progression.

Conclusions: The progression for screening-detected AF is similar to that of clinically detected AF. Many patients with screening-detected AF develop symptoms. A screening strategy can facilitate for early detection of silent AF before clinical manifestations have developed.

P1055

effectiveness and safety of reduced dose of direct oral anticoagulants in real world practice in asia

Lee K-N¹; Choi J-I¹; Boo KY.¹; Kim DY.¹; Kim YG.¹; Kim DH.²; Ahn JH.³; Baek YS.⁴; Lee DI.⁵; Roh SY.⁶; Shim JM.¹; Kim YH.¹; Kim JS.⁷

¹Korea University Anam Hospital, Seoul, Korea Republic of

²Sejong General Hospital, Bucheon, Korea Republic of

³Pusan National University Hospital, Pusan, Korea Republic of

⁴Inha University Hospital, Incheon, Korea Republic of

⁵Chungbuk National University College of Medicine, Cheongju, Korea Republic of

⁶Dongguk University Ilsan Hospital, Cardiology, GoYang, Korea Republic of

⁷Korea University Ansan Hospital, Ansan-Si, Korea Republic of

Introduction: Direct oral anticoagulants (DOACs) have demonstrated noninferiority to warfarin for ischemic stroke, systemic embolism, and bleeding in phase III trials; however, evidence of the effectiveness of reduced dosing of DOACs in Asians is insufficient, although the use of off-label dosing is prevalent in real-world practice. We assessed the effectiveness and safety of DOACs compared to warfarin after balancing covariates in patients with non-valvular atrial fibrillation (NVAF).

Methods: Consecutive patients with NVAF who were on anticoagulants were retrospectively investigated. We defined well-controlled anticoagulation with warfarin as time in therapeutic range (TTR) $\geq 60\%$. Dosing of DOACs was categorized as standard, reduced, on-label, and off-label.

Results: The study included 4325 patients; 34.8% were female, with a mean age of 66.4 years and a mean CHA2DS2-VASc score of 2.71. The patients treated with warfarin (2296, 53.1%) showed a median TTR of 27.2%. Off-label dosing was prescribed in 35.7% of patients using DOACs. During the 11.8 ± 11.5 months of mean follow-up, on-label reduced dosing and off-label reduced dosing of DOACs were associated with a higher incidence of thromboembolism compared to well-controlled warfarin (adjusted hazard ratio [HR] 7.61, 95% confidence interval [CI] [1.97–29.39] and 8.68 [1.13–66.62], respectively). Off-label reduced dosing of DOACs showed a similar incidence rate of thromboembolism but a lower incidence rate of major bleeding than in those with use of on-label standard dosing (1.26 vs. 1.25 and 0.77 vs. 1.31 100 person-years, respectively).

Conclusions There was no significant difference in thromboembolism and major bleeding between the off-label reduced and on-label standard dose of DOACs. The reduced dose of DOACs was associated with higher risk for thromboembolism compared to well-controlled warfarin in real-world practice. This study suggests that new criteria for dose adjustment of DOACs may be needed in Asian patients with AF.

Subject: Poster session 2 -- Atrial Fibrillation - Stroke Prevention

P1056

Differences in hospitalization frequencies depending on used oral anticoagulant type

Apsite K.¹; Stoldere D.²; Eglitis T.J.²; Tupahins A.²; Jubele K.¹; Pukite K.²; Pupkevica I.¹; Lejnieks A.³; Kalejs O.¹

¹Paul Stradins Clinical University Hospital, Riga, Latvia

²Riga Stradins University, Riga, Latvia

³Eastern Clinical University Hospital, Riga, Latvia

Introduction. Atrial fibrillation (AFib) is an arrhythmia type that is characterized by irregular heart rhythm that can increase the risk of stroke, heart failure and other cardiovascular complications. To reduce the risk of stroke patients are recommended to use anticoagulants (AC) - non-vitamin K antagonist oral anticoagulants (NOACs) or vitamin K antagonists (warfarin). This therapy can lead to an increased bleeding risk.

Aim. Evaluate the anticoagulant type's influence on the number and reasons for hospitalization of high-risk AFib patients in six month and one year follow-up.

Materials and methods. This quantitative, analytic prospective study was held from October 2016 till May 2018. High-risk AFib patients were surveyed about their age, gender, medical history, therapy, number and reasons for hospitalization in 6 and 12 months period. A follow-up via a telephone survey was held after 6 and 12 months. Collected data were analyzed with SPSS 22, calculating the internal consistency, and further using descriptive and inferential statistic methods (Chi-square test).

Results. A total of 376 patients, 56.4% (n = 212) women, 43.6% (n = 164) men, mean age 71.1 years (yrs) (SD 9.9) were enrolled in the research. After 6 months a total of 137 patients, 58.4% (n = 80) women, 41.6% (n = 57) men, mean age 71.45 yrs (SD 9.31) and after 12 months 52 patients, 67.3% (n = 35) women, 32.7% (n = 17) men; mean age 71.98 yrs (SD 8.6) were enrolled. On 6-month follow-up group of 15.3% (n = 21) did not use ACs (mean age 76.1 yrs (SD 10.3)), 36.5 % (n = 50; mean age 71.1 yrs (SD 8.0)) used warfarin, 48.2 % (n = 66; mean age 70.2 (SD 9.6)) - NOACs. 12-month follow-up group of 21.2%(n = 11) did not use ACs; (mean age 76 yrs (SD 3.8)), warfarin used 42.3 % (n = 22; mean age 70.9 yrs (SD 8.2)), NOACs - 36.5 % (n = 19; mean age 70.9 (SD 8.3) yrs). On 6-months follow-up 66.4%(n = 91) did not experience repeated hospitalization, 21.9%(n = 30) were hospitalized one time, 11.75%(n = 16) were hospitalized 2 or more times. Reasons for hospitalization were electrical cardioversion (n = 13), stroke (n = 8), bleeding(n = 4), other reasons (n = 22).

After 6-month follow-up warfarin users had a statistically significant higher rate (p = 0.023;95%) for hospitalization because of bleeding (n = 4) compared to other groups – non AC users (n = 0), NOAC users (n = 0), group who changed or stopped using AC (n = 0). There was no other statistically significant difference between groups regarding of number and reasons for hospitalization after one year.

Conclusion. Warfarin users experience a statistically significant higher hospitalization rate regarding bleeding compared to NOAC users and patients who did not use any anticoagulant on a 6-month follow-up (p = 0.023;95%). There were no statistically significant difference comparing hospitalizations regarding stroke, electrical cardioversions and other reasons.

P1057

Oral anticoagulants and health related quality of life: 6- and 12-month follow-up

Apsite K.¹; Eglitis T.J.²; Stoldere D.²; Tupahins A.²; Voicehovskis V.²; Ivascenko T.²; Kalejs O.¹; Lejnieks A.³

¹Paul Stradins Clinical University Hospital, Riga, Latvia

²Riga Stradins University, Riga, Latvia

³Eastern Clinical University Hospital, Riga, Latvia

Introduction. Oral anticoagulants (ACs) for high-risk patients are meant for stroke prophylaxis. These medications have to be used daily. The therapy could have a potential influence on the persons health related quality of life evaluation.

Purpose. Evaluate the ACs type"s influence on the quality of life for high-risk atrial fibrillation (AFib) patients after six and twelve months.

Materials and methods. A prospective descriptive, analytic study was conducted during time period October 2016 – September 2018. Patients were asked demographic questions, questions about their medical history, therapy and the quality of life from short form SF-36. A follow-up was made during telephone interview after a 6- and 12-month period. Collected data were analyzed with SPSS 22, calculating the internal consistency, and further using descriptive and inferential statistic methods (Kruskal-Wallis test, Wilcoxon signed-rank test, Friedman"s two-way ANOVA).

Results. Total of 376 high-risk AFib patients, 56.4% (n = 212) women, 43.6%(n = 164) men; mean age 71.10 years (SD 9.9) After 6 months a follow-up was made with total of 142 patients and after 12 months - with 59 patients. The base group - 28.7% (n = 108) did not use ACs, 34.6% (n = 130) used warfarin (W), 36.7% (n = 138) – NOACs. In the base group a statistically significant difference (p = 0.001;95%CI) was found in physical functioning section comparing W (52.69%) and NOACs (70.50%) users; energy/fatigue levels (p = 0.017;95CI; W – 46.23%; NOACs – 54.2%), emotional well-being (p = 0.017;95CI; W-70.87%, NOACs – 76.34%). On 12 month follow-up a statistically significant difference (p = 0.042;95%CI) was found in energy/fatigue levels (W-60.45%, non-AC users – 40.91%). On the 6 month (6m) follow-up warfarin users had a statistically significant improvement on given evaluation on role limitations due to physical health (p = 0.0001;95%; base – 40%, 6m -85%); in role limitations due to emotional problems (p = 0.003;95%; base – 52.5%, 6m – 85%); emotional well-being (p = 0.004;95%; base – 70.8%, 6m – 78.8%); social functioning section (p = 0.003;95%, base – 76.2%, 6m – 93.1%); general health section (p = 0.028;95%; base – 28.75%, 6m – 41.3%). NOACs users on 6-month follow-up had a statistically significant difference (p = 0.016;95%) in role limitations due to physical health (base – 54%, 6m – 76%); role limitations due to emotional problems (p = 0.029;95%; base - 70%, 6m – 86%), social functioning (p = 0.001;95%, base – 81%, 6m – 93.5%).

Conclusion. At the base level NOAC users evaluated statistically significantly better physical functioning, energy/fatigue levels, emotional well-being scores compared to warfarin users. Warfarin usage on 12-month follow-up correlated with better energy-fatigue levels compared to patients who did not use any anticoagulants (p = 0.042;95%CI). Half a year after administrations out of hospital the health-related quality of life had improved both for warfarin and NOAC users.

Subject: Poster session 2 -- Atrial Fibrillation - Stroke Prevention

P1058

Preference of patients regarding the characteristics of new oral anticoagulants

Sturmer M.¹; Kus T.¹; Becker G.¹; Vinet A.²; Nadeau R.¹

¹Sacred Heart Hospital of Montreal, Division of Cardiology, Montreal, Canada

²University of Montreal, Montreal, Canada

Funding Acknowledgements: Boehringer, Pfizer/BMS, Bayer

NOACs are now largely used for stroke prevention in non valvular atrial fibrillation (AF). However they have both desirable and undesirable characteristics.

Purpose: To assess the preferences of patients with regard to some attributes of the different NOACs.

Methods: Four pharmaceutical companies were asked to provide three characteristics of their products that they deemed important. These were modelled as a questionnaire consisting of the twelve items (proposed characteristics). One hundred adults (65% males, mean age 66.3 ± 10.2 y.o.) with non valvular AF and taking a NOAC were invited to participate. Each characteristic was classified from not important at all to extremely important by each patient. The items were later grouped in 4 categories: 1) efficacy; 2) risks; 3) modes of administration; 4) amount of published research on the drug.

Results: Dabigatran etixilate was taken by 25%, Rivaroxaban by 51%, Apixaban by 23% and Edoxaban by 1% of the study population.

The modes of administration (daily single dosage, intake without prior meal) were considered the least important, in contrast to the questions related to efficacy (decreased cardiovascular mortality, decreased stroke risk compared to warfarin) classified as the most important (Friedman test, $p < 0.0001$). The availability of an antidote was considered very important by 53% of the subjects. The result regarding "ACO which was the most studied" reflects patients' concern for both efficacy and safety.

Conclusion: Our subjects were more concerned with the efficacy of their anticoagulant than with the characteristics of administration or availability of an antidote.

Subject: Poster session 2 -- Atrial Fibrillation - Stroke Prevention

P1059

Atrial fibrillation and anticoagulation in hypertrophic cardiomyopathy

Park YJ.; Lee SS.; Gwag HB.; Park KM.; On YK.; Kim JS.; Park SJ.

Samsung Medical Center, Seoul, Korea Republic of

Objectives

Chronic anticoagulation is recommended in patients with hypertrophic cardiomyopathy (HCM) and atrial fibrillation (AF). Direct oral anticoagulants (NOACs) are an alternative to VKAs but there are limited data to support their use in HCM. We sought to describe the pattern of use, thromboembolic events, bleeding in patients with HCM and AF treated with NOACs.

METHODS: Data from patients treated with NOACs (n = 158) and VKA (n = 103) were retrospectively collected. Annual rates of embolic events, serious bleeding and death were analysed and compared.

RESULTS: After median follow-up of 23.1 months, thromboembolic events (TIA/stroke and peripheral embolism) occurred in 6% of patients on oral anticoagulation. Major/clinically relevant bleeding occurred in 2.8% and the global mortality rate was 11.2%. Thromboembolic event rate was 0.89 per 100patient-years in the NOAC group vs. 1.24 in the VKA group [subhazard ratio (SHR) 0.52;95%CI:0.14-2.45; p = 0.27]. Major/clinically relevant bleeding occurred in 0.52 per 100person-years in the NOAC group vs. 0.70 in the VKA group (SHR 1.28;95%CI 0.24-6.30; p = 0.56).

CONCLUSIONS: HCM patients with AF on NOACs showed similar embolic and bleeding rates to those on VKA.

Subject: Poster session 2 -- Atrial Fibrillation - Stroke Prevention

P1060

The effectiveness and safety of NOAC in patients with non-valvular atrial fibrillation compared to warfarin in Korean population

Kim DH.¹; Choi JI.²; Park SW.¹; Lee DI.³; Kim YH.²

¹Sejong General Hospital, Bucheon, Korea Republic of

²Korea University Anam Hospital, Cardiology, arrhythmia center, Seoul, Korea Republic of

³Chungbuk National University Hospital, Cardiology department, Cheong-ju, Korea Republic of

Funding Acknowledgements: No Funding

Introduction: Real world evidence of NOAC showed consistent effectiveness and safety with previous randomized controlled trials. However, the effectiveness and safety of NOACs in Korea population remains little known.

Objective: We investigated stroke and bleeding risk of NOACs compared to warfarin.

Methods: Using the National Health Insurance Service database, we analyzed as a nationwide cohort of the entire Korean population from 2008 to 2015. Non-valvular AF was identified by using diagnostic codes excluding mechanical heart valves or mitral stenosis. We compared stroke and bleeding risk of NOAC compared to warfarin.

Results: Total 482819 patients were diagnosed with non-valvular AF. Patients who took apixaban, rivaroxaban, dabigatran, and warfarin were 10796, 21239, 16198 and 48696, respectively. Baseline characteristics were similar among the NOACs and warfarin group. Compared to patients with warfarin use, hazard ratio (HR) of stroke risk was 0.673 ($p = 0.644$) in patients with apixaban, 0.510 ($p < 0.001$) in patients with rivaroxaban, and 0.745 ($p = 0.251$) in patients with dabigatran. Compared to patients with warfarin use, HR of bleeding risk was 0.841 ($p = 0.866$) in patients with apixaban, 1.018 ($p < 0.001$) in patients with rivaroxaban, and 0.542 ($p < 0.001$) in patients with dabigatran.

Conclusions: The Data of Korean patients with non-valvular AF showed that, compared to patients with warfarin use, rivaroxaban was highly effective for stroke prevention, whereas bleeding event was significantly lower in patients on dabigatran and higher in patients with rivaroxaban.

P1061

Non-vitamin K antagonist oral anticoagulants in Asian population with supranormal renal function

Lee SR.¹; Choi EK.²; Han KD.³; Jung JH.³; Oh S.²; Lip GYH⁴

¹Soon Chun Hyang University Hospital Seoul, Department of Internal medicine, Seoul, Korea Republic of

²Seoul National University Hospital, Department of Internal Medicine, Division of Cardiology, Seoul, Korea Republic of

³The Catholic University of Korea, Seoul, Korea Republic of

⁴Aalborg University, Aalborg Thrombosis Research Unit, Department of Clinical Medicine, Aalborg, Denmark

Background: In clinical trials, the efficacy of oral factor Xa inhibitors for stroke prevention was reduced in patients with non-valvular atrial fibrillation (AF) with a creatinine clearance (CrCl) >95 mL/min compared with that of warfarin.

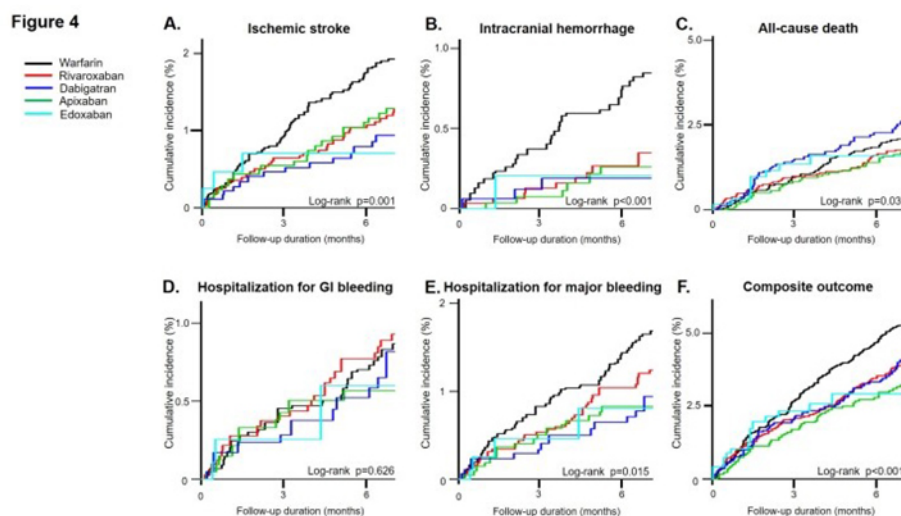
Objectives: We aimed to evaluate the effectiveness, safety, and net clinical benefit of non-vitamin K antagonist oral anticoagulants (NOACs) compared with warfarin in Asian patients with AF and supranormal renal function.

Methods: Using the National Health Insurance Service database from Jan 2014 to Dec 2016, we included patients with non-valvular AF with CrCl >80 mL/min. Among these, patients treated with rivaroxaban (n = 6,297), dabigatran (n = 4,241), apixaban (n = 3,395), edoxaban (n = 1,187), and warfarin (n = 9,884) were analyzed. The propensity score weighting method was used to balance covariates across study groups. Hazard ratios (HRs) for ischemic stroke, intracranial hemorrhage, gastrointestinal bleeding, major bleeding, all-cause death, and the composite outcome were analyzed using Cox regression analysis with warfarin as the reference.

Results: Baseline characteristics were well balanced among all groups (mean age, 66 ± 11 years; 63% were men; mean CHA2DS2-VASc score, 3.0 ± 1.8). Forty-five percent of the patients had CrCl >95 mL/min. Pooled NOACs yielded lower risks of ischemic stroke (HR, 0.507; 95% confidence interval (CI), 0.430-0.596) and the composite outcome (HR, 0.638; 95% CI, 0.579-0.701) than warfarin in patients with CrCl >80 mL/min. These benefits were consistent in those with CrCl >95 mL/min. All 4 NOACs reduced the risks of ischemic stroke and the composite outcome in both patients with CrCl >80 mL/min and >95 mL/min (Figure).

Conclusions: The NOACs showed better effectiveness and safety than warfarin in the patients with AF and supranormal renal function, which was consistent across all 4 NOACs and in those with CrCl >95 mL/min.

Abstract P1061 Figure. Kaplan-Meier of W vs. 4 NOACs



Subject: Poster session 2 -- Atrial Fibrillation - Stroke Prevention

P1062

Left atrial appendage closure in patients with atrial fibrillation and percutaneous coronary intervention: results of a pilot, first-in-man randomized study

Romanov A.¹; Losik D.¹; Grazhdankin I.²; Shabanov V.¹; Ponomarev D.²; Stenin I.¹; Mikheenko I.¹; Elesin D.¹; Zhizhov K.¹; Baystrukov V.²; Kretov E.²; Bondar N.³; Pokushalov E.¹; Boersma L.⁴; Steinberg JS.⁵

¹E. Meshalkin National Medical Research Center, Arrhythmia Department and Electrophysiology Laboratory, Novosibirsk, Russian Federation

²E. Meshalkin National Medical Research Center, Novosibirsk, Russian Federation

³Federal Center of Cardiovascular Surgery, Khabarovsk, Russian Federation

⁴St Antonius Hospital, Department of Cardiology, Amsterdam, Netherlands

⁵Heart Research Follow-up Program, University of Rochester School of Medicine & Dentistry, Rochester, United States of America

Funding Acknowledgements: This work was supported by grant from Boston Scientific

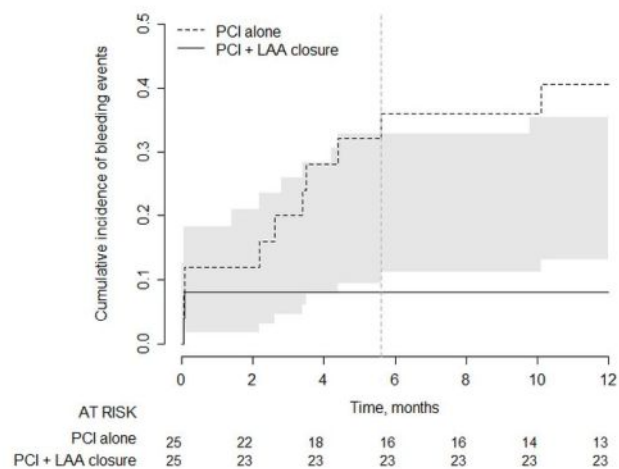
Background: Atrial fibrillation (AF) is detected in up to 30% of patients with acute coronary syndrome (ACS) as concomitant disease. After percutaneous coronary intervention (PCI) such patients are required to take dual antiplatelet therapy with a P2Y₁₂ inhibitor plus aspirin (ASA) to prevent stent thrombosis, as well as oral anticoagulation (OAC) to minimize risk of thromboembolic events due to AF. Left atrial appendage occluder (LAAO) device implantation showed effective stroke prevention in AF patients with high-risk of thromboembolic events and contraindications for OAC. The purpose of this study was to assess the safety and efficacy of WATCHMAN LAAO over Warfarin therapy (W) in AF patients after PCI with respect to bleeding and clinical outcomes.

Methods: 50 patients (mean age 69.4 ± 6.9, 21 female, mean CHA₂DS₂-VASC score 4.1 ± 0.9 and HASBLED score 3.3 ± 0.5) with unstable angina (n = 38), non-ST-elevation ACS (n = 12) and history of AF were randomized after successful PCI to either conventional medical therapy (OMT) or WATCHMAN LAAO. All pts used triple therapy with W + clopidogrel (CLOP)+ASA during 45 days after PCI, and W + CLOP up to 6 months after PCI. After 6 mo, pts in the conventional group switched to W alone, while pts in the LAAO group switched to ASA alone. The primary study safety end point was occurrence of bleeding events according to TIMI/GUSTO criteria, while the primary efficacy endpoint was thromboembolic event rate (stroke, TIA, systemic embolism). Secondary end points included periprocedural complications, stent thrombosis, and clinical outcomes. Patients were followed at 45 days, 3, 6 and 12 months after randomization.

Results: The PCI and LAAO procedures were successfully performed simultaneously without any bleeding or ischemic complications in either group. At 12 months post-procedure, there were 2 (8%) bleeding events in the LAAO group versus 12 (48%) in the conventional group (HR 0.13, 95% CI 0.03 – 0.60, p = 0.008). The two curves depart from the shaded area at 5.8 months, implying a statistically significant between-group difference, further supported by log-rank test (p = 0.002; Figure). During the follow-up period, 2 strokes occurred in the conventional group versus 1 stroke in LAAO group (p > 0.99 between groups), while 2 patients developed MI in the conventional group (p = 0.48 vs LAAO group). Cardiovascular hospitalization occurred in 5 (20%) versus 13 (52%) patients in the LAAO and conventional groups, respectively (p = 0.038). Two patients died in the conventional group with no death in the LAAO group (p > 0.48 between groups).

Conclusion WATCHMAN LAAO in patients with unstable angina and AF undergoing PCI seems safe and has substantially lower number of bleeding events and hospitalization due to cardiovascular reasons over standard medical therapy with no difference in stroke and death risk, warranting further study in a larger cohort. Clinical Trials Registration: NCT02492230

Abstract P1062 Figure



Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1063

Validation of the mb-later score for predicting atrial fibrillation occurrence after catheter-ablation of typical atrial flutter

Mujovic N.¹; Marinkovic M.¹; Vucicevic V.²; Lip GYH³; Potpara T.¹

¹Clinic of Cardiology, Clinical Center of Serbia, University of Belgrade, Belgrade, Serbia

²Clinical center of Serbia, Center for Anesthesiology and Reanimatology, Belgrade, Serbia

³Birmingham City Hospital, Cardiology Department, Birmingham, United Kingdom

Background: Atrial fibrillation (AF) and typical atrial flutter (AFL) share common risk factors and AF frequently occurs after catheter-ablation (CA) of typical atrial flutter (AFL). The MB-LATER score (Male gender [1 point], Bundle branch block [1], Left Atrial [LA] diameter ≥ 47 mm [1], Type of AF before CA – paroxysmal [0], persistent [1] or long-standing persistent [2] and Early Recurrence of AF during the 3-month blanking period after CA-AF [1]) was originally derived and validated for predicting AF recurrence after CA-AF.

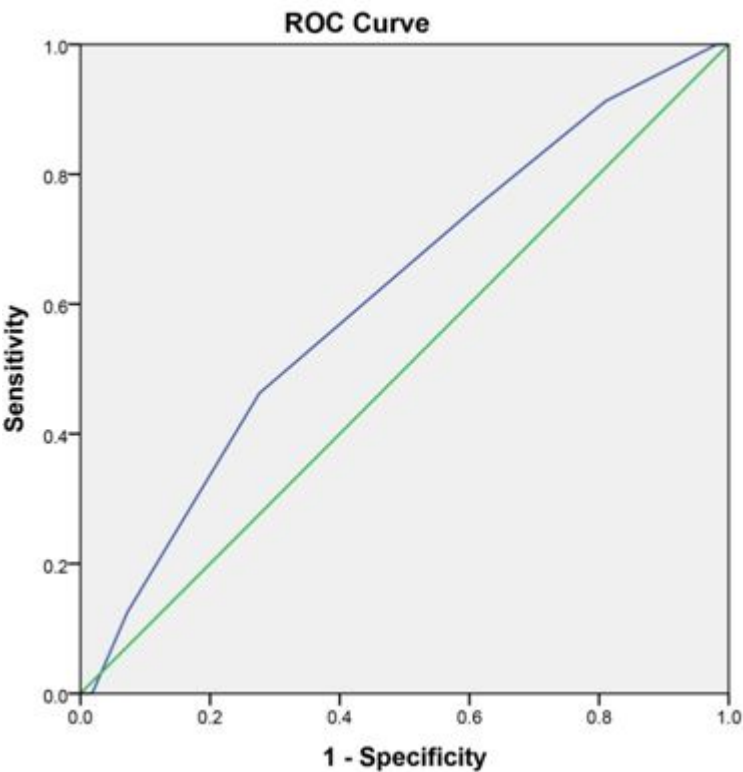
Objective: We validated the MB-LATER score for predicting AF occurrence post CA of typical AFL.

Methods: We enrolled consecutive patients who underwent radiofrequency CA for typical AFL in our hospital between 2007 and 2017. The end-point of CA was a bidirectional cavo-tricuspid isthmus block. Any symptomatic or asymptomatic AF or atrial tachycardia episode for >30 sec, recorded at ECG or during Holter-monitoring after CA was considered the AF occurrence. According to specific clinical setting, the MB-LATER score was modified so that the original component "early recurrence of AF" was replaced with the "presence of AF prior to CA-AFL".

Results: Of 301 patients with AFL (mean age 60 ± 11 years, male 77%), hypertension, congestive heart failure and coronary disease were diagnosed in 65%, 14% and 23%, respectively; of these, paroxysmal AFL was found in 99 (33%), while 126 (42%) also had AF (paroxysmal [68%] or persistent [32%]) documented before CA-AFL. Typical AFL ablation was successfully completed in 277 patients (92%). During a mean follow-up of 26 ± 13 months AF occurrence was documented in 80 patients (26%). Estimated AF-free survival was 75% (95%CI: 70-80%) at 12 months and 63% (95%CI: 55-72%) at 36 months post-ablation. The mean baseline MB-LATER score was 2.9 ± 1.2 . The MB-LATER score showed modest but significant predicting ability for AF occurrence after AFL ablation (c-statistic: 0.61 [95%CI: 0.54-0.69], $p = 0.009$). The MB-LATER score cut-off value of >3 showed the best predictive ability for the AF occurrence post-CA. Freedom from AF was significantly better in patients with a MB-LATER score of <3 than in those with a score of ≥ 3 (log-rank $p = 0.002$).

Conclusion: Although initially proposed for predicting AF after AF-CA, the simple MB-LATER score also shows a significant predictive ability for AF occurrence post-CA of typical AFL.

Abstract P1063 Figure. ROC curve for predicting AF



Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1064**Cardiac resynchronization therapy in diabetic patients improves survival in the group of patients with atrial fibrillation in the first twelve years. Long term follow-up**Ramirez Rodriguez R.¹; Ramirez Rodriguez AM.²¹Doctor Negrin's Hospital, Las Palmas G. C, Spain²Insular Hospital, Las Palmas G. C, Spain

Background: There are not many studies on diabetic patients undergoing cardiac resynchronization therapy that analyze long-term survival or behaviour in patients with atrial fibrillation.

Purpose: To compare the characteristics of diabetic versus non-diabetic patients undergoing CRT. To study the clinical characteristics, echocardiographic parameters and QRS duration in both groups. To analyze long-term survival by stratifying atrial fibrillation

Methods: Cohort study of 355 patients undergoing CRT with a mean follow-up of 9.92 ± 4.24 years. There were 126 non-diabetic patients (35.5%). Mean age of follow-up 66.59 ± 10.23 .

Results: The mean age of diabetic vs non-diabetic was similar (68.6 ± 10.2 vs 65.5 ± 10.1 , $p = 0.005$). There were 93 men (73.8%) in the diabetic group vs 166 (72.5%) in non-diabetic group, $p = 0.789$. Dilated cardiomyopathy was predominant in both groups, followed by ischemic and valvular respectively. Having a resynchronization therapy pacemaker was more frequent in both groups but more so in diabetics (65.1% in diabetics vs 54.6% in non-diabetics, $p = 0.055$). Atrial fibrillation was very similar in both groups (34.9% in diabetics vs 33.8% in non-diabetics). There was more income in the group of diabetics 56 (44.4%) versus non-diabetics 87 (38.7%), $p = 0.291$. Heart failure (HF) was the main reason for admission, followed by infection of the bag. There were more deaths in the diabetes group 61 (48.4%) vs 85 (37.8%) significantly due to HF. Baseline echocardiographic parameters were worse in the group of diabetics but both groups improved significantly after cardiac resynchronization therapy as well as QRS duration and functional class. Diabetic patients with atrial fibrillation undergoing CRT present a greater survival, even more than non-diabetics- It is long-term at around 12 years whereas diabetics have worse survival (Log Rank $p = 0.045$).

Conclusions: -Both groups significantly improve echocardiographic findings, QRS duration and functional class after CRT.

-The group of diabetics has worse echocardiographic parameters before cardiac resynchronization therapy.

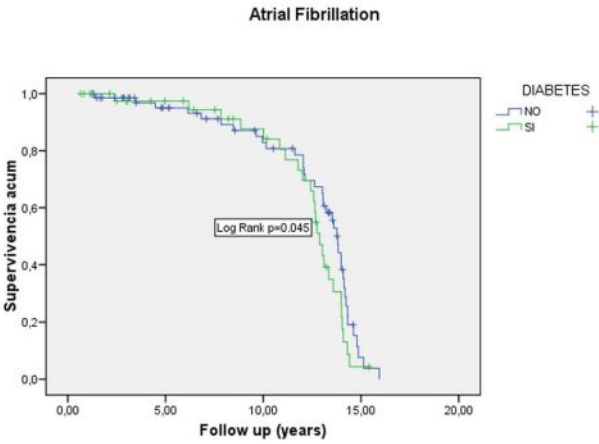
-Diabetic patients undergoing CRT present more readmissions.

-Resynchronization therapy in diabetic patients improves survival in the group of atrial fibrillation. It is very long-term when they have a lower survival rate compared to non-diabetics.

Long-term follow-up diabetics vs non-diabetics in patients with CRT			
	Diabéticos n = 126	No diabéticos n = 229	p
Readmissions	56(44.4%)	87(38.7%)	0,291
-HF	27(47.4%)	47(52.8%)	
Death	61(48.4%)	85(37.8%)	0.052
-HF	24(38.7%)	34(41%)	
-Cancer	4(6.5%)	10(12%)	
-Infections	11(17.7%)	8(9.6%)	

HF: Heart failure

Abstract P1064 Figure. Survival Diabetes, AF and CRT



Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1065

MOODS-12312: a novel risk score to identify patients with atrial fibrillation and significant sleep-disordered breathingKadhim K.¹; Elliott AD.¹; Middeldorp ME.¹; Hendriks J.¹; Gallagher C.¹; Thiagarajah A.¹; Munawar DA.¹; Khokhar KB.¹; Emami M.¹; Mahajan R.¹; Lau DH.¹; Mcevoy RD.²; Sanders P.¹; Linz D.¹¹University of Adelaide, Centre for Heart Rhythm Disorders, Adelaide, Australia²Flinders Medical Centre and Flinders University, Adelaide Institute for Sleep Health (AISH), Adelaide, Australia

Background: Sleep-disordered breathing (SDB) is an important risk factor for developing atrial fibrillation (AF), and treatment of concomitant SDB can improve AF rhythm outcomes. Diagnosis of SDB requires sleep studies which can pose a significant time and resource burden. We sought to develop a prediction score based on clinical characteristics that can help identify AF patients who require further assessment for SDB.

Methods: Prospectively-collected data for 442 consecutive patients treated for AF from 2009 to 2017 were analysed. All patients were considered candidates for rhythm-control and therefore referred for sleep studies. The diagnosis of SDB was confirmed using in-lab polysomnography and classified using the apnoea-hypopnoea-index (AHI), with cut-offs of ≥ 15 /hr and ≥ 30 /hr indicating moderate-to-severe and severe SDB respectively. Patients treated up to 2015 formed the derivation cohort (n = 311) and the remainder (n = 113) formed the validation cohort. Multivariate logistic regression analysis was used to identify clinical variables predictive of moderate-to-severe SDB. A risk score model was developed based on regression coefficients and tested using receiver-operating-characteristics analyses on the validation cohort.

Results: Overall, mean age was 60 ± 11 years, mean body mass index (BMI) was 30 ± 5 kg/m² and 69% were men. The prevalence of moderate-to-severe SDB was 33.7%. There were no significant differences in baseline characteristics between the derivation and validation cohorts. Male gender (score = 1), overweight (BMI: 25-29 kg/m², score = 2), obesity (BMI ≥ 30 kg/m², score = 3), diabetes (score = 1), and stroke (score = 2) were significantly independently predictive of moderate-to-severe SDB and formulated the score. The score performed well to predict moderate-to-severe SDB with a C-statistic of 0.73 (95%CI: 0.67-0.79, P < 0.001) in the derivation cohort, and 0.67 (95%CI: 0.57-0.77, P < 0.001) in the validation cohort. As a rule-out test, a score of ≤ 3 had a negative predictive value of 77% for moderate-to-severe SDB (91% for severe SDB). A score of ≥ 4 had an intermediate positive likelihood ratio (PLR) of 2 for moderate-to-severe SDB (2.2 for severe SDB), while a score of ≥ 5 had a high PLR of 6.5 and 6.8 for moderate-to-severe SDB and severe SDB respectively.

Conclusion: A novel risk score comprising clinical characteristics can identify patients with AF likely to benefit from further assessment for SDB. Application of this model may aid optimise resource utilisation and facilitate timely patient care.

Abstract P1065 Figure. Sensitivity and specificity per MOODS

MOODS Score	Moderate-to-severe SDB		Severe SDB	
	Sensitivity (%)	Specificity (%)	Sensitivity (%)	Specificity (%)
1	97.8	4.6	100	4.7
2	93.3	9.2	96	9.3
3	86.7	21.8	88	20.6
4	60	70.1	72	67.3
5	22.2	96.6	32	95.3
6	0	98.9	0	99.1

P1066

Disparity between subjective and objective sleep-related measures in patients with concomitant sleep-disordered breathing and atrial fibrillation

Kadhim K.¹; Elliott AD.¹; Middeldorp M.¹; Hendriks J.¹; Mahajan R.¹; Mcevoy RD.²; Lau DH.¹; Sanders P.¹; Linz D.¹

¹University of Adelaide, Centre for Heart Rhythm Disorders, Adelaide, Australia

²Flinders Medical Centre and Flinders University, Adelaide Institute for Sleep Health (AISH), Adelaide, Australia

Background: Sleep-disordered breathing (SDB) is common in patients with atrial fibrillation (AF) and may be associated with daytime sleepiness. Increased daytime sleepiness can further exacerbate AF symptoms and have a potential negative impact on quality of life for patients. We sought to assess the correlation between self-reported daytime sleepiness and objective sleep-related measures of sleep-disordered-breathing in patients with AF.

Methods: Prospectively-collected data for 442 consecutive AF patients who were considered candidates for rhythm-control and referred for polysomnography were analysed. Subjective effects of SDB on daytime sleepiness was quantified using the Epworth Sleepiness Scale (ESS, scale 0-24). Polysomnography-derived parameters included apnoea hypopnoea index (AHI, /hr), total sleep duration (minutes), sleep efficiency (time asleep/time spent in bed, %) and arousal index (arousals/hour) were analysed. SDB severity was classified according to AHI as no SDB (AHI < 5), mild SDB (AHI 5-14), and moderate-to-severe SDB (AHI ≥ 15).

Results: Two-thirds (66%) of the population had SDB (AHI ≥ 5/hr) of whom 56% had paroxysmal AF. Mean age for SDB patients was 62 ± 10 years, mean body mass index was 31.2 ± 5.3 kg/m² and 74% were men. Mean ESS was 6 ± 4 and did not differ as the severity of SDB increased (p = 0.2). There was a poor correlation between ESS and AHI (r = 0.135, p = 0.012). Patients with moderate-to-severe SDB (n = 149, 51%) slept less than those with mild SDB (n = 143, 49%), with total sleep durations of 286 ± 90.5 minutes and 322 ± 74 minutes respectively, p < 0.001. These patients also slept less efficiently (sleep efficiency: 68 ± 16% vs 73 ± 15%, p = 0.008), and with higher arousals per hour (arousal index 16.1 ± 6.6/hr vs 30.2 ± 17.6, p < 0.001). However, there was no difference in the reported daytime sleepiness levels (ESS of 5 ± 4 for mild vs 6 ± 4 for moderate-to-severe SDB, p = 0.2). The proportion of patients with excessive daytime sleepiness (ESS > 10) did not differ significantly between the groups (9.1% for mild vs 14.8% for moderate-to-severe SDB, p = 0.14).

Conclusions: Self-reported daytime sleepiness correlated poorly with AHI, the standard objective measure of SDB severity. Additionally, patients with more severe SDB had shorter sleeping durations, less efficient sleep and more arousals per hour, yet report no difference in daytime sleepiness. Mechanisms that counteract daytime sleepiness in AF patients that can explain this disparity are unclear and require further studies.

P1067

Levels of anxiety in patients with persistent atrial fibrillation undergoing elective cardioversion: does the type of anticoagulation matter?

Garcia-Izquierdo Jaen E.¹; Fajardo Simon LM.²; Aguilera Agudo C.²; Soria Gomez T.²; Sanchez Pablo R.²; Jimenez Sanchez D.¹; Veloza D.¹; Sanchez Garcia M.¹; Toquero Ramos J.¹; Castro Urda V.¹; Escudier Villa JM.²; Ortega Marcos J.²; Silva Melchor L.²; Fernandez Lozano I.¹

¹University Hospital Puerta de Hierro Majadahonda, Arrhythmia and Electrophysiology Unit, Madrid, Spain

²University Hospital Puerta de Hierro Majadahonda, Madrid, Spain

Introduction: Anxiety is a risk factor for a range of cardiovascular diseases. Preliminary results from our research group have shown higher levels of anxiety among patients with persistent atrial fibrillation (AF) and early recurrence after elective electrical cardioversion (EC). In addition, anticoagulation with DOACs has been proven to be safe and convenient in this setting, with shorter time to EC (compared to VKAs).

Purpose: To determine whether the use of DOACs, due to its inherent convenience for the patient, can result in lower levels of anxiety prior to EC compared to VKAs.

Methods: We included 107 patients with persistent AF undergoing elective EC. Anxiety was measured at the time of EC with the State-Trait Anxiety Inventory (STAI) consisting of 40 self-report items allocated to 2 different subscales: state and trait. Anxiety scores were compared between patients with NOACs and VKAs.

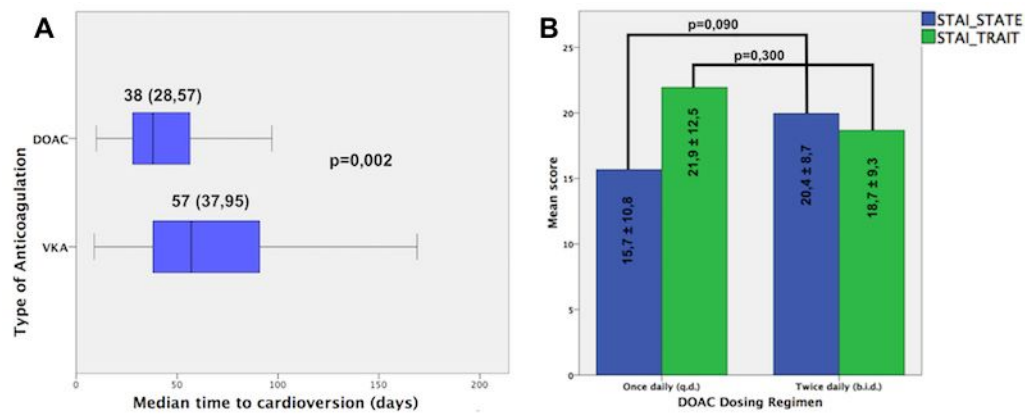
Results: EC was successful in 93% of the cases. 55 patients (51%) were anticoagulated with VKAs and 52 patients (49%) were anticoagulated with DOACs. DOACs were associated with significantly shorter time to EC compared to VKAs (see figure A). However, anxiety scores were similar between these two groups. Regarding the dosing regimen among DOACs, we found a trend towards lower levels of state anxiety in patients on q.d. DOACs (Edoxaban and Rivaroxaban; n = 22) compared to b.i.d. DOACs (Dabigatran and Apixaban; n = 30) (see figure B).

Conclusion: Despite a shorter time to cardioversion with DOACs, patients' anxiety is not different to those on VKAs. Among DOACs, "once daily" regimens tend to be associated with lower levels of state anxiety compared to "twice daily" regimens.

Main characteristics

	Total (n = 107)	VKA (n = 55)	DOAC (n = 52)	p
Age	66,5 ± 9,0	66,4 ± 8,4	66,7 ± 9,7	0,859
Male	81 (76%)	41 (75%)	40 (77%)	0,774
LVEF (%)	55,8 ± 13,6	56,9 ± 13,4	54,6 ± 13,8	0,382
AF duration > 1 year or unknown	58 (54%)	29 (53%)	29 (56%)	0,752
LA Volume (ml/m ²)	43,8 ± 13,1	43,0 ± 13,3	44,7 ± 13,0	0,526
CHADS-VASc	2,5 ± 1,6	2,6 ± 1,7	2,5 ± 1,5	0,606
Median time to EC in days	50 (32, 69)	57 (37,95)	38 (28,57)	0,002
State Anxiety Score	17,1 ± 10,8	16,0 ± 11,6	18,4 ± 9,8	0,246
Trait Anxiety Score	20 ± 10,3	19,8 ± 9,8	20,1 ± 10,8	0,874

DOAC: Direct oral anticoagulants; VKA: Vitamin K antagonists; LVEF: Left ventricular ejection fraction
Abstract P1067 Figure. Time to EC; Anxiety and DOAC regimens



Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1068

Atrial appendage mechanics and superior vena cava area assessed by transoesophageal echocardiography in prediction of atrial fibrillation recurrence after pulmonary vein isolation

Zeljko I.; Pavlovic N.; Kordic K.; Kos N.; Benko I.; Golubic K.; Dula K.; Delic Brkljacic D.; Radeljic V.; Manola S.; Bulj N.

University Hospital Sestre Milosrdnice, Cardiology, Zagreb, Croatia

Funding Acknowledgements: none

OnBehalf: N/A

Pulmonary vein isolation (PVI) by catheter ablation is well established procedure for the treatment of paroxysmal atrial fibrillation (PAF). However, atrial fibrillation recurrence (AFR) is fairly common after the index PVI. Although there are numerous studies reflecting the AFR predictive factors, including different echocardiographic parameters, data on appendages' mechanics and superior vena cava's area is rather scarce. Hence, this study aimed to assess left (LAA) and right atrial appendage (RAA) mechanics by transoesophageal echocardiography (TEE) and to explore its value in prediction of AFR after PVI.

We conducted a single-centre, non-randomized, prospective cohort study. Consecutive patients undergoing PVI were included in a prospective registry. Patients with paroxysmal AF enrolled in the prospective Southeastern-Central Europe Pulmonary Vein Isolation (SECE-PVI) registry from our centre, in the period between January 2016 and June 2017, in whom the index PVI was performed using a point-by-point radiofrequency or 2nd-generation cryoballoon ablation were analysed. Transthoracic echocardiogram (TTE) and 3D TEE were obtained prior to the PVI procedure, and analysed offline in a standardized manner, including LAA strain and strain rate, LAA tissue Doppler imaging (TDI) velocity, LAA peak emptying velocity, LAA surface area, SVC surface area, RAA mean emptying velocity. The primary end point was freedom from any documented recurrence of atrial arrhythmia lasting > 30 seconds.

A total of 55 patients with PAF, in whom TTE and 3D TEE was done prior to index PVI, were included (median age 59 years; IQR 52-63; female 30%; BMI 27.9 ± 4.3 kg/m², LVEF 60%, LA volume index 34 mL/m²). After a median follow up of 12 (IQR 10-12) months, 15 patients had AFR (R-group) and 40 patients had no recurrence (NR-group). Compared to NR-group, patients in R-group had lower LAA TDI velocity (9.53 ± 1.54 vs. 10.56 ± 1.68 cm/s, $p = 0.014$) and LAA surface area (2.55 ± 0.62 vs. 2.84 ± 0.66 cm², $p = 0.045$). RAA TDI velocity ($p = 0.292$) and SVC surface area ($p = 0.361$ cm²), as well as the remaining LAA mechanic's parameters, were not different between the study groups.

In conclusion, TEE parameters of RAA and SVC did not differ between patients with and without AFR. However, LAA TDI velocity and LAA surface area could be useful in follow-up of PAF after index PVI in clinical settings. To our knowledge, this is the first study assessing RAA' mechanics and SVC surface area in predicting AFR after PVI.

P1069

Effect of pulmonary veins catheter ablation over kidney function in patients with atrial fibrillation

Macias Ruiz R.¹; Jimenez-Jaimez J.¹; Alvarez Lopez M.¹; Molina Lerma M.¹; Sanchez Millan P.¹; Cabrera Ramos M.¹; Ramos Maqueda J.¹; Osuna Ortega A.²; Tercedor Sanchez L.¹

¹Hospital Universitario Virgen de las Nieves, Unidad de Arritmias, Servicio de Cardiología, Granada, Spain

²Hospital Universitario Virgen de las Nieves, Servicio de Nefrología, Granada, Spain

Background: Several studies have linked the presence of atrial fibrillation (AF) with a reduced estimated glomerular filtration rate (eGFR). However, the causal relationship between AF and deterioration of renal function has not been well established.

Purpose: The aim of our study is to evaluate the effect of AF rhythm control by pulmonary vein ablation (VVPP) on renal function.

Methods: Prospective cohort of consecutive patients with AF referred to our center for VVPP ablation with a one-year follow-up. The eGFR was calculated by the formula CKD-EPI before, 3 and 12 months after ablation.

Results: 124 patients (age 55.2 ± 10.0 years, 69.4% males) were studied. Seventy-five patients had paroxysmal AF (60.5%). Ninety-eight patients (79%) underwent ablation of VVPP with radiofrequency and twenty-six (21%) cryoablation. At one year of follow-up, the eGFR increased from $90.8 [77.8-100.0]$ to $95.6 [84.8-103.3]$ mL / min / 1.73 m^2 ($P < 0.0001$), with statistically significant among those patients who they presented recurrence at 12 months and those that did not, $-1.1 [-6.0 \text{ a } 8.8]$ mL / min / 1.73 m^2 vs $7.1 [-0.6 \text{ to } 14.2]$ mL / min / 1.73 m^2 , ($P = 0.017$). In patients free of recurrences there was no differences between the baseline eGFR and at 3 months ($P = 0.392$) but there was between the baseline eGFR and at 12 months ($P = 0.006$) (figure 1). The improvement of the eGFR at 12 months was inversely proportional at baseline eGFR, so that patients with eGFR of 30-59 mL / min / 1.73 m^2 showed the greatest improvement (figure 2). In patients who did not have recurrences at 12 months, basally there was an important % with reduced eGFR that significantly reduced at one year of follow-up ($P < 0.0001$), compared to patients who did have recurrences in those who remained the same % of patients in each group at baseline and at 12 months (figure 3).

Conclusions: In patients with AF who underwent pulmonary vein ablation, an overall improvement in the eGFR was observed, attributable to the subgroup that did not have recurrences at one year.

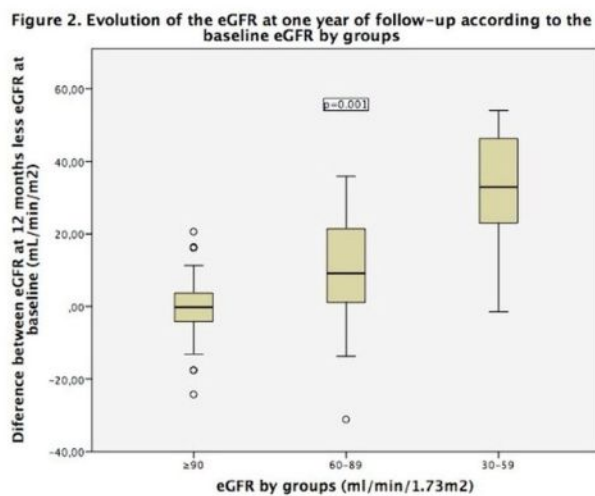
Table 1

	Paroxymal AF (n = 75)	Persistent AF (n = 49)	P value
Clinical characteristics	55.4 ± 10.1	55.0 ± 10.0	0.822
- Age, y	64.0	77.6	0.110
- Male, %	29.2 ± 5.1	30.3 ± 4.6	0.248
- BMI, kg/m ²	45.3	57.1	0.199
- Hypertension, %	12.0	16.3	0.493
- Diabetes, %	42.7	24.5	0.039
- Hypercholesterolemia, %	16.0	30.6	0.054
- Lung disease, %	10.7	18.4	0.223
- Strucural heart disease, %	1 [0-2]	1 [0-2]	0.588
- CHA2DS2-VASC, %	65.4	61.3	
0-1	34.6	38.7	
≥ 2			
Medical treatment, %	34.7	42.9	0.358
- ACEi/ARB	62.7	81.8	0.024
- Beta-blocker	30.7	24.5	0.455
- Statin	18.7	34.7	0.044
- Diuretic	78.7	42.9	<0.001
- Antiarrhythmic drug	57.3	89.8	<0.001
- Anticoagulation			

Echocardiographic data	61.4±5.3	59.6±6.1	0.096
- LVEF, %	48.9±4.4	50.2±5.6	0.158
- LVEDD, mm	41.6±4.8	45.3±4.8	<0.001
- LA diameter, mm			
Blood test	0.87 [0.78-1.06]	0.88 [0.78-1.02]	0.941
- Creatinine, mg/dl	90.8 [70.9-100.0]	91.1 [76.2-99.2]	0.616
- eGFR, mL/min/1.73 m ²			

ACEi/ARB: Angiotensin converting enzyme inhibitor/Angiotensin receptor blocker; AF: atrial fibrillation; BMI: body mass index; eGFR: estimated glomerular filtration rate; LA: left atrium; LVEF: left ventricular ejection fraction; LVEDD: left ventricular end diastolic diameter.

Abstract P1069 Figure 2



P1070

Frailty index or comorbidity index for bleeding risk assessment in patients with atrial fibrillation?

Bisson A.¹; Bodin A.¹; Clementy N.¹; Pierre B.¹; Babuty D.¹; Lip G.²; Fauchier L.¹

¹Tours Regional University Hospital, Hospital Trousseau, Tours, France

²Liverpool Heart and Chest Hospital, Liverpool, United Kingdom

Background Charlson comorbidity index (CCI) is a tool to measure comorbid disease status and a strong estimator of mortality. The quantifiable frailty phenotype has also been validated as predictive of mortality and disability. Claims data can be used to classify individuals as frail and non-frail using the Claims-based Frailty Index (CFI). We evaluated whether these tools may help to predict the risk of bleeding in patients with atrial fibrillation (AF).

Methods All patients with AF seen in an academic institution were identified and followed up for mortality, stroke and bleeding events. HAS-BLED, HEMORR2HAGES, ATRIA and ORBIT scores, CCI and CFI were calculated for each patient. Hazard ratios were calculated and predictive abilities of the scores were compared using the c-statistic in the whole population and then separately in elderly patients (>75 yo).

Results Among 8962 patients with AF, 274 major bleeding events were recorded during a follow-up of 874 ± 1054 days. Bleeding occurred more commonly in patients with higher bleeding risk scores, CCI and CFI. The 4 bleeding risk scores significantly had lower c-statistics than CCI and CFI for predicting major bleeding (table). Results were similar whether patients were treated with OAC or no OAC. In elderly patients, the c-statistics were all lower and were not significantly different for the 4 scores, CCI and CFI scores (0.594, 0.572, 0.595, 0.594, 0.616 and 0.591 for HAS-BLED, HEMORR2HAGES, ATRIA, ORBIT, CCI and CFI, respectively).

Conclusion Comorbidities and frailty, respectively assessed with CCI and CFI, demonstrated statistically better performances in predicting major bleeding than the 4 established bleeding risk scores in AF, although all c-indexes were broadly similar. The 4 bleeding risk scores, CCI and CFI showed lower performance in predicting bleeding within elderly patients in whom they all performed equally to predict bleeding events. Given their simplicity and similar performances, the user-friendly bleeding risk scores remain attractive tools for the estimation of bleeding risk in elderly patients with AF.

Predictive values for major bleeding

	ROC Area	95% Conf. Interval	P value vs CCI/CFI
HASBLED	0.588	0.555-0.621	0.002/0.003
HEMORRâ,,HAGES	0.564	0.531-0.598	<0.0001/<0.0001
ATRIA	0.559	0.522-0.595	<0.0001/<0.0001
ORBIT	0.577	0.542-0.612	0.0002/0.0003
Charlson, CCI	0.652	0.619-0.684	-/0.58
Frailty index, CFI	0.648	0.615-0.681	0.58/-

Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1071**Prediction of mortality and mode of death by clinical score systems for patients with atrial fibrillation**Bodin A.¹; Bisson A.¹; Clementy N.¹; Pierre B.¹; Babuty D.¹; Lip G.²; Fauchier L.¹¹Tours Regional University Hospital, Hospital Trousseau, Tours, France²Liverpool Heart and Chest Hospital, Liverpool, United Kingdom

Atrial fibrillation (AF) is associated with a higher mortality, but modes of death may vary and their respective predictors have been insufficiently defined. Charlson comorbidity index (CCI) is a tool to measure comorbid disease status and a strong estimator of mortality. The quantifiable frailty phenotype is also predictive of mortality and disability and claims data can be used to classify individuals as frail and non-frail using the Claims-based Frailty Index (CFI). We evaluated whether these tools may help to predict mortality and the different modes of death in AF.

Methods All patients with AF seen in an academic institution were identified and followed up for mortality. CHA2DS2VASc score, CCI and CFI were calculated for each patient. Predictive abilities of the scores were compared using the c-statistic.

Results Among 8962 consecutive patients with AF, 1294 patients died during a follow-up of 929 ± 1082 days (median 456), (yearly rate 5.5%) and 97% of causes of death were identified (54% cardiovascular and 43% non-cardiovascular). Death occurred more often in patients with higher CHA2DS2VASc scores, CCI and CFI. CFI was a better predictor of total mortality than CCI and CHA2DS2VASc score (table). CFI was also a better predictor of cardiovascular mortality than CCI and CHA2DS2VASc score. Finally, CFI was also a better predictor of non-cardiovascular mortality than CCI and CHA2DS2VASc score. The predictive performances of the 3 tools were better for cardiovascular death than for non-cardiovascular death.

Conclusion Frailty assessed with CFI demonstrated better performances in predicting total mortality, cardiovascular mortality and non-cardiovascular mortality than CHA2DS2VASc score and Charlson comorbidity index in AF patients. Identifying the risk of non-cardiovascular death with simple tools remains a more difficult challenge in these patients.

		ROC area (95% C)	P vs CHA2DS2VASc/ Charlson
Total mortality	CHA2DS2VASc	0.651 (0.636-0.665)	-
	CHARLSON (CCI)	0.687 (0.672-0.702)	0.0001
	Frailty index (CFI)	0.714 (0.700-0.729)	<0.0001/<0.0001
Cardiovascular death	CHA2DS2VASc	0.673 (0.654-0.692)	-
	CHARLSON (CCI)	0.707 (0.688-0.726)	0.004
	Frailty index (CFI)	0.737 (0.719-0.756)	<0.0001/<0.0001
Non cardiovascular death	CHA2DS2VASc	0.590 (0.567-0.612)	-
	CHARLSON (CCI)	0.637 (0.614-0.659)	0.0008
	Frailty index (CFI)	0.650 (0.628-0.672)	<0.0001/0.008

P1073

Trends in cannabis use in patients with atrial fibrillation: insights from nationwide in-patient sample 2005-2014

Voruganti C.¹; Shantha GPS²; Pelosi F.²; Jongnarangsin K.²; Deshmukh A.³; Briassoulis A.¹; Giudici MC.¹

¹University of Iowa, Iowa City, United States of America

²University of Michigan, Ann arbor, United States of America

³Mayo Clinic, Rochester, United States of America

Background. We sought to examine the association between cannabis use (CU) and in-hospital mortality of patients with atrial fibrillation (AF) from 2005 to 2014. Cannabis is a widely used recreational substance.

Methods Using data from the National Inpatient Sample and the national Census Bureau, annual national estimates in in-hospital mortality for cases with AF and CU were estimated for years 2005-2014. Univariate and multivariate analyses were used to assess and compare in hospital mortality among AF cases with and without CU. We used the Cochran–Armitage test to measure the trends in in-hospital mortality. All statistical analyses were executed by SAS 9.4. We used weighted data to produce national estimates in our study.

Results: Of the 34,756,687 patients admitted with history AF in hospitals between 2005 and 2014, 61,834 had known CU. Patients with CU (vs. no CU use) were younger (mean 51.27 ± 12.91 vs 75.79 ± 11.99 , $P < 0.0001$), more likely to be males (82.11% vs 49.56%, $P < 0.0001$), and African-Americans (30.88% vs 7.54%, $P < 0.0001$) and more frequently admitted on weekends (23.97% vs 21.05%, $P < 0.0001$). In-hospital mortality increased significantly overtime among patients with AF and CU (1.05% in 2005 vs 2.67% in 2014; $p = < 0.0001$). AF Patients with CU had significantly lower mortality than patients without CU (2.51 vs. 5.12, $P < 0.0001$).

Conclusion Among patients admitted with AF, CU was associated with lower in-hospital mortality, likely due to lower burden of comorbidities compared with patients without CU. However, in-hospital mortality among patients with CU increased significantly during the study period.

Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1074

Characterization of multi-component potentials inside the Kock's Triangle with ultra-high density mapping system

Segreti L.¹; Lavallo C.²; Galeazzi M.³; Del Giorno G.⁴; Zingarini G.⁵; Narducci ML.⁶; Russo M.³; Piro A.²; Bongiorni MG.¹; Pelargonio G.⁶; Carbone A.⁴; Piccolo F.⁷; Malacrida M.⁷; Colivicchi F.³; Pandozi C.³

¹Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy

²Umberto I Polyclinic of Rome, Rome, Italy

³San Filippo Neri Hospital, Rome, Italy

⁴Ospedale Maria SS Addolorata, Eboli, Italy

⁵Hospital Santa Maria Della Misericordia, Perugia, Italy

⁶Catholic University of the Sacred Heart, Rome, Italy

⁷Boston Scientific, Milan, Italy

Background: Several authors investigated the propagation of the atrial impulse inside the Kock's Triangle (KT) during sinus rhythm (SR) and tachycardia. However, a thorough knowledge of the origin and significance of multicomponent potentials referred to as slow pathway (SP) potentials, is still lacking.

Purpose: Purpose of the present study was to evaluate the conduction velocities (CVs), signal characterization and find out the origin, distribution, and timing of the SP potentials recorded in the KT.

Methods: The 3-D KT geometry was created during both SR and tachycardia from the basket mapping catheter and a mapping System. The KT was divided into eight distinct regions moving from an antero-septal to postero-septal areas and bounded by tricuspid annulus (TA) anteriorly and tendon of Todaro (TT) posteriorly. The fast pathway (FP) and the SP were localized. Each area was characterized in terms of distribution and timing of Jackman (JP) and Haissaguerre (HP) potentials, CV and signal amplitude.

Results: 20 consecutive successful SP ablation cases of AVNRT were included. The mean number of acquired points of RA was 6000 ± 1100 (mean RA mapping time = 12 ± 5 minutes); 275 ± 63 points were acquired inside the KT over a mean KT area of 29 ± 3 mm². Both JPs and HPs were detected in 100% of pts during SR, whereas they were less frequently recorded during tachycardia (90% and 95%, respectively). The mid-septal regions bounded by TA anteriorly and TT posteriorly showed higher prevalence of JP as compared to antero-/mid-septal regions across TT both in SR and tachycardia (77.4% vs 4.8% during SR, $p < 0.0001$; 84.1% vs 0% during tachycardia, $p < 0.0001$, respectively). HPs seemed to have variable distribution across KT (50% of these potentials recorded in antero- to mid-septal regions across TT for SR, 52.3% for tachycardia). The median signal voltage was 0.44[0.2-0.9] mV during SR and 0.5[0.22-0.895] mV during tachycardia. The mid-septal region was the area of lowest voltage compared to other regions (0.2[0.1-0.7] mV vs 0.5[0.4-1.5] mV for SR, $p < 0.0001$; 0.2[0.15-0.6] mV vs 0.6[0.4-1.5] mV for tachycardia, $p < 0.0001$, respectively) and it had a mean voltage lower than 50% of mean voltage of KT in 81% of the cases for SR and 86% for tachycardia. The mean CV was 0.45 ± 0.2 m/s during SR and 0.46 ± 0.2 m/s during tachycardia. The mid-septal region was the area of mean lowest CV compared to other regions (0.33 ± 0.1 m/s vs 0.5 ± 0.2 m/s for SR, $p < 0.0001$; 0.35 ± 0.1 m/s vs 0.5 ± 0.2 m/s for tachycardia, $p < 0.0001$, respectively).

Conclusions: The genesis of the JPs, although not perfectly known, might be explained by wavefront collision in the lowest area of the KT that may generate a low-high-type double potential. These potentials seem to be associated with slow conduction areas and low signal-amplitude areas, whereas HPs seem to have variable distribution across KT.

P1075

High density mapping of spontaneous atypical atrial flutter on native atria

El Bouazzaoui R.; Placide L.; Massin F.; Granier M.; Parlier P.; Bernard J.; Pasquie JL.

University Hospital Arnaud de Villeneuve, Rhythmology, Montpellier, France

Introduction: Spontaneous non cavotricuspid isthmus-dependent atrial flutters (AFL) on native atria without prior cardiac surgery or catheter ablation are very rare and their circuits are poorly known. Some initial series report global circuit mapping with conventional 3D systems. The purpose of this study is to characterize the circuits of non cavotricuspid isthmus-dependent AFL in native atria using high-density 3D mapping systems.

Methods: We prospectively considered all of the patients referred for atypical atrial flutter ablation on native atria without prior LA ablation or cardiac surgery. Tachycardia mapping was performed using either a Pentaray or an Orion catheter combined to conventional manoeuvres (Entrainment and Post Pacing Intervals). When atypical flutter was confirmed, patients were included in the study. Catheter ablation was performed during the same procedure. Ablation strategy was defined according to tachycardia circuits and operator discretion. Clinical, anatomical and electrophysiological data were recorded on the day of the procedure. Patients had 24 hour-Holter ECG every 3 months over a 1 year-follow-up.

Results: From May 2017 to Oct 2018, 15 patients (12 M; 74.9 yo; IC 95% [70.5- 79.3]) were consecutively included. 12/15 (80 %) had an underlying heart disease with a mean LA volume of 180.5 mL IC 95% [153.9-207.1]. LA voltage mapping highlighted spontaneous scar areas ($<0.05\text{mV}$) in 14/15 patients (93,3 %), with an mean scar area of 4.9 cm^2 IC 95% [2.1-7.8]. According to the electroanatomical mapping and entrainment manoeuvres, 12/15 AFL (80 %) were anatomical large macroreentrant circuits and 3/15 (20%) were localized reentries. The 12 anatomical macroreentrant circuits consisted in 8 perimitral mainly counterclockwise (8/8 100%), 2 pulmonary veins related AFL, 1 periappendage and 1 roof AFL. The 3 localized reentrant circuits were located: on the LA septum, near the left appendage and at the upper part of the ridge. 14/15 (93.3%) AFL were interrupted during the ablation procedure: 7/15 patients turned directly into sinus rhythm and 7/15 converted in another flutter before the conversion to sinus rhythm. 1/15 patient (6.7%) experienced an ischemic stroke. After a median 6.5 month-FU (IQR 5.2 months), 13/15 patients (86.7%) were in sinus rhythm, 3/15 (20%) with antiarrhythmic drugs. 4 patients (26.7%) had a redo procedure (1 for the same AFL).

Conclusion: Non cavotricuspid isthmus-dependent atrial flutters (AFL) on native atria without prior cardiac surgery or catheter ablation were mainly perimitral circuits. Spontaneous scar areas were present in most of the mapped native left atria and appear to be a key issue combined to anatomic boundaries.

Abstract P1075 Figure.

Patients	LA volume (mL)	AFL circuit	Activation map	Scar areas (cm ²)	Ablation lesions	Ablation outcome
1	145	Macroreentry Counterclockwise PM		4.8	A1: Mitral isthmus Other lesions: PVI	SR
2	209	Macroreentry Counterclockwise PM + roof		2.8	A1: Mitral isthmus Other lesions: PVI, roof line	SR
3	191	Macroreentry RPV related AFL Figure-of-8 circuit		7.5	A1: RPV Other lesions: PVI, Box	SR
4	148	Macroreentry RPV related AFL		1.3	A1: RPV Other lesions: LPIV, Roof line	SR
5	163	Localized reentry Upper ridge localized reentry		6.5	A1: Isthmus of Marshall Other lesions: upper ridge, mitral isthmus	New AFL then SR
6	189	Macroreentry Double loop: PM+roof AFL		0	A1: Mitral isthmus Other lesions: Roof line, PVI	SR
7	168	Macroreentry Counterclockwise PM		3.6	A1: mitral isthmus Other lesions: PVI, CTI	New AFL then SR
8	173	Localized reentry Periappendage localized reentry		4.9	C1: foster left appendage Other lesions: PVI, mitral isthmus, roof line	New AFL SR
9	123	Macroreentry Triple loop: PM+periappendage+roof AFL		1.2	C1: foster left appendage Other lesions: CTI	New AFL then SR
10	192	Macroreentry Periappendage circuit		6	C1: left appendage A1: Mitral isthmus Other lesions: LSPV	AFL persistence
11	287	Macroreentry Double loop: PM + roof AFL		3.2	A1: Mitral isthmus, roof line Other lesions: posterior scar, right septum	New AFL then SR
12	156	Macroreentry Counterclockwise PM		1.8	C1: anterior scar+ mitral annulus	SR
13	132	Macroreentry Roof-dependent AFL		1.3	Other lesions: PVI, mitral isthmus	New AFL then SR
14	152	Macroreentry Counterclockwise PM		20.9	A1: mitral isthmus, roof line Other lesions: CTI, RPV, foster left appendage	New AFL then SR
15	280	Localized reentry Septal localized reentry		6.6	C1: septal scar	SR

Legend: Results of anatomical, electrophysiological and activation mapping findings. PM: perimitral; A1: posterior mitral isthmus; C1: mitral isthmus; PVI: pulmonary vein isolation; RPV: right pulmonary vein isolation; LSPV: left superior pulmonary vein isolation; CTI: cavotricuspid isthmus; AFL: atrial flutter; LA: Left atrial

Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1076

Atrial high rates episodes predict the development of heart failure with preserved ejection fraction

Marinheiro R.¹; Parreira L.¹; Amador P.¹; Lopes C.¹; Fernandes A.¹; Farinha J.¹; Fonseca M.¹; Esteves A.¹; Mesquita D.¹; Lopes A.¹; Venancio J.²; Caria R.²

¹Hospital Center of Setubal, Setubal, Portugal

²Hospital de Santa Cruz, Lisbon, Portugal

Introduction: Atrial fibrillation (AF) has been associated with new-onset heart failure (HF), particularly in those with preserved ejection fraction (HFpEF), highlighting the relevance of atrial function in this entity. Subclinical atrial high rate episodes (AHRE) detected by cardiac devices (like pacemakers (PM)) have been shown to be associated with subsequent development of clinical AF. The association between AHRE and new-onset HFpEF has not been extensively evaluated.

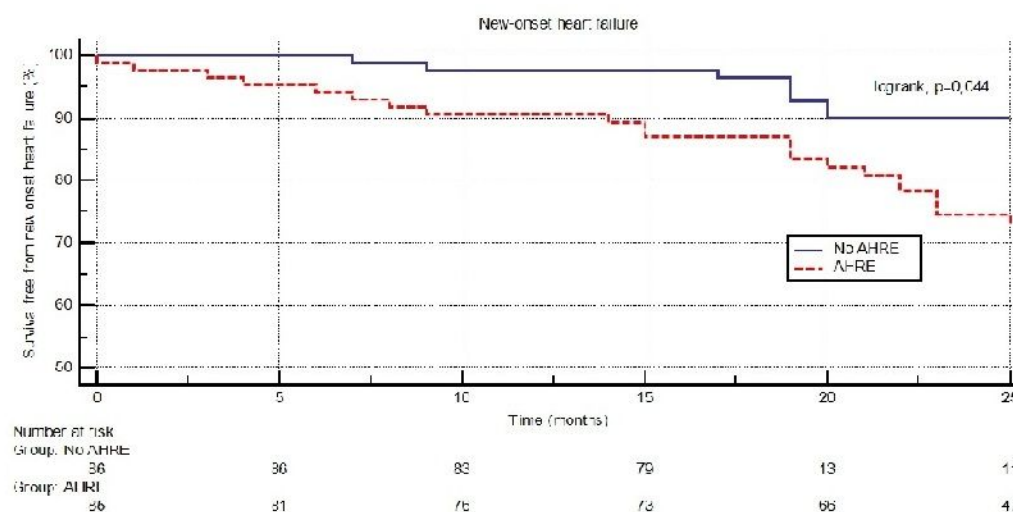
Aims: To determine if PM patients in whom AHRE were detected have a higher prevalence of new-onset HFpEF comparing with those with pacemaker but no AHRE, independently of new-onset AF.

Methods: Single-center observational study. From September 2014 to September 2016 we included patients followed in the PM follow-up clinics with AHRE episodes longer than 6 minutes if EGM was available or 6 hours if it is not. We excluded patients with previous diagnosis of AF or with reduced EF. We compare these patients (AHRE+) with an age- and gender-matched control group of patients with PM but no AHRE (AHRE-). All patients have a transthoracic echocardiogram demonstrating a preserved EF and none had symptoms or signs suggesting HF at the time of the inclusion. During the follow-up we evaluated admissions for new-onset HF and also new-onset AF. HF was defined as an admission with new or increasing symptoms and new or increasing signs of the disorder, including signs of fluid retention or objective evidence of heart failure and a significant change in the treatment to improve heart failure, defined by initiation of intravenous diuretic agents or other intravenous drugs or mechanical ventilation or mechanical support. AF diagnosis required an electrocardiogram (ECG) or Holter monitoring confirming > 30 seconds of AF.

Results: Eighty-six patients entered the study (median age 78 (71-84) years, 53% males). During a mean follow-up of 24 months, 35 patients (41%) had new-onset HF in the AHRE+ group, comparing to 9 (10%) in the AHRE- group ($p < 0.001$). Kaplan-Meier survival curve demonstrated the risk of HFpEF is higher in AHRE+ group comparing with AHRE- group (logrank, $p = 0.044$). AF occurred in 32 (37%) patients in AHRE+ group versus 6 (7%) in AHRE- group ($p < 0.001$) but no interaction was found between AF and HFpEF ($p = 0.447$).

Conclusion: In this population, AHRE were associated with a higher risk of HFpEF. AHRE are possibly a marker of electrophysiological atrial remodeling, predicting the future development of HF, even in those with pEF and no AF. It is of paramount importance to monitor patients with AHRE more closely, not only due to AF and stroke risk, but also due to HF.

Abstract P1076 Figure1 - Kaplan-Meier survival curve



P1077**Reablation in supraventricular tachycardia associated with younger age and negatively associated with atrioventricular nodal reentrant tachycardia**

R Sousa A.¹; Oliveira A.²; Morgado F.²; Carmo P.²; Cavaco D.²; Adragao P.²

¹Hospital Santa Cruz, Paediatric Cardiology, Carnaxide, Portugal

²Hospital Santa Cruz, Cardiology, Carnaxide, Portugal

Background: supraventricular arrhythmias are common in young patients. These arrhythmias can be effectively treated by catheter ablation. Recurrence rate and variables associated with reablation are not well established and are a fundamental aspect of patient and parent counselling.

Purpose: our purpose was to study variables associated with reablation in young patients submitted to supraventricular catheter ablation

Methods: a retrospective case-control study was conducted including patients aged 30 or under that had performed at least one supraventricular catheter ablation with more than 90 days of follow-up. Demographic and clinical data from January 2011 to September 2018 were prospectively registered in a local database and retrieved for analysis. Patients with incomplete data were excluded.

Results: 132 patients aged 8 to 30 years of age (mean 19.49 ± 5.81 years) were included in the study. Of these, 60.61% were male. The most frequent presenting symptom was palpitations (84.85%) and 10.61% of patients were asymptomatic. The most frequent reason for supraventricular ablation was a manifest accessory pathway (including Wolff–Parkinson–White syndrome) in 69.70% of patients followed by atrioventricular nodal reentrant tachycardia (AVNRT) in 18.94% and atrial tachycardia in 7.58%.

15 patients required reablation (11.36%). Reablation was performed with a median of 309 days after the first ablation (IQR: 91–1407). Patients with atrial tachycardia were the group with the highest reablation rate (27.27%), followed by patients with manifest accessory pathway (13.04%).

Patients requiring reablation were younger - 14.73 ± 4.95 years vs. 20.10 ± 5.64 years, $p = 0.001$. AVNRT was negatively associated with reablation ($p = 0.041$). There was no association between age and AVNRT.

Conclusions: following catheter ablation of supraventricular tachycardia younger patients have a higher likelihood of reablation while AVNRT is associated with a low likelihood of reablation.

Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1078

Excessive atrial ectopic activity predicts type of major cardiac adverse events in patients with frequent premature ventricular contractions

Parreira AL.; Marinheiro R.; Lopes A.; Mesquita D.; Amador P.; Farinha J.; Fonseca M.; Santos B.; Venancio J.; Lopes C.; Caria R.
Centro Hospitalar de Setúbal, Setúbal, Portugal

Introduction: The presence of frequent premature ventricular contractions (PVCs) in the presence of structural heart disease (SHD) are associated to a worse prognosis. The development of atrial fibrillation (AF) in patients with left ventricular dysfunction has been associated with the development of heart failure (HF). We believe that frequent premature atrial contractions (PACs) are a surrogate marker of future AF.

Aims: Evaluate if the presence of excessive atrial ectopy can influence the type of death in patients with frequent PVCs.

Methods: We evaluated 1967 consecutive 24-hour Holter monitoring performed between 2006 and 2010 in a single center. Patients with atrial fibrillation were excluded. 312 patients with more than 40 PVCs/hour were retrospectively evaluated. Patients were divided in two groups according to the presence of excessive atrial ectopic activity defined as more than 40 PACs/hour. We evaluated the type of major cardiovascular event (MACE) during follow-up. Arrhythmic: (sudden death (SD) and hospitalizations for ventricular arrhythmias) or Heart failure (HF) related: (death or hospitalizations due to HF).

Results: The results of Holter monitoring predicted the type of MACE (Table)

The presence of frequent PACs or AF during follow-up were associated with the occurrence of HF events but not with the occurrence of Arrhythmic events. The presence of runs of non-sustained ventricular tachycardia (NSVT) was associated with both HF and arrhythmic events.

Conclusion: In this group of patients the severity of ventricular arrhythmias was associated to both type of MACE, arrhythmic and heart failure related. However the presence of excessive atrial ectopic activity predicts the occurrence of heart failure events but not of arrhythmic events.

Predictors of Arrhythmic and HF MACE

	SD/VT or VF hospitalization			HF death or HF hospitalization		
	OR	95% CI	P value	OR	95% CI	P value
Age	0.988	0.948-1.029	0.560	1.042	0.993-1.092	0.091
Male gender	2.33	0.626- 8.639	0.206	1.818	0.632- 5.234	0.268
Structural heart disease	2.733	0.824-9.071	0.1	22.35	2.936-170.19	0.003
LV fractional shortening	0.988	0.934- 1.046	0.686	0.854	0.801- 0.910	<0.0001
Left atrium diameter	1.084	1.007-1.167	0.033	1.148	1.073-1.228	<0.0001
Frequent PACs	1.147	0.306-4.294	0.839	4.250	1.613-11.19	0.003
AF during follow-up	0.821	0.220-3.060	0.769	8.320	2.866-24.153	<0.0001
NSVT	3.803	1.230-11.760	0.020	2.765	1.026- 7456	0.044

SD: sudden death; VT: ventricular tachycardia; VF ventricular fibrillation; LV: left ventricle

P1079

Demographics and clinical characteristics of patients newly diagnosed with paroxysmal supraventricular tachycardia (PSVT)

Preib M.¹; Pokorney S.²; Cyr P.¹; Everson K.³; Wood D.⁴; Sacks N.¹

¹Precision Xtract, Boston, United States of America

²Duke University Medical Center, Durham, United States of America

³Precision Health Economics, Boston, United States of America

⁴Milestone Pharmaceuticals, Quebec, Canada

Funding Acknowledgements: Milestone Pharmaceuticals

Background: Contemporary epidemiological data describing PSVT patients are limited.

Purpose: Describe newly diagnosed PSVT patients across age groups: under 18, 18-40, 41-64, and ≥65.

Methods: Newly diagnosed PSVT patients (ICD-9:427.0; ICD-10:I57.1) with at least 1 year of claims pre- and post-diagnosis were identified using Truven MarketScan and Medicare databases.

Results: Among 36,881 newly diagnosed PSVT patients, a majority of patients in all age groups were female. Charlson Comorbidity Index increased with age ($P < 0.0001$). Comorbidities varied across age group; prevalence increased with age ($P < 0.0001$). The most prevalent comorbidities in all age groups were chronic pulmonary disease (CPD), anxiety/panic disorder, hypertension, and diabetes. Hypertension was the most prevalent comorbidity for those over age 40, anxiety/panic disorder for those age 18-40, and CPD for patients under age 18. Only those ≥65 had cardiovascular diseases in the top 5 most prevalent comorbidities. Of patients <18, 25.3% had ablations compared to 3.4% of those ≥65 (Table).

Conclusion: More females were diagnosed with PSVT than males. Ablation rates decreased with increasing age. The most prevalent comorbidities across age groups were unrelated to cardiovascular disease, except in patients ≥65.

Characteristics of PSVT Patients(New Dx)

	Age <18 (n = 1267)	Age 18-40 (n = 5112)	Age 41-64 (n = 18339)	Age ≥65 (n = 11977)
Female	659 (52%)	3452 (68%)	11322 (62%)	7547 (63%)
Charlson Comorbidity Index (pre-dx) Mean (SD)	0.15 (0.5)	0.2 (0.6)	0.5 (1)	1.3 (1.7)
Diabetes	<11	171 (3%)*	2636 (14%)*	3213 (27%)
Congestive Heart Failure	<11	26 (0.5%)*	300 (2%)*	1726 (14%)
PVD	<11	18 (0.4%)*	425 (2%)*	1959 (16%)
AMI		<11	72 (0.4%)*	96 (0.8%)
Mitral Valve Prolapse	<11	30 (0.6%)*	399 (2%)*	1248 (10%)
AFib		15 (0.3%)*	330 (2%)*	2648 (22%)
Congenital Cardiac Defects	13 (1%)^	13 (0.3%)^	13 (0.1%)	<11
Hypertension	12 (1%)*	499 (10%)*	7181 (39%)*	9816 (82%)
Cerebrovascular Disease	<11	13 (0.3%)*	297 (2%)*	950 (8%)
CPD	144 (11%)^	466 (9%)*	2,046 (11%)*	2917 (24%)
Chronic Renal Disease	<11	27 (0.5%)*	303 (2%)*	1136 (10%)
Malignancy	<11	54 (1%)*	997 (5%)*	1497 (13%)
Anxiety/Panic Disorder	63 (5%)*	611 (12%)*	1516 (8%)^	1056 (9%)
Ablations (% w/ 1+)	25.3%*	13.5%^	11.7%*	3.3%

* $P < 0.0001$ ^ $P < 0.05$ v next oldest

Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1080

Prognostic value of cardiac troponin level in patients presenting with supraventricular tachycardias

Zahran M.; Bahouth F.; Azzam Z.; Suleiman M.

Rambam Health Care Campus , Haifa, Israel

Background: An association between paroxysmal supraventricular tachycardias (PSVT) and elevated cardiac troponin (cTn) has been reported in small studies and case series, even in the absence of significant coronary artery or structural heart disease.

Purpose: We sought to explore the prognostic significance of elevated cTn in patients presenting with PSVT.

Methods and Results: Between Dec 2014 and Jan 2016, a total of 165 patients (60% men, mean age 55 ± 17 year-old) with an acute episode of regular supraventricular tachyarrhythmia were admitted to the internal medicine emergency department. One hundred and twenty-two patients had at least one serum cTnI value measured. Of those, 56 had a positive result, defined as serum cTnI of more than 0.028 ng/dL.

Multivariate adjustment showed that heart rate > 150 bpm on admission (OR = 3.9; 95% CI 1.1-9.5; $p < 0.003$) and history of coronary artery disease (OR = 3.4; 95% CI 1.2-10.1; $p < 0.026$) were the only independent predictor of cTn elevation. After mean ($\pm$ SD) follow-up period of 23 ± 7 months, the combined primary outcome of death, coronary intervention (PCI) or myocardial infarction (MI) occurred in 7 patients (12.5%) out of 56 patients with positive cTn and in zero patients with negative cTn ($p = .002$). After multivariate adjustment, Cox proportional hazards modeling showed that elevated cTn on admission was independent predictor of adverse outcomes only in patient with known coronary artery disease (CAD) (HR = 3.3, $p = 0.05$).

Conclusion: In patients presenting with PSVT, elevated cTn is associated with increased risk of adverse cardiac outcomes in patients with history of CAD. Serum cTn should be measured selectively, such as in patients with symptoms of ischemic chest pain and a high pretest likelihood of having CAD.

P1081

Paroxysmal supraventricular tachycardia with no basal ventriculoatrial conduction at the tachycardia cycle length in the electrophysiological study, what is the mechanism?

Ramos Maqueda J.; Sanchez Millan P.; Jordan Martinez L.; Cabrera Ramos M.; Jimenez Jaimez J.; Macias Ruiz R.; Molina Lerma M.; Tercedor Sanchez L.; Alvarez Lopez M.

Hospital Universitario Virgen de las Nieves, Granada, Spain

A 34 year old men without previous cardiological history presented short-lasting bursts of palpitations with a sudden beginning and ending. In one of these episodes a narrow QRS tachycardia was registered and spontaneously terminated. Basal 12-lead surface electrocardiogram revealed sinus rhythm without preexcitation. The patient was then scheduled for an electrophysiological study. A decapolar catheter was positioned within the coronary sinus(CS) and other quadripolar catheter in the right ventricle(RV) apex. Programmed incremental RV apex pacing revealed concentric and decremental retrograde atrial activation. Atrioventricular(AV) node retrograde conduction was present with pacing trains (S1) at cycles length (CL) from 600 milliseconds(ms) to 450 ms. At a CL of 440ms or below, VA dissociation was revealed(Figure 1A). During atrial programmed stimulation protocol, no anterograde dual AV nodal physiology was demonstrated. With a basal 400 ms CL drive train and one extrastimuli at 280 ms CL from the CS, a narrow QRS tachycardia was reproducibly induced. The tachycardia CL was 400 ms with a VA interval of 110 ms and earliest atrial activation in distal electrodes of CS catheter(Figure 1B)

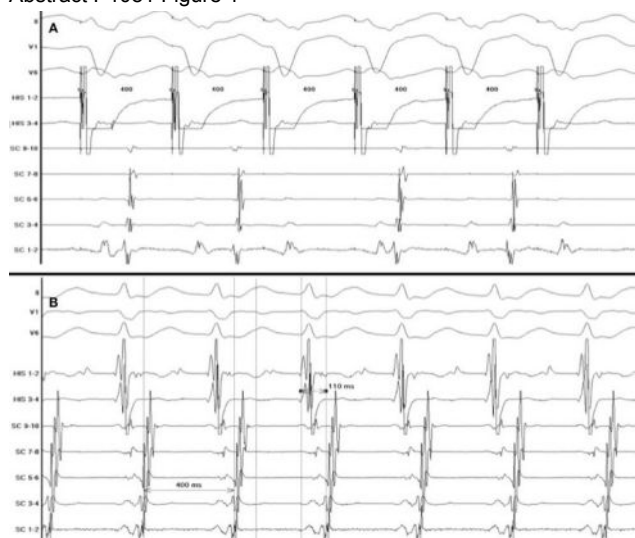
Differential diagnosis

The differential diagnosis of this tachycardia included atypical AV nodal reentrant tachycardia with a left sided atrial insertion (AVNRT), atrial tachycardia (AT), and AV reentrant tachycardia mediated by a concealed left accessory pathway (CLAP). Figure 1A shows no VA conduction at tachycardia CL(400 ms) even with isoproterenol infusion. This finding ruled out, theoretically, the possibility of a tachycardia mediated by a CLAP. Entrainment of the tachycardia during pacing at the RV apex(RVA) was achieved, showing a postpacing interval of 100 ms and a V-A-V response after ventricular overdrive pacing. Also tachycardia reset during RVA pacing was achieved while the His bundle was refractory. This maneuvers reasonably ruled out AVNRT and AT. At this point we considerate LV pacing from the ablation catheter positioned in the ventricular side of superior mitral annulus (MA). From this location VA 1:1 conduction was present at the tachycardia CL(400ms) and the shortest RR conducted retrograde with an eccentric sequence was 300 ms CL. This confirm the presence of a CLAP. Mapping of the MA during atrial pacing with orthodromic echo beats was performed and ablation of the superior zone of the mitral annulus suppressed the tachycardia in a few seconds. Finally the patient became non-inducible for any tachycardias.

Conclusions and implications for clinical practice

The most standard means of identifying concealed left accessory pathways is to pace the RV. However rarely RV pacing fails to demonstrate eccentric ventriculoatrial conduction making identification of these pathways challenging. This case shows that consideration of LV pacing to search for a "hidden" concealed left accessory pathway may be reasonable in these rare diagnostic dilemma cases.

Abstract P1081 Figure 1



Subject: Poster session 2 -- Atrial Fibrillation - Clinical

P1082

Should we also screen for obstructive sleep apnea in patients presenting with excessive supraventricular ectopic activity?

Marinheiro R.; Parreira LP.; Amador P.; Mesquita D.; Sousa S.; Silva M.; Farinha J.; Fonseca M.; Esteves A.; Lopes A.; Lopes C.; Chambel D.; Santos B.; Carradas C.; Caria R.

Hospital Center of Setubal, Setubal, Portugal

Background: It is recommended to consider obstructive sleep apnoea (OSA) screening in atrial fibrillation (AF) patients with risk factors, due to the strong evidence of an association between these two entities. Excessive supraventricular ectopic activity (ESVEA) has been proposed to be a risk factor for AF. However, strong evidence between ESVEA and OSA has not been established.

Objective: We aimed to determine if ESVEA is associated with moderate to severe OSA since its treatment with continuous positive airway pressure (CPAP) may prevent ESVEA, as it prevents AF.

Methods: We studied patients who performed polysomnography and 24-hour Holter monitoring in the same year. Patients with atrial fibrillation were excluded. ESVEA was defined as more than 30 PACs per hour (frequent PACs) or runs of >4 consecutive PACs. The circadian pattern of PACs was also evaluated. Sleeping hours were used to define "nocturnal". Moderate to severe OSA was defined when polysomnography demonstrated a apnoea/hypopnoea index (AHI) >15. We examined the association between ESVEA and moderate to severe OSA during wakefulness and sleep.

Results: We studied 290 patients [median age 65 (55-72) years, 62% males, body mass index (BMI) 30 (27-34)]. 112 (38%) had moderate to severe OSA (median AHI = 11 (5-24); mean oxygen saturation = 94% (92-95)). Median PACs was 35 (9-117) and 29 patients (10%) had frequent PACs. Runs of >4PACs occurred in 114 patients (39%). Forty-three patients (15%) had predominant nocturnal PACs and 42 (14%) had nocturnal runs of PACs. Multivariate logistic regression analysis demonstrated nocturnal PACs were associated with moderate to severe OSA ($p = 0.027$) (table 1).

Conclusion: OSA screening in patients presenting with nocturnal PACs, especially if male and obese, should be routinely considered. Treating moderate to severe OSA patients with CPAP has a potential benefit in preventing ESVEA and consequently AF.

Multivariate Cox regression analysis

	Odds Ratio	95 % Confidence Interval	p-value
Male gender	4.49	2.48-8.17	<0.001
Body mass index(kg/m ²)	1.09	1.03-1.15	0.002
Nocturnal PACs	4.12	1.17-14.46	0.027

Variables not included in the model: age, number of PACs/h, frequent PACs (>30PACs/hour), runs of PACs (>4 consecutive PACs), nocturnal runs of PACs.

P1083**Abnormal atrial activity: is it associated with obesity, obstructive sleep apnea or both of them?**

Marinheiro R.; Parreira L.; Amador P.; Mesquita D.; Sousa S.; Silva M.; Fonseca M.; Esteves A.; Farinha J.; Lopes C.; Santos B.; Chambel D.; Carradas C.; Caria R.

Hospital Center of Setubal, Setubal, Portugal

Introduction: Recent studies demonstrated that significant atrial electrical remodeling occurs in both obesity and obstructive sleep apnea (OSA). However, due to the closely relation between this two entities, it is difficult to distinguish which one of them can mostly contribute to atrial arrhythmias.

Objective: to determine if atrial arrhythmias are associated with obesity, OSA or both.

Methods: We studied patients who performed 24-hour Holter monitoring and polysomnography in the same year. Patients' weight and height were measured at the time of polysomnography. Based on Holter monitoring, we considered "abnormal atrial activity" (AAA) is present when atrial fibrillation (AF), frequent premature atrial contractions (PACs) (>30 PACs/hour) or runs of >4 consecutive PACs are present. We also study the presence of these arrhythmias separately and its circadian pattern. Moderate to severe OSA was defined when polysomnography demonstrated an apnoea/hypopnoea index (AHI)>15. Oxygen saturation (SaO₂) was also analysed during sleep. Obesity was considered when BMI > 30 kg/m². Multivariate logistic regression was used to examine the association between AAA (as a whole and separately) and obesity and OSA.

Results: We studied 343 patients [median age 66 (56-72) years, 62% male]: 192 (56%) were obese (body mass index (BMI)=31 (28-34)) and 143 (42%) had moderate to severe OSA (median AHI = 12 (6-26), mean SaO₂ = 94% (92-95)). AAA was associated with obesity (Odds Ratio (OR) 2.06, 95% confidence interval (CI) 1.27-3.33, p = 0.003), while nocturnal AAA was associated with mean SaO₂ (OR 0.73, 95% CI 0.55-0.97, p = 0.028). Multivariate analysis regarding AF, frequent PACs and runs of PACs separately is presented in table. No interaction was found between OSA and SAOS in any of studied AAA.

Conclusion: In this population, only nocturnal AAA (as a whole and separately as AF, frequent PACs or runs of PACs) was associated with OSA. On the contrary, non-nocturnal AAA was associated with obesity. When AAA occurs during sleeping hours in obese patients, it is probably related to OSA, but the same is not true when it occurs during wakefulness.

Multivariate Cox regression analysis

		Odds Ratio	95% Confidence interval	p-value
Atrial fibrillation	Obesity	2.695	1.388-5.235	0.003
	OSA	2.061	1.103-3.853	0.023
Nocturnal frequent PACs	OSA	3.504	1.684-7.289	0.001
Nocturnal runs of PACs	OSA	3.103	1.521-6.331	0.002

Other variables not included in the models: male gender, median oxygen saturation, proportion of time oxygen saturation < 90%. Age was also included in the model.

Subject: Poster session 2 -- Syncope and Bradycardia

P1084

The predictive value of a multivariate model of autonomic and baroreflex function applied to patients with reflex syncope

Laranjo S.; Oliveira M.; Rocha I.

Cardiovascular Autonomic Function Lab, Faculty of Medicine of Lisbon, Lisbon, Portugal

Autonomic nervous system (ANS) and baroreflex control of heart rate plays an important role in the pathophysiology of reflex syncope (rS). Head-up tilt testing (HUT) is useful to confirm clinical suspicion. However, regardless of the type of protocol used for HUT, the test is demanding because of its duration and stressfulness. Previous studies showed that some physiological parameters might change well before the onset of rS. Our aim was to develop a mathematical model to determine the predictive accuracy of autonomic and baroreflex function in the prediction HUT response in rS patients (P).

Methods: 248P (61% females, aged 48 ± 12 yrs), were placed in a tilt bed. Blood pressure (BP), RR intervals (RRI), cardiac output (CO) and total peripheral resistance (TPR) were continuously monitored for 10 min, in supine position, after which P were tilted to 70° . As syncope/presyncope developed, the bed returned to 0° and the evaluation was terminated. Otherwise, the test would end after 20 min. Heart rate (HRV) and systolic blood pressure (sBPV) variabilities were analysed. Baroreflex sensitivity (BRS) and baroreflex effectiveness index (BEI) were calculated. According to the HUT response, P were divided in "fainters" and "non-fainters". A multivariate logistic regression function fitting the supine and orthostatic phases was used to assess the association between the studied variables and the events by the Odds Ratios (OR; 95% CI). Results: 151P (61%) experienced rS during HUT. Sex and age distributions of "fainters" and "non-fainters" were not different. In supine position, significant differences on the analyzed parameters were observed between the two groups: "fainters" had significantly lower sBP, CO, TPR, HRV and sBPV powers and an impaired BRS, characterized by a lower gain and an increased latency. In this group, the onset of the orthostatic stress was characterized by almost 2x increase in LF (sympathetic) power, associated with a steep decrease of TPR, CO and BRS function (with a 3x increase in latency) and a lower BEI. The presence of low HRV (OR:2.1), low sBPV (OR:1.5) and a BRS below mean values (BEI <45%, OR:3.5; increased latency >1.5s, OR:2.9), at baseline and within the 5min after the initiation of orthostatism, were significant and independent markers for the development of a syncopal event induced by tilting. Moreover, when BEI values were added to any of the above-mentioned independent factors, a significant increase in discrimination and model fitting was observed (OR 4.1, $P < 0.05$), leading to an increase in sensibility (92,4%) and specificity (87%) to predict a positive HUT.

Conclusion. ANS and baroreflex function analysis within the first 10 min of positive HUT showed progressive changes, which does not occur in P with a negative response. This approach may have implications in the prediction of HUT response.

Subject: Poster session 2 -- Syncope and Bradycardia

P1085

POTS serum activates G-protein coupled receptors responsible for cardiovascular homeostasis and pain control

Axelsson J.¹; Ricci F.²; Di Martino G.²; Medic Spahic J.³; Persson-Tholin J.⁴; Persson M.⁴; Hamrefors V.³; Sutton R.⁵; Fedorowski A.³

¹Karolinska University Hospital, Dept. of Stem Cell Therapy and Apheresis, Stockholm, Sweden

²G. d'Annunzio University, Chieti, Italy

³Dept. of Clinical Sciences, Lund University, Malmö, Sweden

⁴Skane University Hospital, Dept. of Clinical Research, Malmö, Sweden

⁵Imperial College Healthcare NHS Trust, London, United Kingdom

Funding Acknowledgements: the Swedish Heart and Lung Foundation, the Medical Faculty of Lund University, Skåne University Hospital, the Crafoord Foundation, Solidex

Background Postural Orthostatic Tachycardia Syndrome (POTS) is a cardiovascular autonomic disorder of unknown aetiology affecting predominantly young women characterized by orthostatic intolerance, deconditioning, and pain in various locations. Previous studies suggested autoimmune involvement mediated via adrenergic and non-adrenergic G-protein coupled receptors (GPCRs) as a possible aetiology.

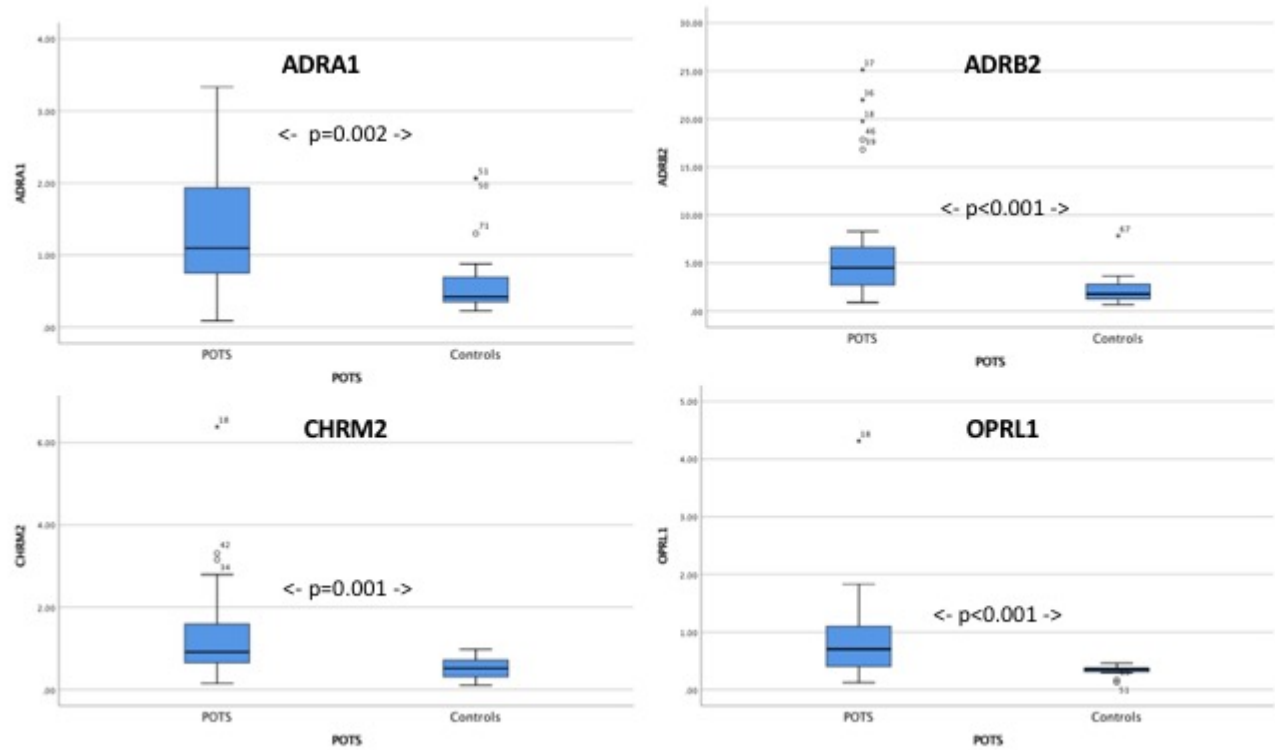
Purpose We aimed to study capability of serum from POTS patients and controls to activate selected G-protein coupled receptors involved in cardiovascular homeostasis and pain control.

Methods Sera from 47 POTS patients (age, 29 ± 10 y; 40 women) and matched 24 healthy controls (age, 30 ± 9 y; 20 women) were collected. A commercial FRET-based reporter system based on a beta-arrestin-linked transcription factor driving transgenic beta-lactamase transcription was used. Briefly, HEK293M-cells stably over-expressing one of the GPCRs, adrenergic alpha-1 (ADRA1), adrenergic beta-2 (ADRB2), muscarinic type-2 (CHRM2) and opioid-receptor-like 1 receptor (OPRL1) were plated in 96-well optical plates and allowed to re-attach during 48 hrs. The cells were then treated with 10% sera diluted in RPMI for 5 hours, followed by addition of the FRET-substrate, incubation for 60 min and analysis in a CLARIOStar multi-purpose plate reader at the recommended wavelengths. Non-parametric Mann-Whitney U-test was applied for group comparison.

Results Serum from POTS patients significantly activated all four receptors compared with controls ($p < 0.05$ for all receptors and inter-group comparisons; Fig. 1). Based on the results, a logistic model with all four GPCRs as POTS predictors was performed and a predicted value for every individual was calculated. A ROC curve was obtained by adding the predicted value as an independent variable. The obtained area-under-curve was 0.89 (0.80-0.97; $p < 0.001$).

Conclusions Our results suggest the presence of GPCRs activating proteins at high concentration in the sera of POTS but not in control subjects. The affected GPCRs control cardiovascular system and pain thus offering a plausible explanation of syndrome's clinical presentation.

Abstract P1085 Figure. Fig.1 POTS sera and GPCRs



Subject: Poster session 2 -- Syncope and Bradycardia

P1086

Cardiovascular neurohormones impact time to onset of vasovagal syncope induced by head-up tilt

Torabi P.¹; Ricci F.²; Hamrefors V.¹; Sutton R.³; Benditt D.⁴; Fedorowski A.⁵

¹Dept. of Clinical Sciences, Lund University, Malmö, Sweden

²G. d'Annunzio University, Chieti, Italy

³Imperial College Healthcare NHS Trust, London, United Kingdom

⁴University of Minnesota, Cardiac Arrhythmia Center, Cardiovascular Division, Minneapolis, United States of America

⁵Malmö University Hospital, Malmö, Sweden

Funding Acknowledgements: the Swedish Heart and Lung Foundation, the Medical Faculty of Lund University, the Crafoord Foundation, the Region Skåne

Background

Vasovagal reflex is the most common form of syncope but the pathophysiological mechanisms that initiate the reflex are not well understood. Previous studies have indicated that resting and orthostatic levels of various neurohormones may predispose to vasovagal reflex.

Purpose

We aimed to study supine and early orthostatic levels of neurohormones involved in control of circulatory homeostasis in relation to the onset of tilt-induced spontaneous vasovagal reflex.

Methods

Consecutive patients (n = 1193; 60.4% women, age, 53 ± 22 years) were enrolled in an 'unexplained syncope' investigation project which included a standard head-up tilt test (HUT) protocol. One-hundred-and-seventy-three patients (14.5%) developed a spontaneous vasovagal reflex during drug-free HUT. Of these, 161 (56.3% women; age, 45 ± 21 years) had blood samples collected from an intravenous line installed approximately 10 minutes prior to the test. Blood samples were obtained both in supine position and after 3 min of HUT. We analysed baseline and 3-min HUT levels of epinephrine, norepinephrine, C-terminal-pro-arginine-vasopressin (CT-proAVP), C-terminal- endothelin-1 (CT-proET-1), mid-regional-fragment of pro atrial-natriuretic-peptide (MR-proANP) and pro-adrenomedullin (MR-proADM) in relation to time between HUT start and test termination due to vasovagal syncope. We applied logistic regression model adjusted for age and gender. Neurohormone levels were log-transformed and standardized.

Results

The median time to syncope was 8 min (Interquartile range, 5-16 min). Ten patients experienced syncope prior to 3-min HUT and were excluded from analysis. Older age ($\beta=0.13$; SE = 0.03, $p < 0.001$) and higher supine systolic blood pressure (SBP, $\beta=0.06$; SE = 0.03, $p = 0.02$) but not higher supine heart rate ($\beta=0.01$; SE = 0.05, $p = 0.88$) predicted greater delay to syncope. Higher baseline supine MR-proADM predicted longer time to syncope ($\beta=2.03$; SE = 1.02, $p = 0.50$) whereas other resting neurohormones were not associated with time-to-syncope. Elevated 3-min orthostatic levels of epinephrine ($\beta= -2.13$; SE = 0.59, $p < 0.001$) and CT-proAVP ($\beta= -1.39$; SE = 0.68, $p = 0.043$) were predictive of shorter time-to-syncope during HUT, whereas higher 3-min MR-proADM ($\beta= 1.76$; SE = 0.82, $p = 0.035$) was associated with longer time-to-syncope.

Conclusions

Among patients with tilt-induced spontaneous vasovagal reflex syncope, older age, and higher blood pressure and pro-adrenomedullin predict later onset of reflex. Conversely, a pronounced early increase in circulating epinephrine and vasopressin during movement to upright posture herald earlier vasovagal reflex. These observations may be used for future syncope-preventive strategies.

Subject: Poster session 2 -- Syncope and Bradycardia

P1087

Utility of different risk scores in the prognosis of patients consulting emergencies department by syncope

Mora G.; Diaz A.

Universidad nacional de Colombia, Bogota, Colombia

Syncope is a common reason for consultation in emergency services and in these patients, studies are conducted to rule out cardiovascular pathologies that have an unfavourable prognosis. Different risk scores have been proposed to classify these patients. The objective of the study was to evaluate the prediction in the short-term prognosis in these patients.

Methods and Materials

Prospective cohort study that includes adult patients admitted for syncope in several emergency services. The following risk scores were evaluated: San Francisco, OESIL, EGSYS, Boston, ROSE and the risk scale to predict arrhythmias (RSPA). The final points evaluated were mortality, cardiovascular events and the combined end point at the month of follow-up.

Results: We included 248 patients with an average age of 58.5 (18-80) years, 54.4% were women. Mortality was 2% (5/248). The area under curve for mortality was better with of San Francisco ruler 0.741 (0.695 to 0.787) $p = 0.0001$. Sensitivity (S), specificity (E), positive predictive value (PPV) and negative (NPV) for mortality at 1 month was for the Boston score of 80, 61.2, 4.08 and 99.3 respectively. EGSYS was 0, 72.3, 0 and 97.2 respectively. OESIL it was 80, 31.8, 2.3 and 98.7 respectively. ROSE was 80, 12, 1.8 and 96.7 respectively. San Francisco ruler was 100, 19, 2.5 and 100 respectively. RSPA was 60, 24, 1.6 and 96.7 respectively.

For cardiovascular events the results were: with the score of Boston 65.5, 67.4, 36.4 and 87.2 respectively. EGSYS was 25.5, 72, 20.6 and 77.2 respectively. OESIL was 87.3, 36.8, 28.2 and 91 respectively. ROSE was 96.4, 14.5, 24.3, and 93.3 respectively. San Francisco ruler was 96.4, 22.8, 26.2 and 95.7 respectively. RSPA was 76.4, 24.4, 22.3 and 78.3 respectively.

For the combined point was: the score of Boston 64.6, 68.9, 42.4 and 84.6 respectively. EGSYS was 26.2, 72.1, 25 and 73.3 respectively. OESIL was 84.6, 37.2, 32.4 and 87.2 respectively. ROSE was 93.8, 14.2, 28, and 86.7 respectively. San Francisco ruler was 92.3, 22.4, 29.7 and 89.1 respectively. RSPA was 78.5, 25.1, 27.1 and 76.7 respectively.

Conclusions: The risk scores evaluated in this study, applied to our population, do not apply to the operational characteristics and stimulate the search for other risk predictors.

P1088

Diagnosing the undiagnosed patient with syncope: Diagnostic yield, accuracy and safety of a tertiary syncope unit

De Jong J S Y¹; Snijders Blok MR.¹; Thijs RD.²; Harms MPM³; Hemels MEW⁴; Van Dijk N.⁵; De Lange FJ.¹

¹Academic Medical Center of Amsterdam, Heart Centre, Department of Clinical and Experimental Cardiology, Amsterdam, Netherlands

²Leiden University Medical Center, Neurology, Leiden, Netherlands

³University Medical Center Groningen, Internal and Emergency Medicine, Groningen, Netherlands

⁴Rijnstate Hospital, Cardiology, Arnhem, Netherlands

⁵Academic Medical Center of Amsterdam, Family Medicine, Amsterdam, Netherlands

OnBehalf: FAST II

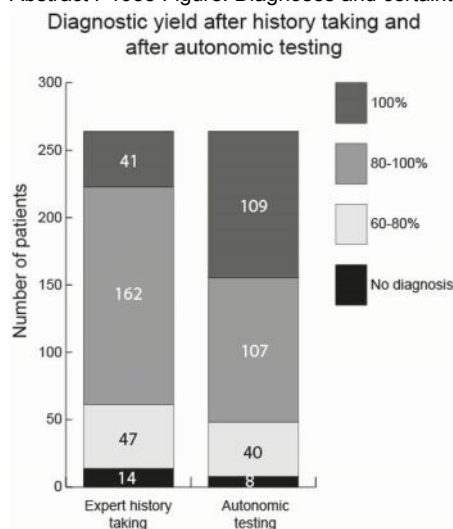
Background: Patients with syncope often stay undiagnosed and especially untreated. As syncope is symptom with potentially lethal as well as benign causes, it is important to make a diagnosis. However, due to specialization and subsequent fragmentation in hospital care, physicians often fall back on ruling out causes in their own field. In addition, the most prevalent cause of syncope, reflex syncope, has not been claimed by any specialty. This results in a low diagnostic yield. The yield in emergency departments and hospital wide has been studied, and is highly variable, but the yield of a tertiary syncope unit has yet to be determined. We assessed the diagnostic yield, accuracy, and safety of a tertiary syncope unit.

Methods: Consecutive patients presenting to a tertiary syncope unit were included. The consultation consisted of history taking, after which a diagnosis could be made, followed by an ECG, physical examination and, based on clinical judgment, autonomic function testing. After the full consultation the initial diagnosis was made and the physician's subjective probability was recorded. The diagnostic yield was defined as the rate of patients that received a diagnosis during the consultation. Patients filled in a questionnaire after 3-6 months and after 1-1.5 years, assessing the number of recurrences, changes in treatment, outcomes of testing, and changes in diagnoses. Patients with a reduction in syncopal episodes of < 50%, with any changes in treatment, diagnosis, or any testing, were reviewed by an expert committee. Follow-up was used as a gold standard to assess the accuracy of the diagnoses.

Results: 264 patients were included. Mean age was 51y (IQR: 34-64y), patients experienced six (IQR: 3-20) life-time syncopal episodes and three (IQR: 1-6) episodes last year. Patients underwent median of 11 diagnostic tests and consulted a median of 6.5 specialists before the syncope unit consultation. After history taking, 250 out of 264 (94.7%) patients were diagnosed. After additional autonomic testing, six additional patients were diagnosed. Autonomic testing increased the subjective probability of the physician (Figure). The accuracy of the diagnoses was 91.3%. No cardiac syncope was missed. Three patients were diagnosed with epilepsy after follow-up.

Conclusion: A tertiary syncope unit has a high diagnostic yield and accuracy, and is safe. No cardiac syncope was missed. However, patients underwent many tests prior to the consultation of the tertiary syncope unit. This study emphasizes the need of thorough history taking in case of unexplained syncope and probably earlier referral to a syncope unit may result in a shorter time to diagnosis with less costs.

Abstract P1088 Figure. Diagnoses and certainty



P1089

Performance of a new implantable cardiac monitor pause detection algorithm in the presence of low-amplitude R-waves

Toquero J.¹; Saha S.²; Perschbacher D.²; Siejko K.²; Herrmann K.²

¹University Hospital Puerta de Hierro Majadahonda, Arrhythmia Unit, Cardiology Department, Madrid, Spain

²Boston Scientific, St. Paul, United States of America

Background: Implantable Cardiac Monitors (ICM) may be used to identify cardiac pauses in patients with unexplained syncope. False pauses are often due to under-sensing of R-waves due to variable or very low amplitude R-waves. An abundance of false pauses increases the burden on clinics.

Purpose: This analysis evaluates the performance of a new pause detection algorithm model for use in an ICM, including scenarios with low amplitude R-waves. The algorithm is designed to maintain sensitivity while reducing false positives from under-sensing or missing/flat-line signal.

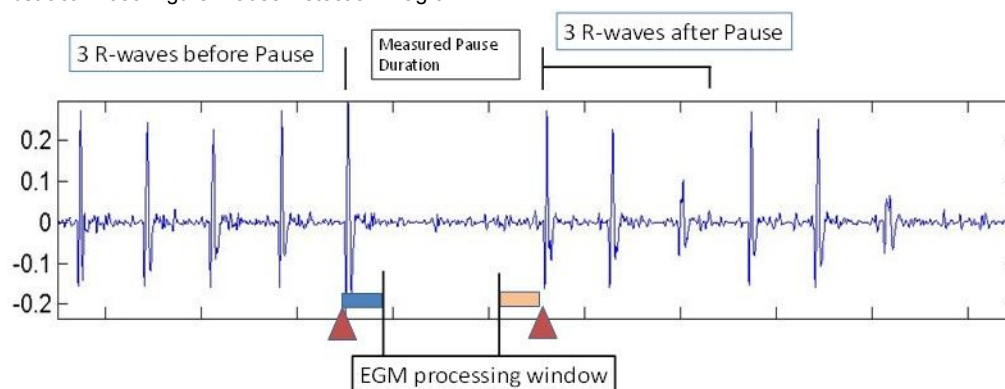
Methods: The ICM pause algorithm uses a proprietary two-step detect/confirm process: 1) Trigger, which detects a suspected pause when an R-R interval is longer than a programmed threshold, and 2) Confirmation, which confirms or rejects the suspected pause. The confirmation process analyzes the signal for broadband myopotential noise, signal-to-noise ratios to determine under-sensing, and non-physiologic flat signals. A software model of the algorithm was tested on a V2-V3 vector from Holter monitor recordings of 2000+ patients. Sensitivity (relative to the detection of R-waves) and positive predictive value (PPV) were evaluated for 3-second pauses under 4 different sensitivity settings.

Results: A total of 1454 suspected 3-second pauses were adjudicated as either true (n = 166) or false (n = 1288). Sensitivity performance for 3-second pauses across the 4 settings ranged from 92% - 99% and PPV ranged 82%-98%. By contrast, when there is no confirmation step (Trigger only), the PPV was 11%. Low amplitude R-waves < 100 μ V adjacent to the pause were present in 58.8% (855/1454) of suspected pauses, 1.8% (3/166) of the true positives, and 28.6% (2/7) of the false positive detections.

Conclusion: The ICM pause detection algorithm maintained high sensitivity and PPV in the presence of low-amplitude R-waves. This algorithm performance may substantially reduce clinic burden.

Data Source	Sensitivity	PPV
Sarkar et al.	(not reported)	50%
Passman et al.	(not reported)	54%
Algorithm Settings		
Trigger Only	100%	11%
Most Sensitive	98.8%	81.6%
More Sensitive	97.0%	92.0%
Balanced	94.0%	95.7%
Less Sensitive	92.1%	98.1%

Abstract P1089 Figure. Pause Detection Diagram



P1090

Positive tilt table test is associated with increased adenosine plasma levels but not with adenosine receptors in patients with syncope

Sotiriadou M.¹; Antoniadis AP.¹; Vergopoulos S.²; Lazaridis C.¹; Konstantinidis P.¹; Virgiliou C.³; Gkika E.⁴; Theodoridis G.³; Mpalaouri I⁵; Mpougiouklis D.⁵; Gerou S.⁵; Papadopoulos C.¹; Fragakis N.¹; Vassilikos V.¹

¹Hippocraton General Hospital of Thessaloniki, Third Department of Cardiology, Thessaloniki, Greece

²General Hospital of Chalkidiki, Department of Internal Medicine, Polygyros, Greece

³Aristotle University of Thessaloniki, Department of Chemistry, Thessaloniki, Greece

⁴Aristotle University of Thessaloniki, Laboratory of Forensic Medicine and Toxicology, School of Medicine, Thessaloniki, Greece

⁵Analysi Iatriki A.E. Diagnostic - Research Clinics, Thessaloniki, Greece

Background/Introduction: Tilt table test and Adenosine test are useful investigations in the diagnostic workup of syncope of unknown origin. It has been suggested that Adenosine plasma levels and Adenosine receptor levels can differentiate patient subgroups with discrete responses to tilt table and Adenosine tests. However, the exact role of Adenosine plasma levels and Adenosine receptor levels in the management of patients with syncope has not yet been fully elucidated.

Purpose: We sought to investigate the Adenosine plasma levels and Adenosine receptor levels in patients without structural heart disease who underwent tilt table and Adenosine tests as part of the diagnostic investigation of syncope.

Methods: Tilt table and Adenosine tests were performed as per the standard protocols. Adenosine test was considered positive in the event of asystole > 6 sec or heart block for > 10 sec after intravenous Adenosine administration at 0.15 mg/kg. Adenosine plasma levels were assessed at three timepoints during the tilt table test: in supine position, immediately after bed tilt and, in cases of a positive test, at the time of syncope. Furthermore, we assessed the A2A Adenosine receptor levels of monocytes in the study patients and in 17 healthy controls.

Results: We enrolled 93 patients (57 women, age 48.04 ± 22.14 years). Adenosine test was positive in 13% of patients and tilt table test in 36.6% of patients. Adenosine plasma levels in supine position did not differ between patients with negative or positive tilt table test (0.30 ± 0.30 vs. 0.47 ± 1.08 ppm/Um/L) and the same applied for negative vs. positive Adenosine test. In patients with positive tilt table test, there was a trend for increased Adenosine plasma levels at the tilt phase (0.47 ± 1.25 vs. 0.44 ± 0.77 ppm/Um/L, $p = 0.09$). Moreover, patients with positive tilt table test exhibited a trend for increased Adenosine plasma levels at syncope (0.82 ± 2.07 vs. 0.47 ± 1.25 ppm/Um/L, $p = 0.07$). Adenosine receptor levels did not differ between patients with negative tilt table test (95.90 ± 94.79), positive tilt table test (119.26 ± 234.53) and controls (59.14 ± 26.16).

Conclusion(s): Patients with positive tilt table test demonstrate a trend for increased Adenosine plasma levels at the tilt phase of the test, and these levels further increase at syncope. Adenosine receptor levels did not differ within patients with syncope and compared to controls. Adenosine plasma levels warrant further investigation and may contribute to the diagnostic evaluation of patients with syncope.

Subject: Poster session 2 -- Syncope and Bradycardia

P1091

Interconnection the characteristics of orthostatic resistance and arterial baroreflex sensitivity in patients with postural tachycardia syndrome

Chepcheruk O.; Glukhovskoi D.; Barsukov A.; Shimanski D.

Kirov Military Medical Academy, Saint Petersburg, Russian Federation

Introduction. Postural orthostatic tachycardia syndrome (PoTS) is one of the manifestations of vegetovascular dystonia. PoTS is reliably more frequent observed in patients prone to neuroreflex syncope compared to those without a history of syncope. Characteristics of a vascular tone control, the state of arterial baroreflex in this population have been little studied.

Purpose. To evaluate the characteristics of orthostatic resistance and arterial baroreflex sensitivity (ABS) in patients with PoTS.

Methods. 159 subjects (120 men and 39 women, mean age 36.4 ± 18.5 years) with a history of orthostatic instability were examined. All subjects passed a prolonged passive orthostatic test (tilt-test) with beat-to-beat mode. The criterion for the diagnosis of PoTS was considered as an increase in heart rate (HR) in orthostasis by 30 or more per 1 minute from baseline, with the development of subjective discomfort symptoms. The examined individuals underwent a baroreflex sensitivity analysis, based on the assessment of two main criteria: the number of baroreceptor responses (BR), and the baroreflex effectiveness index (BEI).

Results. PoTS was verified in 25 subjects, which constitutes 15% of the studied population. These subjects were included in Group 1. The proportion of tilt-positive subjects in this Group corresponded to 25% (6 patients). The dominant mechanism for syncope development in Group 1 was vasodepressor (83% of cases), a mixed mechanism was detected in 17% of cases. Cardioinhibitory syncope was not reported. Group 2 included 134 subjects, with no PoTS diagnose, as per tilt-test results. The proportion of tilt-positive subjects in Group 2 was 28% (45 subjects). The dominant mechanism for syncope in group 2 was mixed (51%), vasodepressor mechanism was detected in 36% of cases, and cardioinhibitory – in 13% of cases. The parameters of ABS in study subjects in most cases were within normal values. The number of BR in Group 1 subjects was 26.8 ± 31.1 units in supine position; 8.4 ± 93.5 units in orthostasis. In Group 2 subjects, the number of BR at rest was 18.1 ± 22.61 units, and 9.2 ± 93.5 units in orthostasis ($p = 0.03$ and $p = 0.1$, respectively). BEI in Group 1 subjects was $0.71 \pm 0.19\%$ in supine position; $0.62 \pm 0.15\%$ in orthostasis. BEI in Group 2 subjects at rest corresponded to $0.63 \pm 0.23\%$, and to $0.61 \pm 0.23\%$ in orthostasis ($p = 0.04$ and $p = 0.1$, respectively).

Conclusions. The incidence of a tilt-positive response in orthostatic-compromised subjects with and without PoTS is comparable. The vasodepressor syncope mechanism was identified reliably more frequent in subjects with PoTS. The mixed mechanism of tilt-induced syncope happened to be more typical for subjects without PoTS. Cardioinhibitory syncope was not observed among tilt-positive subjects with PoTS. All the examined subjects showed normal baroreflex sensitivity parameters at rest. In orthostasis, subjects with PoTS showed a reliably more pronounced decrease in the number of BR and BEI

Subject: Poster session 2 -- Syncope and Bradycardia

P1092

Evaluation of arterial baroreflex sensitivity in subjects with postural tachycardia syndrome

Chepcheruk O.; Glukhovskoi D.; Barsukov A.

Kirov Military Medical Academy, Saint Petersburg, Russian Federation

Relevance. Postural tachycardia syndrome (PoTS) is considered to be one of the manifestations of adverse orthostatic hemodynamic disorders. Characteristics of the vascular tone control, the state of arterial baroreflex in this subpopulation haven't been studied enough.

Purpose. To evaluate the characteristics of arterial baroreflex sensitivity in men with PoTS.

Methods. Sixty men aged 24.9 ± 8.68 years with a history of presyncopal conditions or prolonged syncope during a long stay in a head up position were examined. Subjects with organic pathology of the cardiovascular and central nervous systems were not included into the study. PoTS was verified in some subjects, the diagnosis criterion of which was considered as: the increase in heart rate (HR) in orthostasis by ≥ 30 per 1 minute from baseline in subjects aged ≥ 20 years (and by ≥ 40 per 1 minute in subjects aged ≤ 19 years), or the index of HR > 120 per 1 minute within 10 minutes from the beginning of the head up phase of the tilt-test with the development of subjective discomfort symptoms. According to the tilt-test results, data analysis was carried out for those subjects who experienced PoTS (Group 1), and for those who did not demonstrate symptoms typical for PoTS (Group 2). The heart rate and blood pressure parameters were measured in the beat-to-beat mode at the supine phase of the test, and in a head up position (up to 40 minutes). The criterion for the diagnosis of tilt-positive response was identified as the development of a presyncopal or syncopal condition during the tilt-test.

Results. PoTS was verified in 21 subjects, which is 15% of the studied population (Group 1). The proportion of tilt-positive subjects of this Group corresponded to 33 % (7 patients). Group 2 included 39 subjects without PoTS diagnosis. The proportion of tilt-positive subjects in Group 2 was 13 % (5 patients). The average HR in a supine phase in Group 1 subjects was 67.8 ± 12.1 per 1 minute, and 69.0 ± 11.0 per 1 minute ($p = 0.701$) in Group 2 subjects. The average HR in orthostasis was shown as 103 ± 16.2 per 1 minute in Group 1 subjects, and 89.9 ± 12.5 per 1 minute ($p = 0.002$) in Group 2 subjects. The parameters of baroreflex sensitivity in study subjects in most cases were within normal values. The baroreflex sensitivity index in Group 1 subjects was identified as 69.4 ± 14.8 % in supine position; 56.4 ± 19.3 % in orthostasis. The baroreflex sensitivity index in Group 2 subjects was 76.1 ± 12.5 % in supine position; 66.7 ± 18.0 % in orthostasis (between groups in a supine position: $p = 0.068$, and $p = 0.025$ in a head up position).

Conclusion. The incidence of a tilt-positive response in orthostatic-compromised subjects with PoTS is higher in comparison to those without PoTS. In orthostasis, subjects with PoTS were characterized by a more pronounced decrease in the baroreflex effectiveness index, which may indicate functional insufficiency of regulatory mechanisms in a long stay in a head up position.

Subject: Poster session 2 -- Syncope and Bradycardia

P1093

Value of baseline 12 lead- ECG in predicting syncope caused by arrhythmia in patients wearing an implantable loop recorder

Sandgren E.¹; Rorsman C.¹; Edvardsson N.²; Engdahl J.³

¹Varberg Hospital, Department of Medicine, Varberg, Sweden

²Sahlgrenska Academy at Sahlgrenska University Hospital, Gothenburg, Sweden

³Danderyd University Hospital, Department of Clinical Science, Stockholm, Sweden

Aim: To evaluate the role of baseline 12-lead ECG in predicting the syncope mechanism during continuous monitoring with an implantable loop recorder (ILR).

Methods: Consecutive patients with syncope implanted with an ILR were retro/prospectively enrolled. Baseline 12-lead ECG were related to ECG diagnosis derived from ILR tracings recorded at the time of syncope recurrence.

Results: A total of 300 patients with a mean age of 66 ± 16 years were included, of which 49% (146/300) received an ILR guided diagnosis (syncope recurrence with an ECG recording which confirms or excludes arrhythmia as the cause of syncope) during follow-up. Patients with abnormal baseline ECG received more frequently an ILR guided diagnosis as compared to those with normal baseline ECG (59% vs 44%, $p = 0.018$). For a diagnosis of arrhythmic syncope, the corresponding frequencies were 45% vs 26%, $p = 0.001$.

In total thirty-three patients had bifascicular block at baseline ECG and in this group an ILR guided diagnosis was significantly more common 76% (25/33) compared to those with normal baseline ECG 44% (90/205), ($p < 0.001$). Of those 96% (24/25) were diagnosed with arrhythmic syncope, 23 due to bradyarrhythmia. Bifascicular block occurred almost exclusively among those ≥ 60 years (31 of 33 bifascicular blocks). After logistic regression the adjusted odds ratios for arrhythmic syncope was significant for bifascicular block 5.5 (5.1-5.9, $p < 0.001$) but age was longer an independent risk factor.

There was statistically significant shorter time to ILR guided diagnosis for those with bifascicular block (median 3 months, range 0.25-30) compared to those with atrioventricular block one (median 7 months, range 1-34) or normal baseline ECG (median 9 months, range 0.25-42), $p = 0.004$.

Conclusion: A baseline 12-lead ECG with bifascicular block was a strong predictor for syncope during follow-up, almost exclusively due to bradyarrhythmia. Bifascicular block at baseline was found almost exclusively among those above 60 years of age and we find it reasonable to select permanent pacing instead of an implantable loop recorder for patients above 60 years of age with bifascicular block and unexplained syncope. No other ECG findings were associated with the ILR outcome.

Subject: Poster session 2 -- Syncope and Bradycardia

P1094

Quality of life of patients with syncope one year after syncope unit evaluation

De Jong J S Y¹; De Lange FJ.¹; Van Dijk N.²

¹Academic Medical Center of Amsterdam, Heart Centre, Department of Clinical and Experimental Cardiology, Amsterdam, Netherlands

²Academic Medical Center of Amsterdam, Family Medicine, Amsterdam, Netherlands

Background: Although syncope occurs episodal, patients have the same quality of life as those suffering from chronic diseases like rheumatoid arthritis, chronic backpain, and heart failure. Treatment of patients with syncope in a hospital wide setting has proven to increase the quality of life, but the influence of treatment on the quality of life of patients in a tertiary setting has never been assessed.

Objective: To assess the influence of treatment on the quality of life of patients with syncope in a tertiary syncope unit.

Methods: We included 264 consecutive patients presented in the tertiary syncope unit. Quality of life was assessed on two scales: the Short-Form 12 (SF12) and the Syncope Functional Status Questionnaire (SFSQ), which measure the generic and disease specific quality of life respectively. The Short-Form 12 (SF12) results in two scores ranging from 0 (worst) - 100 (best), the physical component score (PCS) and the mental component score (MCS) of the generic quality of life. Missing SF-12 data was imputed using multiple imputation. The SFSQ results in one score: the syncope dysfunction score (SDS), ranging from 0 (best) - 100 (worst) Patients filled in the questionnaires before their visit to the syncope unit and after 12-18 months. The syncope unit consultation consisted of history taking, physical examination, ECG. Autonomic function tests were performed if indicated. These were: active lying-to-standing test, Valsalva manoeuvre, carotid sinus massage and head-up tilt-table test. The consultation ended with explication of a diagnosis and treatment.

Results: Patients were 51y (IQR: 41-60), had 3 recurrences last year (IQR: 1-6) and 6 during their lifetime (IQR: 3-20). There were more females than males (54%). The generic quality of life of the patients was low at baseline in the physical (PCS: 39.3 ± 12) as well as the mental component (MCS: 45.1 ± 11). Disease specific quality of life was also impaired (43 ± 28). After follow-up (median 61.4 (IQR: 56.0-69.9) weeks), generic quality of life increased significantly (PCS: 42.1 ± 11 , $p < 0.001$; MCS: 47.7 ± 10 , $p < 0.001$), but with a small effect size (effect size = 0.36). Disease specific quality of life increased significantly (mean difference: -16.38 ± 25.9), and with a large effect size (effect size = 0.63). Patients experienced less syncopal episodes after the consultation (median syncopal recurrences: 0 (IQR: 0-4), $p < 0.001$).

Conclusion: Patients with syncope have an impaired quality of life and a tertiary syncope unit is effective in increasing that quality of life, especially in the disease specific domain. Patients experienced significantly less recurrences during the year of follow-up when compared to the year prior to the consultation.

Subject: Poster session 2 -- Syncope and Bradycardia

P1096

Long-term efficacy of tilt training in the treatment of reflex syncope

Laranjo S.¹; Alves S.¹; Rocha I.²; Oliveira M.¹

¹Hospital Santa Marta, Department of Cardiology, Lisbon, Portugal

²Cardiovascular Autonomic Function Lab, Faculty of Medicine of Lisbon, Lisbon, Portugal

Reflex syncope (rS) is a common clinical entity resulting from an excessive reflex autonomic response, particularly during orthostatism. Treatment options are controversial and of limited effectiveness. Tilt training (TTr) is a form of therapy proposed to patients with recurrent forms of rS. The aim of our study was to assess the effectiveness of TTr and to characterize hemodynamic and autonomic responses during a TTr program in patients (P) with rS refractory to conventional measures.

Methods: Between 2005 and May 2018 we enrolled 102P (57,8% female, age $46,13 \pm 18,28$ yrs). All had orthostatic induced rS, refractory to conventional measures and documented by head-up tilt test. All P met the following inclusion criteria: 1) at least 2 syncopal episodes within the last 6 months or 1 syncope and 3 pre-syncopal episodes/year; 2) absence of known structural and/or electrical heart disease; 3) absence of other evident etiologies for syncope. The TTr program included 9 tilt sessions (3 times a week, 30 min; 60° – 6 sessions, 70° – 3 sessions), under ECG and blood pressure (BP) monitoring, combined with home orthostatic self-training (gradually extending time to 30 mn) and 10° head-up during sleep. Stroke volume (SV), cardiac output (CO), total peripheral resistance (TPR), baroreflex sensitivity (BEI) and heart-rate variability were computed. P were examined at 1 month and every 6 months thereafter. Treatment effects were assessed using telephone survey. Quality of life ("Impact of Syncope on Quality of Life" questionnaire) was evaluated before beginning the TTr program and at 6 months follow-up.

Results The average follow-up after TTr was 66.79 ± 41.30 months. Most of the P did not present recurrent episodes of syncope ($n = 89$; 86,3%) or pre-syncope ($n = 82$, 80%). In the remaining P (14%), there was a significant decrease in the number of syncopes (5.1 ± 2.7 /patient/year 12 months before vs. 1.4 ± 0.8 /patient post-TTr; $p = 0.0059$) and pre-syncope ($11,4 \pm 6,2$ /patient/year 12 months before TTr vs. $4,5 \pm 2,6$ /patient post-TTr, $p = 0.0175$). The TTr program was associated with a QoL improvement in the ISQL items, related to worry, fear and frustration with the difficulties experienced ($p < 0.05$). Over the course of the TT program there was a significant increase in mean systolic BP, SV, TPR and CO. Simultaneously, a shift in autonomic nervous system response pattern was seen, associated with an increase of the baroreflex effectiveness index. There was a trend for a global increase in heart rate variability, with a significant decrease of the sympathovagal balance (LF/HF) index.

Conclusion: In refractory rS, TTr may be an effective therapeutic option with long-term benefits and a significant impact in QOL. These results are associated with a significant modulation of autonomic nervous system function, leading to a more homeostatic response and a better baroreflex function.

P1097

The role of beta1 receptor gene polymorphism in the preference of beta blocker treatment in vasovagal syncope patients

Atici A.¹; Barman HAB²; Sonsoz MRS³; Gulsen KG.⁴; Sahin IS.⁴

¹Istanbul gaziosmanpasa taksim training and research hospital, istanbul, Turkey

²Okmeydani Training and Research Hospital, cardiology, Istanbul, Turkey

³Istanbul University , cardiology, Istanbul, Turkey

⁴bagcilar training and research hospital, cardiology, istanbul, Turkey

Introduction: Beta blockers are the most commonly prescribed therapy in vasovagal syncope (VVS). Although recent clinical trials failed to demonstrate beneficial effects of beta-blocker therapy over placebo, these trials did not take into consideration of Beta1 gene polymorphism. We aim to investigate beta1 gene polymorphism in patients with VVS and to assess favourable effects of beta-blocker therapy on prognosis with respect to gene polymorphism

Material/Methods: We included 108 patients who admitted to our outpatient clinic with a complaint of at least one episode of syncope and diagnosed VVS after tilt table test. Beta-blocker therapy initiated with metoprolol succinate and titrated unless the patient is intolerant. The number of syncope/presyncope episodes of patients during the first, third and sixth month prior to therapy is recorded. We search for Arg389Gly alteration on B1-adrenoceptor(ADRB1) gene.

Results: There were 48 patients(54%) with Arg389Arg and 41 patients(46%) with Arg389Gly gene polymorphism. Total episodes of syncope and presyncope before diagnosis and after diagnosis was statistically lower in patients with Arg389Arg gene polymorphism (respectively before diagnosis, after 1,3,6. month $3.25 \pm 0.9/2.70 \pm 0.8$, $p < 0.001$)-(5.39 $\pm$ 1.8/4.47 $\pm$ 1.3, $p:0.005$)-(9.91 $\pm$ 2.0/8.95 $\pm$ 2.0, $p < 0.001$). Patients with Arg389Arg and Arg389Gly gene polymorphism were compared with regard total syncope or presyncope episodes after treatment initiated. 1,3,6,12,18. month total syncope/presyncope episodes compared. Patients with Arg389Arg gene polymorphism had significantly lower number of episodes than patients with Arg389Gly $2.70 \pm 0.8/3.14 \pm 0.7$, $p: 0.013$)-(4.47 $\pm$ 1.3/ 5.31 $\pm$ 1.3, $p:0.005$)-(8.95 $\pm$ 2.0/9.90 $\pm$ 1.7, $p:0.026$)-(12.12 $\pm$ 2.1/13.53 $\pm$ 2.2, $p:0.003$)-(14.20 $\pm$ 2.5/16.04 $\pm$ 1.7, $p < 0.001$).

Conclusion: Treatment effects of beta-blocker therapy in patients with Arg389Arg gene polymorphism, VVS pathophysiology is directly related to the genetic disorders and treatment selection can be based on gene polymorphism.

characteristics of patients with VVS

Age	27.03 $\pm$ 4.18
Female Sex(n, %)	53 (60)
LVEF(%)	67.33 $\pm$ 4.65
SBP (mmHg)	119.5 $\pm$ 6.9
DBP (mmHg)	75.83 $\pm$ 6.1
Heart rate(beat per minute)	79.97 $\pm$ 5.9
TSE	11.12 $\pm$ 2.6
TPSE	13.29 $\pm$ 2.6
Beta blocker dose(mg)-Arg389Arg	108.33 $\pm$ 47.6
Beta blocker dose(mg)-Arg389Gly	101.21 $\pm$ 41.0
Gene Polymorphism-Arg389Arg (n,%) 48 (54)	48 (54)
Gene Polymorphism-Arg389Gly (n,%) 41 (46)	41 (46)

SBP: Systolic blood pressure DBP: Diastolic blood pressure, LVEF : Left ventricular ejection fraction, TSE: Total syncope episode, TPSE: Total presyncope episodes Arg: Arginin, Gly: Glisin.

Abstract P1097 Figure

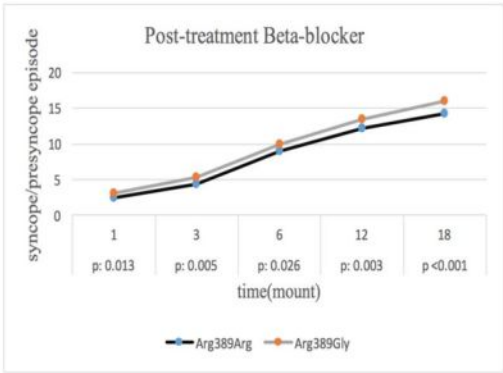


Figure: Frequency of syncope and presyncope according to gene polymorphism in patients with VVS diagnosis post-treatment

P1098

Selection of pacemaker therapy and outcomes in unexplained syncope

Yasa E.¹; Ricci F.²; Hamrefors V.³; Sutton R.⁴; Fedorowski A.¹¹Skåne University Hospital, Department of Cardiology, Malmö, Sweden²G. d'Annunzio University, Chieti, Italy³Dept. of Clinical Sciences, Lund University, Malmö, Sweden⁴Imperial College Healthcare NHS Trust, London, United Kingdom

Funding Acknowledgements: This work was supported by grants from the Swedish Heart and Lung Foundation, Malmö University Hospital, the Crafoord Foundation,

Background: Pacemaker-(PM) therapy is usually effective when syncope is associated with bradyarrhythmia, but syncope recurrences and fall injuries after PM implantation may occur.

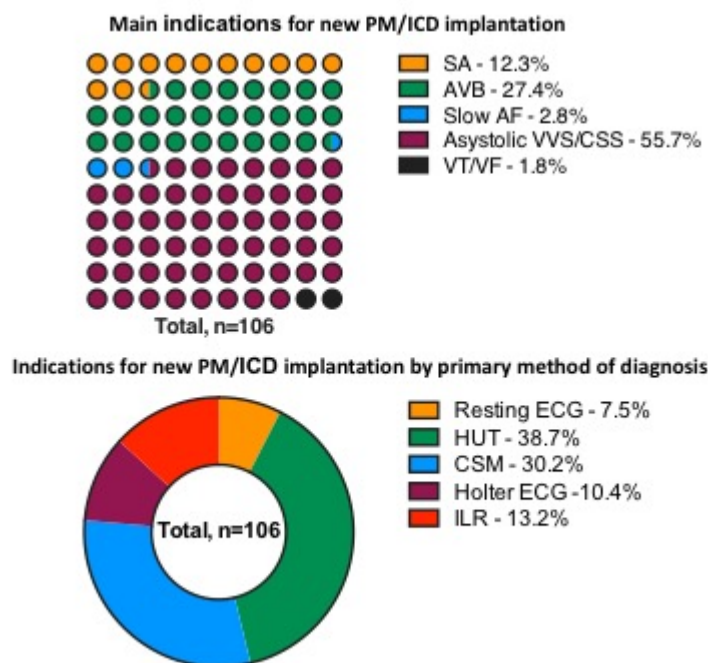
Purpose: We aimed to survey PM indications and outcomes of PM implantation, following evaluation of unexplained syncope.

Methods: Among 1666 consecutive non-paced patients investigated in a tertiary syncope unit by carotid-sinus massage (CSM), head-up-tilt-test (HUT), and ECG-monitoring, 106 (6.4%; age, 65 ± 17 years) received a PM. We assessed methods of bradyarrhythmia detection, indications for PM implantation, and explored incidence of recurrent syncope, fall-related fractures, and mortality.

Results: Indications for PM-therapy were identified in 73/106 patients (69%) by CSM (n = 32) or HUT (n = 41), in 14/106 patients (13%) by implantable loop-recorder (ILR), and in 19/106 (18%) by standard/prolonged ECG (Fig.1). Sinus arrest (SA) was the predominant PM indication during CSM/HUT and external ECG-monitoring, whereas ILR detected proportionally the same number of sinus arrest and AV-block (AVB). During follow-up (median, 4.3 years), 15 patients (14%) had syncope recurrence, 15 suffered low-energy fractures, and nine died. Neither syncope recurrence nor low-energy fracture were dependent on PM-selection method. The composite endpoint of recurrent syncope/fall-related fracture was associated with hypertension (OR 2.45; 95%CI 1.00-6.0), reduced glomerular-filtration-rate (OR 1.63 per 10ml/min; 95%CI 1.22-2.19), and atrial fibrillation (AF, OR 3.98; 95%CI 1.11-14.3). Recurrent syncope indicated increased mortality (OR 9.20; 95%CI 1.89-44.8).

Conclusions: Cardiovascular autonomic testing (CSM/HUT) and ECG monitoring effectively identify pacing indications in patients with unexplained syncope. After pacemaker implantation, hypertension, renal failure and atrial fibrillation predict syncope recurrence and fall-related injury. Recurrent syncope indicates increased mortality.

Abstract P1098 Figure. Indications for PM implantation



Subject: Poster session 2 -- Syncope and Bradycardia

P1099

Evaluation of syncope in emergency care units

Camiletti A.¹; Souza OS.¹; Junior NAO¹; Bronchtein AIC¹; Pinheiro MVT¹; Rangel RAL¹; Abufaiad B.¹; Nascimento EM.²; Pereira BB.²; Oliveira GMM²

¹Rede DOr Sao Luiz, Rio de Janeiro, Brazil

²State University of Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil

Funding Acknowledgements: own financing

OnBehalf: Rede Dor Sao Luiz

Introduction: A dedicated syncope unit operating with standardized protocols with the support of trained experts could reduce the rates of unwarranted admissions, ensuring a higher percentage of proper diagnostics.

Purposes: Analyze syncope evaluation at emergency care units following implementation of syncope unit (SU) and standardized protocols (SP).

Method: Multicentric study involving every patient with a possible syncope diagnosis from the ECUs at 11 hospitals. Creation of SU, SP and flowchart for diagnostic guidance and risk stratification (RS). The SU is created, providing around-the-clock support from experts and implementing protocols for diagnostics orientation and RS. Expository training for all medical teams to present the evaluation processes, detailing the concepts for every variable. Training conducted before SP implementation, over periods of 6 to 12 months. Full details of variables and evaluation processes provided for subsequent consultation.

Results: Roughly 235 ECU doctors underwent training. 1,357 patients included in protocols; average age of patients was 77 (29-90 years old), with 57% being women. The presence of cardiomyopathy (24%) and diabetes (15%) were the most common morbidities. Tests conducted: laboratory exams (1088), electrocardiograms (944) and CT scans of the head (613) in case of trauma or suspected neurological conditions. Legitimate syncope was identified in 87% of cases, with 46% of them reporting previous syncopal episodes, particularly among women (63%). Clinical evaluation verified trauma associated with syncope in 36% of cases. Most common etiologies: reflex syncope (53%) and cardiac syncope (13%). Syncope etiology could not be determined in 19% of cases. Following evaluation and stratification, 57% were discharged and 39% were admitted. 7% of admitted patients had pacemakers/cardioverter-defibrillators implanted, 2% underwent electrophysiology studies and cardiac ablation, and 2% died of non-cardiovascular causes.

Conclusion: The SU resulted in more precise and effective treatment, allowing for etiological diagnoses in 82% of cases. The creation of the SU and use of RS protocols allowed for the hospitalization of high-risk patients, while low-risk patients were discharged and provided with precautionary guidelines.

Subject: Poster session 2 -- Syncope and Bradycardia

P1100

Risk stratification of patients in syncope units

Camiletti A.¹; Souza OFS¹; Bronchtein ASC¹; Junior NAO¹; Abufaiad B.¹; Pinheiro MVT¹; Pereira BB.²; Nascimento EM.²; Rangel RAL¹; Oliveira GMM¹

¹Rede DOr Sao Luiz, Rio de Janeiro, Brazil

²State University of Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil

Funding Acknowledgements: not applicable

OnBehalf: not applicable

Introduction: Inadequate syncope stratification can expose high-risk patients to hazardous situations.

Purposes: Identify highest-risk predictors in patients treated at syncope unit (SU).

Method: Study involving consecutive patients treated at SUs in emergency care units at 11 hospitals in the period from May 2015 to July 2017. The SUs followed controlled protocols (CP) with syncope specialists providing around-the-clock dedicated phone support. Logistic regression (LR) analysis with elastic net regularization was employed for exploratory analysis and variable selection. Once the variables were selected, a nonparametric analysis through Decision Trees (DT) was carried out for predictive purposes with the most relevant variables for the hospitalization outcome. 41 variables were considered based on the CP, such as syncopal episode triggers, consequences of the episode and arrhythmia symptoms (AS) preceding the syncope.

AS in this case were defined as the presence of palpitations or tachycardia during the syncope incident itself, as well as trauma such as major bodily injuries which may necessitate imaging exams. We utilized the R software. P values < 0.001 were considered significant.

Results: 1,184 patients were examined and 40% were hospitalized. The LR isolated 6 out of the 41 variables included with a significance level of 10%: triggers such as postural changes, excretion and head and neck movements, along with age, trauma and arrhythmia symptoms. The age cutoff on the DT was 59 years of age ($p < 0.001$), with the following variables classified as hospitalization predictors: presence of AS ($p < 0.001$) and age > 59 leading to an 84.6% hospitalization rate, and presence of AS ($p < 0.001$) and age ≤ 59 leading to a 87.5% hospitalization rate. Incidence of trauma ($p = 0.002$) was responsible for a 73% hospitalization rate for patients of age > 59, as well as patients of age ≤ 59 when trauma was associated with postural changes in 82.1% of cases.

Conclusion: The SU and use of CP for risk stratification contributed to the hospitalization of a large share of high-risk patients and allowed for the discharging of medium- and low-risk patients.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1101

Cumulative comorbidity and shockable initial rhythm in out-of-hospital cardiac arrest

Van Dongen LHPI; Oving I.; Dijkema PW.; Blom MT.; Tan HL.

Academic Medical Center of Amsterdam, Amsterdam, Netherlands

Funding Acknowledgements: European Union's Horizon 2020, ESCAPE-NET, grant 733381, Netherlands CardioVascular Research Initiative, RESCUED, CVON2017-15

OnBehalf: ARREST

Background: Presence of a shockable initial rhythm (SIR) strongly increases survival chances after out-of-hospital cardiac arrest (OHCA). Various chronic health conditions are associated with lower odds of SIR in OHCA. The relation between cumulative disease burden and presence of SIR is unknown.

Purpose: Study the relationship between cumulative disease burden and SIR in OHCA.

Methods: From a prospective community-based OHCA registry, 1,047 OHCA patients aged ≥ 18 y with presumed cardiac cause in 2012-2013 are included. The Charlson Comorbidity Index (CCI) was determined using medical histories from GPs and hospitals. Presence of SIR was analysed by logistic regression, adjusting for age, sex and resuscitation parameters. Stratification was performed by age and sex.

Results: The mean age was 67.0 ± 13.5 y, 73% were male and 50.1% had SIR. Increasing CCI was associated with older age ($P < 0.001$) and residential location of OHCA ($P < 0.001$). The crude analysis showed a decreased SIR proportion as CCI increased (Table 1, CCI = 0 as reference), but the full model showed no statistically significant associations. Interaction terms were not significant for age ($P = 0.34$) and sex ($P = 0.92$). However, stratification by age showed decreasing ORs of SIR with increasing CCI in patients aged < 70 y, but not in patients aged ≥ 70 y. Stratification by sex showed no statistically significant results.

Conclusions: In patients aged < 70 y, but not in patients aged ≥ 70 y, the odds of SIR during OHCA declined with rising cumulative comorbidity, suggesting that age affects the influence of cumulative comorbidity on initial rhythm in OHCA.

Table 1

A	CCI = 1-2 OR (95%)	CCI = 3-4 OR (95%)	CCI ≥ 5 OR (95%)
Crude	0.76 (0.57-1.02)	0.63 (0.45-0.90)	0.52 (0.34-0.79)
Model 1*	0.85 (0.62-1.16)	0.83 (0.56-1.21)	0.72 (0.45-1.14)
Model 2**	0.84 (0.59-1.20)	0.95 (0.61-1.46)	0.91 (0.54-1.54)
B***			
Age < 70	0.81 (0.53-1.25)	0.53 (0.29-0.98)	0.39 (0.16-0.94)
Age ≥ 70	0.73 (0.39-1.38)	1.37 (0.73-2.58)	1.40 (0.70-2.84)
Male	0.80 (0.53-1.19)	1.00 (0.61-1.66)	0.85 (0.46-1.57)
Female	1.07 (0.50-2.29)	0.85 (0.35-2.07)	1.22 (0.44-3.40)

Panel A. Multivariate analyses of the relation between cumulative comorbidity and SIR. B. Stratified analyses by age and sex. * Adjusted for age and sex. ** Adjusted for age, sex, OHCA location, witnessed collapse, bystander CPR, and time to registration of initial rhythm. *** In analyses stratified by age or, age or sex is removed from the model, respectively.

P1102

Validation of an easy-to-use, operator-independent, clinical model to predict the left vs. right ventricular outflow tract origin of idiopathic premature ventricular contractions

Kueffer T.¹; Baldinger S.¹; Knecht S.²; Seiler J.¹; Spiess F.²; Servatius H.¹; Osswald S.²; Noti F.¹; Schaer B.²; Haeberlin A.¹; Tanner H.¹; Kuehne M.²; Roten L.¹; Sticherling C.²; Reichlin T.¹

¹Bern University Hospital, Bern, Switzerland

²University Hospital Basel, Basel, Switzerland

Introduction: Catheter ablation of frequent idiopathic premature ventricular contractions (PVC) is increasingly used to eliminate symptoms and to prevent or treat PVC-induced cardiomyopathy. The presence of a left ventricular outflow tract (LVOT) origin significantly increases complexity and duration of these procedures. We aimed to independently validate a previously proposed, easy-to-use, operator-independent clinical model to predict an LVOT origin in outflow tract PVC's.

Methods: In a two center observational cohort study, unselected patients undergoing catheter ablation for idiopathic PVCs between 2013 and 2016 were enrolled. All procedures were performed using an electroanatomical mapping system (CARTO 3). Structural heart disease as the underlying cause for the PVCs was ruled out using echocardiography or cardiac MRI at the discretion of the physicians. Successful ablation was defined as a $\geq 80\%$ reduction of the initial overall PVC burden assessed after a median FU of 2.2 months (IQR 1.3-3.7 months) using 24h Holter ECG. Patients with unsuccessful ablation were excluded from this analysis.

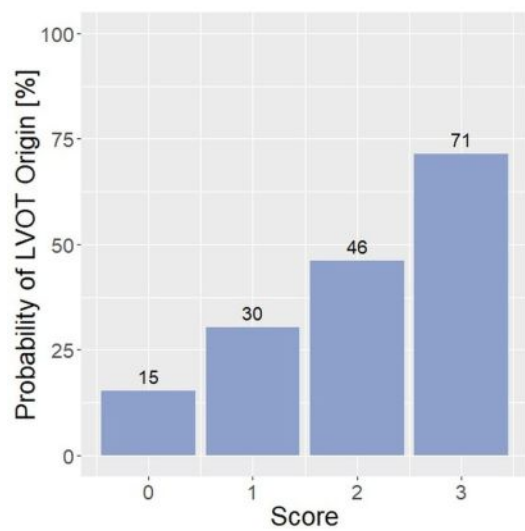
Results: We included 89 consecutive patients with successful radiofrequency ablation of outflow tract PVC's. The median age was 48 years (IQR 39-63 years), 40 patients (45%) were male, and 35 (39%) suffered from hypertension. An LVOT origin was found in 33 patients (37%). The OR for an LVOT origin was 7.8 (95% CI 2.9 – 21.4, $p < 0.001$) for an age > 50 years, 2.3 (95% CI 0.9 – 5.4, $p = 0.07$) for male gender and 2.3 (95% CI 0.9 – 5.4, $p = 0.07$) for the presence of hypertension. A simple score incorporating these three variables to predict an LVOT origin had a predicted probability of 15% for a score 0, 30% for score 1, 46% for score 2, and 71% for score 3 and reached 67% sensitivity and 68% specificity at a cutoff score of 2.

Conclusion: In patients currently referred for outflow tract PVC ablation, an LVOT origin was strongly associated with an older age, and to a lesser extent with male gender and hypertension. The proposed clinical score provides a positive predictive value for an LVOT origin of 71% for a score of 3.

Baseline Characteristics

Variable	Total (n = 89)	Left Ventricle Origin (n = 33)	Right Ventricle Origin (n = 56)	P value
Age (years)	48 (39-63)	61 (51-72)	46 (37-55)	<0.001
Gender (male)	40 (45%)	19 (58%)	21 (38%)	0.07
Hypertension	35 (39%)	17 (52%)	18 (32%)	0.07

Baseline characteristics according to the site of origin of the ventricular arrhythmia
Abstract P1102 Figure. Probability for a LVOT origin



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1103

Gender differences in presentation and outcome of out-of-hospital cardiac arrest

Caputo ML.¹; Burkart R.²; Benvenuti C.²; Conte G.¹; Regoli F.¹; Krull J.¹; Cioffi G.¹; Moccetti T.¹; Klersy C.³; Auricchio A.¹

¹Cardiocentro Ticino, Lugano, Switzerland

²Ticino Heart Foundation, Breganzona, Switzerland

³Policlinic Foundation San Matteo IRCCS, Pavia, Italy

Introduction: Several studies suggest gender difference in presentation and treatment of Out-of-Hospital Cardiac Arrest (OHCA). Unknown is whether the difference is related to lay responder network performance. We aimed to analyse the performance of lay responder network and outcome of OHCA occurred in Swiss Canton Ticino according to the sex of the victim.

Methods: We performed a retrospective analysis of prospectively collected data of OHCA since 2005 in Swiss Canton Ticino. When a cardiac arrest is suspected, assisted triage and life support are dispatched and medical assistance is initiated until an ambulance arrives. The Emergency Medical Service dispatcher send the ambulance and, in parallel, notifies the alert to the traditional first-responders (police officers and fire brigade, trained in Basic Life support-Defibrillation and equipped with an Automatic External Defibrillator). If conditions are regarded as safe, the lay responders are notified as well. The latter are mostly lay persons, but even off-duty healthcare providers.

Results: A total of 3623 patients, 1140 women (31 %) and 2493 men (69%), were included. OHCA in women occurred more often at home (72% versus 63%, respectively, $p < 0.001$) and less frequently it was witnessed (56% versus 63%, respectively, $p < 0.001$). Women were more likely to be older than men (median age 76 versus 69 years old, respectively, $p < 0.001$). In the subgroup of patients with a shockable rhythm, no sex differences were observed in cardio-pulmonary resuscitation received by lay responders before ambulance arrival. However, women were less frequently defibrillated by a lay responder before ambulance arrival (12% versus 22%, $p 0.004$) and, therefore, median time to first shock was slightly prolonged in women respect to men (10 min [8-14] versus 8 min [6-11], respectively, $p 0.03$). Survival at discharge in women was significantly lower, even when the presenting rhythm was a VF or a VT (13% versus 22%, respectively, $p 0.001$).

Conclusions: In our experience, OHCA presentation and outcome significantly differs according to sex. Women presenting with a shockable rhythm had a lower survival compared to male patients due to different clinical presentation (more often occurring at home and unwitnessed) and to delayed time of defibrillation.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1104

Left dominant arrhythmogenic cardiomyopathy: clinical presentation, diagnostic work-up and consistency of current diagnostic criteria

Sicuso R.¹; Casella M.¹; Gasperetti A.¹; Vettor G.¹; Catto V.¹; Sommariva E.¹; Negro G.¹; Mushtaq S.¹; Andreini D.¹; Basso C.²; Dello Russo A.¹; Tondo C.¹

¹Cardiology Center Monzino IRCCS, Milan, Italy

²University Hospital of Padova, Padua, Italy

Background: Left-dominant arrhythmogenic cardiomyopathy (LDAC) is considered a new subtype of the classical right-dominant disease. Clinical presentation is unspecific and often confused with other disease involving left ventricle. The diagnostic criteria for right ventricle arrhythmogenic cardiomyopathy were revisited by Marcus and colleagues in 2010 and have improved the diagnostic sensitivity and specificity but did not include the left-dominant subtype which remains an underrated disease.

Purpose: Our study describes a population of patient suspected and finally diagnosed with LDAC, at our institution. We also show the typical work-up including symptoms and family history evaluation as well as diagnostic tools.

Methods: Patients with uncertain diagnosis but high clinical suspicion of arrhythmogenic cardiomyopathy underwent specific examinations and tests including cardiac magnetic resonance for both morphofunctional study and tissue characterization; electro-anatomic voltage mapping (EVM) for detecting decreased electrical activity and endomyocardial biopsy guided by voltage mapping that accurately detects fibro-fatty substrate involvement.

Results

Arrhythmogenic cardiomyopathy was diagnosed in 93 patients, 19 (20.4%) of them presented LDAC. 13 (68.4%) presented unspecific ECG abnormalities. Only 3 patients experienced a sustained ventricular arrhythmia with right bundle branch block morphology whereas other 6 had frequent ventricular ectopic beats of the same morphology. Echocardiography examination was nearly normal in the majority of patients. Late gadolinium enhancement at cardiac magnetic resonance revealed left ventricular fibro-fatty scarring in 100% of cases. EVM was performed in all patients (in 36.8% of right ventricle, 36.8% of left ventricle, 26.4% of both ventricles) and detected areas of decreased electrical activity in 12 patients. Thirteen patients underwent endomyocardial biopsy (in 11 cases EVM- guided) which in 69.2% revealed fibro-fatty infiltration. 11 patients were evaluated with genetic analysis and 6 (54.5%) of them had causative mutations of desmosomal genes. Finally, only 4 (21%) patients would have LDAC diagnosed according to the existing criteria and in all these cases specific genetic tests and endomyocardial biopsy had to be used to reach the diagnosis.

Conclusion: LDAC is an underestimated pathology which require a specific work-up and probably a revision of diagnostic criteria for arrhythmogenic cardiomyopathy.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1105

Incidence of ventricular arrhythmias and usefulness of patients history in prediction of ajmaline test results in patients with suspected brugada syndrome

Tronconi A.; Galizio N.; Carrero G.; Mysuta M.; Bozza A.; Peltzer M.; Labin B.; Gonzalez JL.

Favaloro Foundation University Hospital, Buenos Aires, Argentina

Background: Brugada Syndrome (BS) is characterized by an increased risk of sudden death. BS is diagnosed in patients (p) with ST-segment elevation with type 1 morphology $\geq 2\text{mm}$ in right precordial leads, occurring either spontaneously or after provocative drug test.

Purpose: Describe the incidence of life threatening arrhythmia events and the most frequent clinical characteristics associated with a positive ajmaline test in p with suspected BS.

Methods: Between 01/2001 and 08/2018, 364p were submitted for a Ajmalina test. BS was suspected because of: familiar history of BS (FH of BS) 12/364p (4%), familiar history of sudden cardiac death in < 35 years (FH of SCD) 28/364p (8%), Brugada Type II or III ECG 245/364p (67%), unexplained syncope 48/364p (13%), SCD 7/364p (2%), non sustained ventricular arrhythmia (NSVA) 8/364p (2%) or atrial fibrillation (AF) in < 35 years old with no other risk factor for AF 15/364p (4%). Ajmaline was administered intravenously 1mg/Kg over 5 minutes or until positivation of the test, prolongation of the QRS duration or presence of ventricular arrhythmia. The test was considered positive as previously described in the literature. Global positive test results and incident sustained ventricular arrhythmias (SVA) were registered. Subgroups analysis according to the reason for initial BS suspicion was performed.

Results: Ajmaline test and sub group results are described in the table. The incidence of SVA was 3/364 (0.8%), two of these p required electrical cardioversion to restore sinus rhythm. No patients died during the test.

Conclusion: In our study population, the ajmaline positivity test rate variates according to the initial suspicion. The clinical characteristic associated with the highest positive rate was FH of BS and secondly the FH of SCD. The high rate of positivity in the FH of BS group is consistent with the genetic heritage of the syndrome. We observed a low incidence of SVA. According with our findings, Ajmaline test is a safe procedure to perform in p with suspected BS.

Results

Global population	123/364 (34%)
Brugada Typi II or III on ECG	82/245 (33%)
AF	3/15 (20%)
FH of BS	7/12 (58%)
FH of SCD	14/28 (50%)
Unexplained syncope	13/48 (27%)
SCD	2/7 (28%)
NSVA	1/12 (8%)

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1106

Impact of transcatheter mitral valve repair on ventricular arrhythmias

Eitel C.; Ledwoch J.; Ledwoch J.; Stiermeier T.; Desch S.; Saad M.; Vogler J.; Heeger CH.; Thiele H.; Eitel I.; Tilz RR.

Medical University, Lübeck, Germany

Aims: Patients with heart failure and severe mitral regurgitation (MR) have a poor prognosis and carry an increased risk for ventricular arrhythmias. The present study evaluates the impact of transcatheter mitral valve repair using the MitraClip on the potential reduction of ventricular arrhythmias.

Methods: Patients undergoing MitraClip implantation were prospectively enrolled into the present study and received 24h Holter EKG assessment prior to and 6 months after the procedure. In addition left ventricular dimensions and function were assessed at baseline and follow-up.

Results: A total of 50 patients with mainly functional MR (82%) were included. Sustained or nonsustained ventricular tachycardia (sVT/nsVT) occurred in 33% of patients and was reduced to 12% after the procedure ($p = 0.01$). Also, premature ventricular complex burden (PVC) burden $\geq 5\%$ was decreased from 16% to 4% ($p = 0.04$). Patients with persistent ($n = 3$) or new sVT/nsVT ($n = 3$) at follow-up showed a significant decrease in left ventricular ejection fraction (from 43% [38 – 51%] to 38% [30 – 44%]; $p = 0.01$).

Conclusions: Transcatheter mitral valve repair using MitraClip reduced the risk for ventricular arrhythmias in the majority of patients. Patients with persistent or new ventricular arrhythmias after MitraClip implantation showed progression of heart failure and remain at increased risk for pump failure and ventricular arrhythmias.

P1107

Ventricular arrhythmias in obstructive sleep apnea patients

Marinheiro R.; Parreira L.; Amador P.; Mesquita D.; Sousa S.; Silva M.; Fonseca M.; Farinha J.; Esteves A.; Santos B.; Chambel D.; Carradas C.; Lopes C.; Caria R.

Hospital Center of Setubal, Setubal, Portugal

Background: Although several arrhythmias have been proposed to be linked with obstructive sleep apnea (OSA), there is some controversy regarding the high frequency of ventricular arrhythmias in OSA patients.

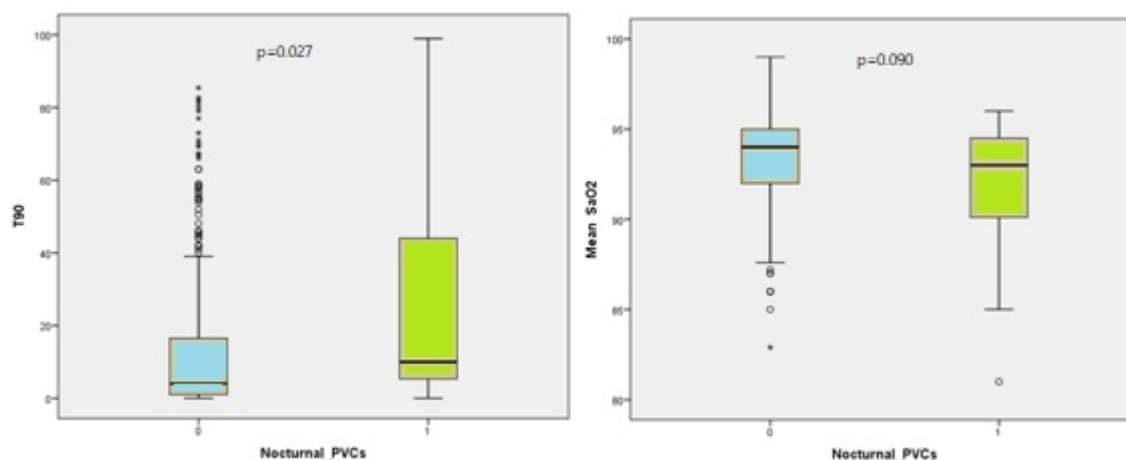
Objective: To determine if ventricular arrhythmias are associated with OSA.

Methods: We studied patients referred for polysomnography who also performed a 24-hour Holter monitoring. Moderate to severe OSA was considered when an apnoea/hypopnoea index (AHI) >15 was present. Mean oxygen saturation (SaO₂) and percentage of total sleep time with SaO₂ < 90% (T90) were evaluated during sleep. Based on Holter monitoring, we analysed number of premature ventricular contractions (PVCs), frequent PVCs (>30/h), non-sustained and sustained ventricular arrhythmias and also the circadian pattern of these arrhythmias. Multivariate logistic regression was used to examine the association between ventricular arrhythmias and OSA.

Results: We studied 343 patients [median age 66 (56-72) years, 62% male, body mass index (BMI)=31 (28-34)]. 143 (42%) had moderate to severe OSA, median AHI was 12 (6-26), mean SaO₂ was 94% (92-95) and median T90 was 5% (1-17). Median number of PVCs was 21 (1-250), 63 patients (26%) had frequent PVCs, 17 patients (5%) had NSVT and no patient had VT. The presence of moderate to severe OSA was not associated with number of PVCs, frequent PVCs or NSVT. However, it was associated with predominantly nocturnal PVCs (Odds ratio 4.0, 95% confidence interval 1.0-16.3, $p = 0.05$), after adjusting for age, gender, BMI. Patients with nocturnal PVCs had a higher T90 comparing to those without nocturnal PVCs, but there was no statistically significant difference between the presence of nocturnal PVCs and mean SaO₂ (figure).

Conclusions: The presence of moderate to severe OSA was not related to the frequency or complexity of ventricular arrhythmias, but it is associated with the circadian pattern of PVCs. Nocturnal PVCs were related to the percentage of total sleep time with SaO₂ < 90%, highlighting the possible role of hypoxemia in arrhythmogenesis of OSA patients.

Abstract P1107 Figure. Statistical box plot analysis



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1108

Ventricular arrhythmia risk after cardiac resynchronization therapy depends on myocardial scar but not on left ventricular remodeling. The GAUDI-Remod study

Linhardt M.¹; Doltra A.²; Acosta J.³; Jauregui B.⁴; Fernandez-Armenta J.⁵; Anguera I.⁶; Bispal F.⁷; Marti-Almor J.⁸; Tolosana JM.¹; Penela D.⁹; Soto-Iglesias D.¹; Ortiz JT.²; Mont L.¹; Auricchio A.¹⁰; Berruezo A.⁴

¹Sección de Arritmias, Hospital Clínic de Barcelona, Barcelona, Spain

²Hospital Clínic de Barcelona, Barcelona, Spain

³Hospital Universitario Virgen del Rocío, Sevilla, Spain

⁴Heart Institute, Teknon Medical Center, Barcelona, Spain

⁵University Hospital Puerta del Mar, Cadiz, Spain

⁶University Hospital of Bellvitge, Barcelona, Spain

⁷Germans Trias i Pujol Hospital, Badalona (Barcelona), Spain

⁸Hospital del Mar, Barcelona, Spain

⁹Ospedale Guglielmo da Saliceto, Piacenza, Italy

¹⁰Cardiocentro Ticino, Lugano, Switzerland

Introduction

Ventricular arrhythmia risk estimation in patients with severe heart failure is challenging. Left ventricular (LV) ejection fraction (LVEF) is the most widely used parameter, however, its predictive value is limited. Myocardial scar in the LV as detected with delayed enhancement cardiac magnetic resonance (DE-CMR) is an emerging risk predictor and has been shown to be associated with malignant arrhythmic events and sudden cardiac death (SCD), both in ischemic (ICM) and non-ischemic cardiomyopathy. Patients qualifying for cardiac resynchronization therapy (CRT) are expected to improve LVEF and, surpassing the threshold of 35%, many of them abandon the ICD indication for primary prevention of SCD.

Purpose

The aim of this prospective international multi-center trial was to evaluate the association of myocardial scar with malignant arrhythmic events and mortality in function of the echocardiographic response in patients receiving CRT.

Methods: Decision between CRT-defibrillator (CRT-D) and CRT-pacemaker (CRT-P) was made clinically by the treating cardiologist. DE-CMR was performed in all patients before device implantation to determine presence and mass of LV scar. Transthoracic echocardiography was performed at baseline and 12 months to determine response to CRT. Follow-up clinical evaluation and device interrogation was performed every 6 months.

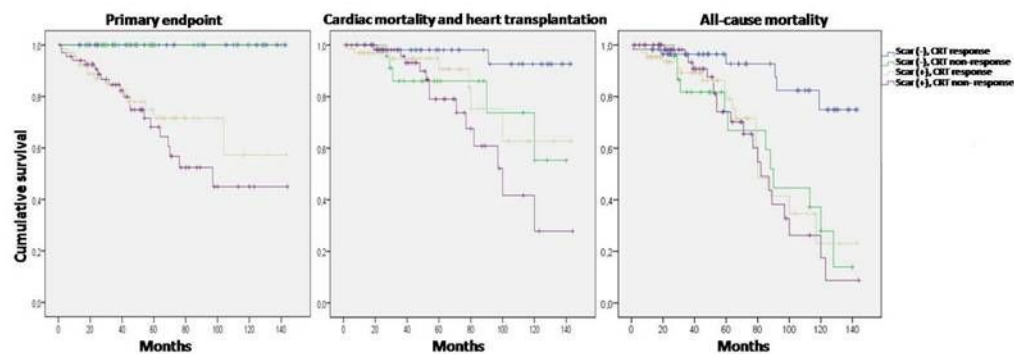
Results

218 patients (158 (73%) male, mean LVEF $26 \pm 7\%$, 79 (36%) ICM) with indication for CRT were included and followed for 54 ± 37 months after device implantation (60 CRT-P (27.5%) vs. 158 CRT-ICD (72.5%)). LV myocardial scar was present in 135 (62%) patients (mean scar mass 22 ± 23 g). 126 (58%) patients were CRT responders, defined as showing a reduction in LV end-systolic volume (LVESV) of $\geq 15\%$ within 12 months. The composite endpoint of sustained VT, appropriate ICD therapy and SCD was only reached in patients with myocardial scar and was independent of CRT response (HR 1.023 [1.016-1.030] for each 1g increase of scar mass and 1.002 [0.989-1.016] for each 1% of LVESV reduction in the multivariate analysis). With respect to cardiac mortality and heart transplantation, presence of myocardial scar and non-response to CRT had an additive effect. All-cause mortality was only significantly better in patients who did not have a myocardial scar and also were responders to CRT as compared to all other groups (Figure 1).

Conclusions

Malignant arrhythmic events and SCD depend on the presence of myocardial scar but not on the response to CRT. Only the absence of myocardial scar in combination with response to CRT was associated with improved all-cause mortality.

Abstract P1108 Figure. Kaplan Meier estimates



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1109

Frequent premature ventricular contractions in the absence of structural heart disease display a more benign profile

Parreira AL.; Marinheiro R.; Mesquita D.; Amador P.; Farinha J.; Fonseca M.; Lopes C.; Chambel D.; Carradas C.; Caria R.

Centro Hospitalar de Setúbal, Setúbal, Portugal

Background and aims: The prognosis of frequent premature ventricular contractions (PVC) depends on the presence of structural heart disease (SHD). The aim of this study was to evaluate the characteristics of the PVCs in the 24 hours Holter recording, in terms of frequency and complexity, according to the presence of SHD.

Methods: We evaluated 1967 consecutive 24-hour Holter monitoring performed between 2006 and 2010 in a single center. Patients with atrial fibrillation were excluded. 312 patients with more than 40 PVCs/hour were retrospectively evaluated. Patients were divided in two groups according to the presence SHD. We evaluated the characteristics of the PVCs in terms of frequency and presence of complex forms.

Results: In 177 patients (57%) PVCs were considered idiopathic and in 135 patients (43%) SHD was present; 93 patients (69%) had ischemic heart disease, 21 (16%) non ischemic cardiomyopathy, 7 (5%) hypertrophic cardiomyopathy, 9 (7%) aortic stenosis, 3 patients had mitral valve disease, one left ventricular non-compaction and one myocarditis. The number of PVCs did not differ between groups. However idiopathic PVCs were more frequently monomorphic, and couplets, triplets and episodes of non-sustained ventricular tachycardia (NSVT) were less prevalent (see Table).

Conclusion: In this group of patients with frequent PVCs, the idiopathic forms had a more benign profile than the forms secondary to SHD.

	Idiopathic (n = 177)	Structural Heart Disease (n = 135)	P value
Age in years, median (IQR)	68 (60-77)	70 (62-76)	0.433
Male gender, n (%)	85 (48%)	101 (75%)	<0.0001
Antiarrhythmic medication, n (%)	48 (27%)	70 (52 %)	<0.0001
PVC number, median (IQR)	2833 (1618- 7285)	2976 (1504-6346)	0.517
Monomorphic (%) / Polimorphic (%)	28% / 72%	13% / 87%	0.002
Couplets, n (%)	117 (67)	118 (87)	<0.0001
Triplets, n (%)	47 (26)	59 (44)	0.002
NSVT episodes, n (%)	22 (12%)	40 (30%)	<0.0001

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1110

Brugada Syndrome in a paediatric population: correlation between symptoms at presentation and clinical, genetic and electrocardiographic features

Gribaudo E.; Gabbarini F.; Cerrato N.; Fumero F.; Giacchino D.; Bergamasco L.; Agnoletti G.; Gaita F.; Giustetto C.

Hospital Molinette of the University Hospital S. Giovanni Battista/City University Hosp of Health an, Turin, Italy

Aim

Brugada syndrome (BrS) is an arrhythmogenic disease associated with sudden death (SD). Few studies exist on the paediatric population. The aim of this study was to analyse the clinical, electrocardiographic (ECG) and genetic characteristics of the paediatric population of the Brugada Registry

Methods

1044 patients were included in the Registry from 2001 to 2017. Patients younger than 18 years old at the time of the diagnosis were considered.

Results

Forty-three patients were included in the study (77% male). Mean age at diagnosis was 11 ± 5 years. Thirty-five (81%) were asymptomatic, while 8 (19%) experienced symptoms before the diagnosis: 2 died for ventricular arrhythmias, one had a documented sustained ventricular tachycardia and 5 experienced suspected arrhythmic syncope. Mean age at first event was 6 ± 5 years. The two patients with arrhythmic death had a coved-type ST segment elevation in multiple peripheral leads and homozygous SCN5A and SCN10A mutations. Genetic test was performed in 28 patients (80%) and a SCN5A/SCN10A mutation was identified in 5 (71%) symptomatic and in 11 (52%) asymptomatic children. Type 1 ECG was documented in 7 (87%) symptomatic and in 23 (66%) asymptomatic children. A fragmented QRS was recorded in 3 (38%) symptomatic and in 1 (3%) asymptomatic child ($p = 0.01$). S wave in lead II was significantly longer in the symptomatic group than in the asymptomatic one ($p = 0.04$).

Conclusion: Fragmented QRS, coved-type ST segment elevation in peripheral leads and longer S wave duration in lead II were more common in patients with symptoms at presentation than in those asymptomatic. Homozygous mutations in sodium channel genes were found only in patients with major ventricular events.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1111

Ventricular arrhythmia recurrence in patients with myocarditis, a french multicenter retrospective study

Zouaghi A.¹; Rosier L.²; Schmidt M.¹; Marijon E.³; Extramiana F.⁴; Algarrondo V.⁴; Lellouche N.⁵; Manenti V.⁶; Waintraub X.¹; Guenancia C.²; Gandjbakhch E.¹

¹Hospital Pitie-Salpetriere, Paris, France

²University Hospital of Dijon, Dijon, France

³European Hospital Georges Pompidou, Paris, France

⁴Hospital Bichat-Claude Bernard, Paris, France

⁵Mondor Hospital, Paris, France

⁶Institut Cardiovasculaire Paris Sud, Paris, France

OnBehalf: GPUR (Groupe parisien universitaire en rythmologie Investigators)

Introduction: Ventricular arrhythmia (VA) is a classical complication of myocarditis. The arrhythmia recurrence risk is poorly known and the long-term management, including indications for implantable cardiac defibrillators (ICD), is controversial.

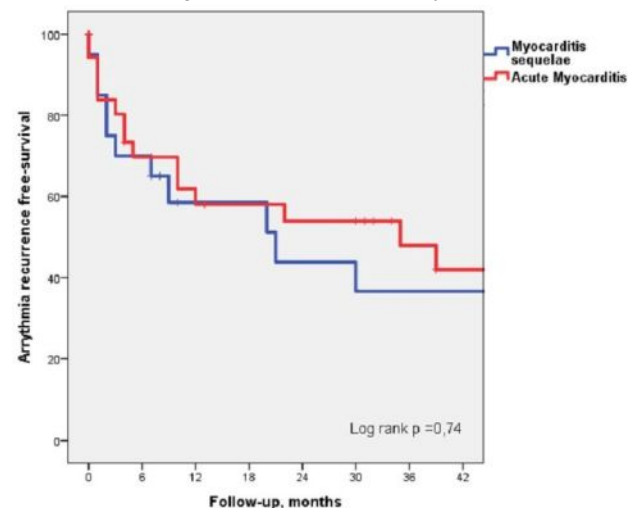
Aim: To study the recurrence of sustained VA in patients with acute myocarditis or chronic myocarditis sequelae.

Methods: All patients from seven tertiary hospitals with clinical suspicion of myocarditis and sustained ventricular tachycardia or ventricular fibrillation were included in the study cohort.

Results: 55 patients were included (73% of men). The diagnosis of myocarditis was made by myocardial biopsy in 6 patients (11%) and cardiac MRI in 46 patients (84%). 35 patients had acute myocarditis (64%) and 20 sequelae. Six patients died during the first hospitalization. During a median follow-up of 39 months, VA reoccurred in 27 patients (55% of survivors) within a median time of four months, with no significant difference between patients with acute myocarditis or sequelae. The only risk predictive factor for VA recurrence was the presence of a left ventricular dysfunction on MRI (HR = 2.61, 95% CI = [1.06-6.43], p = 0.037). An ICD was implanted in 40 patients, of whom 47.5% benefited from appropriate therapies. 20 patients underwent radiofrequency ablation procedures, of whom 40% had VA recurrence after the last ablation.

Conclusion: Sustained VA complicating acute or sequelae of myocarditis display a very high risk of recurrence, and should be discussed for ICD.

Abstract P1111 Figure. Survival curve for arrhythmia recurrence



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1112

Incidence, predictors and clinical impact of electrical storm in patients with left ventricular assist devices: new insights from the ASSIST-ICD study

Martins RP.¹; Leclercq C.¹; Auffret V.¹; Boule S.²; Mondoly P.³; Sacher F.⁴; Kindo M.⁵; Gaudard P.⁶; Gourraud JB.⁷; Defaye P.⁸; Hamon D.⁹; Bories MC.¹⁰; Eschallier R.¹¹; Flecher E.¹; Galand V.¹

¹University Hospital of Rennes - Hospital Pontchaillou, Department of Cardiology and Vascular Disease, Rennes, France

²CHRU Lille, Lille, France

³University Hospital of Toulouse, Toulouse, France

⁴University Hospital of Bordeaux, Bordeaux, France

⁵University Hospital of Strasbourg, Strasbourg, France

⁶University Hospital of Montpellier, Montpellier, France

⁷University Hospital of Nantes, Nantes, France

⁸University Hospital of Grenoble, Grenoble, France

⁹University Hospital Henri Mondor, Creteil, France

¹⁰Hôpital Européen Georges Pompidou- Université Paris Descartes, Paris, France

¹¹University Hospital Gabriel Montpied, Clermont-Ferrand, France

Funding Acknowledgements: French Federation of Cardiology

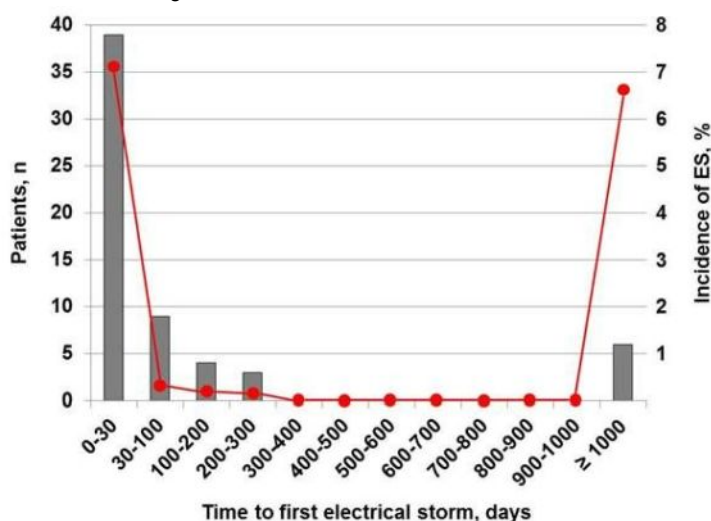
Aims: Ventricular arrhythmias (VAs) can occur after continuous-flow left ventricular assist devices (LVAD) implantation, as a single arrhythmic event, or as an electrical storm (ES) with multiple repetitive VAs episodes. We aimed at analyzing the incidence, predictors and clinical impact of ES in LVAD recipients.

Methods: Patients analyzed were those included in the multicenter ASSIST-ICD observational study. ES was consensually defined as occurrence of ≥ 3 separate episodes of sustained VAs within a 24-hour interval.

Results: Among 652 LVAD patients, 61 (9.4%) presented an ES during a follow-up period of 9.1 (2.5-22.1) months. First ES occurred after 17 (4.0-56.2) days after LVAD implantation, most of them during the first month after the device implantation. The incidence then tended to decrease and re-increasing after few years of follow-up (Figure). A history of VAs prior to LVAD implantation and heart failure duration > 84 months were independent predictors of ES. The occurrence of ES was associated with an increased early mortality since 20 patients (32.8%) died within the first two weeks after ES. Twenty-two patients (36.1%) presented at least one recurrence of ES, occurring 43.0 (8.0-69.0) days after the initial ES. Overall, the survival of patients presenting or not an ES was similar, although a trend towards higher mortality was observed in ES patients.

Conclusion: Almost 10% of the patients implanted with an LVAD will present an ES after mid-term follow-up. A history of VAs prior to LVAD and long heart failure duration are predictors of the occurrence of an ES during follow-up. The short-term mortality after ES is high, and one-third of the patients will die within 15 days. Whether radiofrequency ablation of arrhythmias improves outcomes would require further studies.

Abstract P1112 Figure.



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1113

Population-specific genetic architecture in a representative patient cohort with LQT syndrome and effectiveness of family cascade screening

Krebsova A.¹; Norambuena P.²; Votypka P.²; Tavecova T.³; Kubus P.³; Petrakova J.⁴; Segetova M.¹; Piherova L.⁵; Macek Sr M.²; Macek Jr M.²; Janousek J.³; Kautzner J.¹

¹Institute for Clinical and Experimental Medicine (IKEM), Cardiology, Prague, Czech Republic

²Motol University Hospital, Institute of Biology and Medical Genetics, Prague, Czech Republic

³2nd Faculty of Medicine, Charles University in , Children's Heart Centre, Prague, Czech Republic

⁴University Hospital Olomouc, Cardiology, Olomouc, Czech Republic

⁵General University Hospital, Institute of Inherited Metabolic Disorders, Prague, Czech Republic

Funding Acknowledgements: Supported by Ministry of Health of the Czech Republic, grant Nr. NV18-02-00237 by G90039 (IKEM, institutional support) and NF-CZ11-PDP-3-003-2014

Introduction: Long QT syndrome is a genetically heterogeneous disorder with type-specific risk for ventricular arrhythmias and sudden cardiac death (SCD).

Purpose: The purpose of this study was to assess the molecular architecture of LQT in a pilot cohort of adult and paediatric affected individuals.

Patients and Methods: The study group comprised unrelated 73 individuals (39 adults/34 children). The mean QTc interval was 500 ms in adults- and 514 ms in paediatric individuals. There were 21/39 (54 %) cardiac arrest survivors in adults and 9/34 (26 %) among paediatric patients. Genetic counselling was followed by custom-made targeted panel using massively parallel DNA sequencing comprising 229 cardiac conditions-related genes. Presence of pathogenic variants was independently validated by Sanger DNA sequencing and by family segregation analyses.

Results: Class 4 or 5 (ACMG.net) DNA variant detection rate was 59 % in adults and 71 % in children (see the table). The most frequent gene with a causative DNA variant was KCNQ1 (56 % of pathogenic variants) in paediatric- and KCNH2 (65 %) in adult patients, resp. Two non-related KCNH2 homozygotes for a variant absent in ExAC database (KCNH2 c.526C > T p.Arg176Trp, class 2) were identified, both having severe phenotype. Further compound heterozygotes for KCNH2 genes and KCNH2/KCNQ1 DNA variants (1 each) were identified in severely affected children. Family cascade screening was performed in 68/73 families and 50 individuals (from 27/68 tested families) with risk of malignant arrhythmias were identified.

Conclusions: Next generation sequencing revealed high percentage of pathogenic LQTS DNA variants, especially in the paediatric cohort (71 %). Detection rate in adults was insignificantly lower (59 %). The finding of variant in the KCNH2 gene specific for a population emphasizes the need for development of population-specific variant databases. Family cascade screening revealed a significant number of affected relatives.

Gene frequency in Czech cohort

Mutations in Genes (Class 4-5 ACMG):	KCNQ1	KCNH2	SCN5A	KCNJ2	ANK2	SNTA	No of pts with class 4/5 variant
Adults (N = 39)	6	15	0	1	1	0	23/39 (59 %)
Children (N = 34)	14	5	4	1	0	1	24/34 (71 %)
P	=0.045	=0.003	-	-	-	-	NS

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1114

Survival in heart failure ischemic patients without implantable cardioverter defibrillator

Da Silva Rocha M.; Costa R.; Freitas De Siqueira S.; Hueb W.; Machado Cesar L.; Peixoto G.; Martinelli Saccab MG.; Hueb T.; Martinelli Filho M.

Instituto do Coracao FMUSP, Pacemaker, Sao Paulo, Brazil

Background: In patients with ischemic cardiomyopathy (ICM) and severe left ventricular dysfunction, landmark primary prevention implantable cardioverter defibrillator (ICD) trials date back more than 15 years. These studies report better survival rates in patients with ICD; however, tailored medical therapy has advanced greatly, and the use of ICDs needs to be reassessed.

Aims: The aim of this study was to evaluate the survival rates of patients with ICM and severe left ventricular dysfunction without an ICD.

Methods: It is a prospective observational cohort study that analyzed patient records from a tertiary hospital. Patients with multivessel coronary disease who previously had undergone coronary artery bypass graft surgery, percutaneous coronary intervention, or medical therapy alone were included. The outcomes were all-cause mortality, sudden cardiac death and cardiovascular death.

Results: Of the 573 eligible patients between August 2010 and September 2014, 506 were included in the analysis. There were 386 (76.3 %) men; mean age was 65.3 ± 10.4 years, mean left ventricular ejection fraction was 29 ± 5 (%), 79.3% of the patients were in NYHA Functional Class I/II and 91.9% in Canadian Cardiovascular Society Grading System score angina class I/II, systemic hypertension was present in 85.6%. The patients were under optimized medical therapy. The 30- month survival rate was 85.4%, and survival free of cardiovascular death was 90.7%. Atrial fibrillation, type 2 diabetes, chronic kidney disease, and male gender were independent predictors of all-cause mortality.

Conclusions: Nowadays survival of patients with ICM without ICD suggests the reassessment of current ICD indication for primary SCD prevention.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1115

Mean entropy predicts failed anti-tachycardia pacing or ventricular fibrillation using cardiac MRI texture analysis of scar heterogeneity

Gould J.¹; Porter B.¹; Chen Z.¹; Claridge S.¹; Sidhu BS.¹; Sieniewicz BJ.¹; Bishop M.¹; Niederer S.¹; Rajani R.²; Carr-White G.²; Chiribiri A.¹; Rinaldi CA.²

¹King's College London, Division of Imaging Sciences & Biomedical Engineering, London, United Kingdom

²Guy's & St Thomas' NHS Foundation Trust, Cardiology Department, London, United Kingdom

Background: Risk stratification of patients at risk of ventricular arrhythmia (VA) remains complex in both ischaemic and non-ischaemic cardiomyopathy (ICM and NICM) populations. Quantifying microchannels within surviving areas of scar tissue (responsible for re-entrant VA) may be possible using Cardiac Magnetic Resonance texture analysis (CMR-TA) to quantify scar heterogeneity from late gadolinium enhancement (LGE) imaging. In a recent study, we have shown that mean entropy, calculated using CMR-TA, predicts appropriate ICD therapy.

Purpose: To develop a risk stratification tool to determine which patients are at high risk of ATP failure for ventricular tachycardia (VT) or spontaneous ventricular fibrillation (VF) and therefore likely to require shock therapy. We therefore hypothesised high mean entropy (higher degree of total scar inhomogeneity) is associated with a high risk of shock therapy for failed ATP or spontaneous VF.

Methods: We performed a prospective longitudinal study of consecutive patients receiving ICD implantation in a tertiary cardiac centre. All patients underwent CMR imaging including late gadolinium enhancement (LGE) prior to ICD implantation. A standardised program for appropriate VA detection and ATP/shock therapy was used. The primary endpoint was failed ATP or spontaneous VF. All types of scar were manually segmented on short axis LGE images at basal, mid-ventricular and apical levels. Texture analysis was then performed in all patients using dedicated custom built software. An initial filtration step highlighted objects with a 2-6mm radius using a Laplacian filter and were denoted as spatial scaled factor (SSF) 2-6. Histogram analysis of pixel intensity was subsequently performed and mean entropy calculated.

Results: 130 patients were recruited and 16 excluded from the analysis due to absence of LV scar. A total of 33 out of the remaining 114 patients had appropriate ICD therapy (median time to therapy 329 [IQR 116-529] days, age 60 ± 14 years, 87.9% male, LVEF $29.8 \pm 12.9\%$, 54.5% ICM, 45.5% secondary prevention). Analysis of those having appropriate ICD therapy showed 16/33 had successful ATP (no shock therapy) and 17/33 had failed ATP or spontaneous VF (with successful shock therapy). Univariable analysis of those receiving appropriate ICD therapy showed only secondary prevention and mean entropy were associated with the primary endpoint (Figure 1A). In a multivariable Cox Regression model adjusting for significant and important clinical covariates (LVEF $\leq 35\%$, ICM, secondary prevention), mean entropy was an independent predictor of failed ATP or spontaneous VF (HR 3.50, 95% CI 1.29-9.54, $p = 0.014$) (Figure 1B).

Conclusion: Mean entropy was an independent predictor of failed ATP or spontaneous VF suggesting a potential role for CMR-TA in not only risk stratifying patients for ICD implantation, but also in identifying which patients are likely to fail ATP or have spontaneous VF and require early shock therapy.

Abstract P1115 Figure 1



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1116

Mean entropy predicts appropriate ICD therapy using cardiac magnetic resonance texture analysis of scar heterogeneity

Gould J.¹; Porter B.¹; Chen Z.¹; Claridge S.¹; Sidhu BS.¹; Sieniewicz BJ.¹; Bishop M.¹; Niederer S.¹; Rajani R.²; Carr-White G.²; Chiribiri A.¹; Rinaldi CA.²

¹King's College London, Division of Imaging Sciences & Biomedical Engineering, London, United Kingdom

²Guy's & St Thomas' NHS Foundation Trust, Cardiology Department, London, United Kingdom

Background: Risk stratification of patients at risk of ventricular arrhythmia (VA) remains complex in both ischaemic and non-ischaemic cardiomyopathy (ICM and NICM) populations. Quantifying microchannels within surviving areas of scar tissue (responsible for re-entrant VA) may be possible using Cardiac Magnetic Resonance texture analysis (CMR-TA) to quantify scar heterogeneity from late gadolinium enhancement (LGE) imaging.

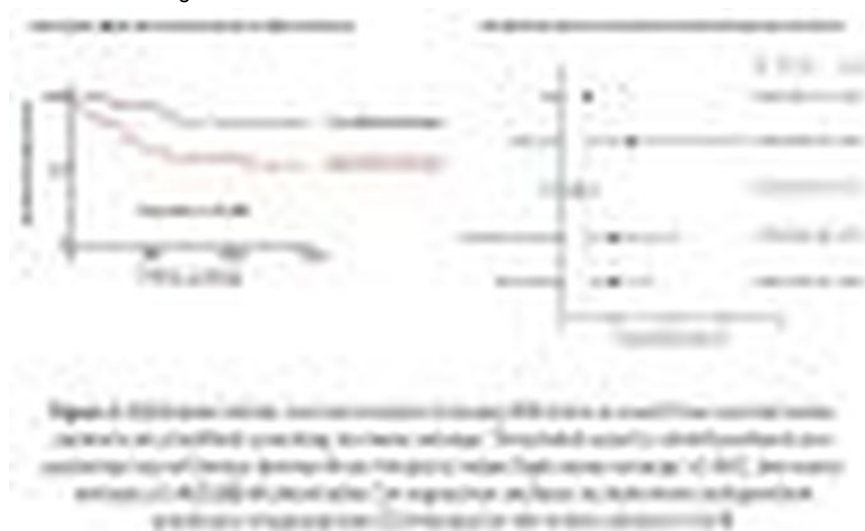
Purpose: To develop a risk stratification tool to determine which patients are at high risk of VA and therefore should undergo ICD implantation. We therefore hypothesised high mean entropy (higher degree of total scar inhomogeneity) is associated with a high risk of appropriate ICD therapy.

Methods: We performed a prospective longitudinal study of consecutive patients receiving ICD implantation in a tertiary cardiac centre. All patients underwent CMR imaging for ventricular volumes, systolic function and late gadolinium enhancement (LGE) prior to ICD implantation. A standardised program for appropriate VA detection and anti-tachycardia pacing/shock therapy was used. The primary endpoint was appropriate ICD therapy for ventricular tachycardia or ventricular fibrillation. All types of scar were manually segmented on short axis LGE images at basal, mid-ventricular and apical levels. Texture analysis was then performed in all patients using dedicated custom built software. An initial filtration step highlighted objects with a 2-6mm radius using a Laplacian filter to generate scar textures, denoted as spatial scaled filter (SSF) 2-6. Histogram analysis of pixel intensity was subsequently performed and mean entropy calculated.

Results: 130 patients were recruited and 16 excluded from the analysis due to absence of LV scar. A total of 114 patients underwent CMR-TA (Age 64 ± 13 years, 79% male, LVEF $30 \pm 14\%$) and were followed up for a median of 955 days (IQR 691-1185 days) following ICD implantation. A total of 33 patients received appropriate ICD therapy (Anti-Tachycardia Pacing or shock therapy) and the median time to first appropriate ICD therapy was 329 [IQR 116-529] days. Receiver operator characteristic curves were plotted to identify optimised cut-off points for mean entropy using Youden's index to discriminate the primary endpoint. Kaplan-Meier survival analysis (Figure 1A) demonstrated time until first appropriate ICD therapy was significantly shorter in the high mean entropy (high risk) group (Log rank $p = 0.003$). In a multivariable Cox-Regression model adjusting for significant and important clinical covariates (Age, LVEF $\leq 35\%$, ICM, secondary prevention), mean entropy was the sole predictor of appropriate ICD therapy (hazard ratio 1.88, 95% CI 1.08-3.27, $p = 0.025$) (Figure 1B).

Conclusion: Mean entropy was the sole predictor of ICD therapy suggesting a potential role for CMR-TA in predicting VA and risk-stratifying patients for ICD implantation.

Abstract P1116 Figure 1



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Epidemiology, Prognosis, Outcome

P1117

The prognostic impact of electrocardiographic changes during therapeutic hypothermia in patients with resuscitated cardiac arrest

Bae MH.¹; Cho HJ.²; Kim HN.¹; Park BE.¹; Park YJ.¹

¹Kyungpook National University Hospital, Daegu, Korea Republic of

²Fatima General Hospital, Internal Medicine, Daegu, Korea Republic of

Background: Therapeutic hypothermia improves survival and neurologic outcome in patients who resuscitated after cardiac arrest.

Purpose: It is not well known about the prognostic impact of the change of electrocardiographic (ECG) parameters during therapeutic hypothermia. Also, it is not well known about the prognostic impact of the Osborn wave during therapeutic hypothermia.

Methods: Among patients who resuscitated after cardiac arrest from October 2012 to April 2018, Ninety-two patients (mean age 51 ± 15 ; 74% men) performed therapeutic hypothermia were included. We compared precooling ECG parameters to ECG parameters during therapeutic hypothermia by using paired sample's 2 t-test.

Results: There were 19 in-hospital deaths (21%) among overall patients performed therapeutic hypothermia after resuscitated cardiac arrest. Idiopathic VF or hemodynamic unstable VT was occurred in 34 patients (37%). At the baseline characteristics, patients in-hospital death group were older than in-hospital survivor group (49 ± 14 versus 61 ± 13 , $p = 0.001$). During therapeutic hypothermia, heart rate decreased (114 ± 28 versus 75 ± 21 , $p < 0.001$) and corrected QT (QTc) interval increased (480 ± 46 ms versus 512 ± 55 ms, $p < 0.001$). However, there were no significant differences in PR and QRS intervals during therapeutic hypothermia. Osborn wave developed in 23 patients (25%). However, the heart rate, Osborn wave, PR, QRS, and QTc intervals during therapeutic hypothermia did not affect the in-hospital mortality. Also there were no significant differences in change of ECG parameters between in-hospital survivors and nonsurvivors.

Conclusion: Therapeutic hypothermia decreased heart rate and prolonged QTc interval. However, the ECG changes during therapeutic hypothermia did not associated with in-hospital mortality.

Table 1

ECG parameters	Therapeutic hypothermia		p value
	Before	After	
HR (bpm)	113.7 ± 27.7	74.8 ± 20.9	<0.001
PR intervals (ms)	160.8 ± 34.7	170.2 ± 30.9	0.020
QRS duration (ms)	112.4 ± 28.6	111.3 ± 24.4	0.717
QTc intervals (ms)	480.3 ± 46.1	511.8 ± 55.1	<0.001

Change in ECG parameters during therapeutic hypothermia

P1118

Myocarditis with prevalent arrhythmic manifestation: catheter ablation and outcome during long-term follow up

Grifoni G.¹; Casella M.²; Narducci ML.³; Bianchini L.²; Zanchi S.²; Negro G.²; Gasperetti A.²; Vettor G.²; Conte E.²; Sicuso R.²; Andreini D.²; Pelargonio G.³; Basso C.⁴; Dello Russo A.²; Tondo C.²

¹IRCCS Multimedica of Milan, Milan, Italy

²Cardiology Center Monzino IRCCS, Milan, Italy

³Catholic University of the Sacred Heart, Rome, Italy

⁴University of Padova, Padua, Italy

Funding Acknowledgements: none

OnBehalf: none

BACKGROUND: The treatment of ventricular arrhythmias in patients (pts) with myocarditis is challenging. In consensus papers and guidelines no mention is done about trans catheter ablation (RFCA) and its role in myocarditis, however first experiences in this kind of patients showed favourable results.

PURPOSE: Our multicentre registry describes baseline characteristics and long-term outcome of pts with myocarditis and related ventricular arrhythmias underwent to RFCA.

METHODS: A cohort of 50 pts with myocarditis and ventricular arrhythmias were analyzed retrospectively. Myocarditis diagnosis was confirmed in all pts by clinical criteria, cardiac-MRI and ventricular electroanatomical mapping associated to electrophysiological study. In 34 pts an endomyocardial biopsy was performed and in 28 (56%) cases, Dallas Criteria confirmed the diagnosis.

RESULTS: Between January 2005 and July 2018 a cohort of 50 patients were retrospectively studied (median age, 42 years; 30% female). 19 (40%) pts showed sustained ventricular tachycardia (VT), 16 (30%) pts non sustained ventricular tachycardia (NSVT). 15 (30%) pts showed frequent premature ventricular complex (PVC;>25000 in 24 hours). The patients' characteristics were reported in figure 1. 22 pts (47%) underwent ICD implantation mainly for persistent left ventricular low ejection fraction during follow up. In all pts RFCA was carried out with an acute success rate of 97% and no complication. In 36 (75%) pts was performed an endocardial approach while in 14 pts (25%) epi-endocardial approach was needed. After a median follow-up of 3 years the recurrence rate of ventricular arrhythmias was 25%. 7 pts showed VT recurrence, in 4 cases the recurrence was represented by NSVT and in 3 pts by PVC. Cardiovascular death occurred in 3 (6%) pts. One patient died from end stage heart failure, one from an electrical storm despite ICD, and one experienced sudden cardiac death. Appropriate shock was reported in 13 (30%) pts with ICD.

CONCLUSION: Our study represents one of the largest registry of pts with myocarditis and ventricular arrhythmias treated with catheter ablation. Our data showed catheter ablation as safe and effective in this population although more data we needed.

Abstract P1118 Figure 1

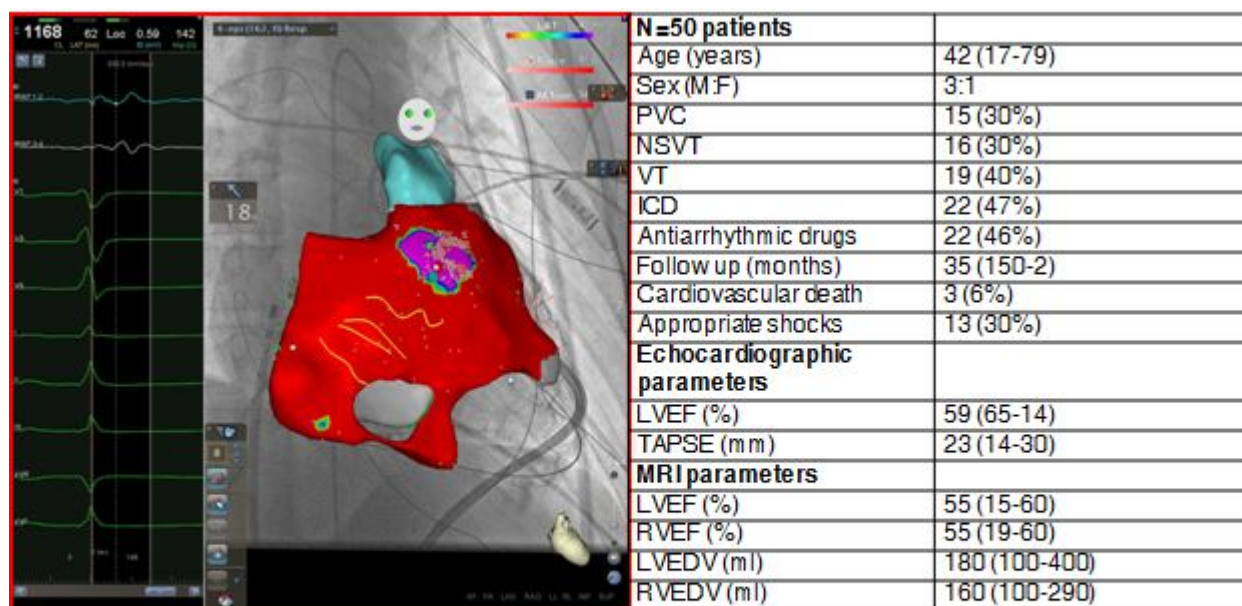


Figure 1. On the left an example of epicardial VT ablation. On the right baseline clinical features of enrolled patients. Values express as number of patients (%) or as median (Q1–Q3).PVC premature ventricular complex; NSVT non sustained ventricular tachycardia; VT/VF ventricular tachycardia/ventricular fibrillation; ICD implantable cardioverter defibrillator; LVEF left ventricular tachycardia; TAPSE Tricuspid Annular Plane Systolic Excursion; RVEF right ventricular ejection fraction; LVEDV left ventricular end diastolic volume; RVEDV right ventricular end diastolic volume.

P1119

Trans catheter ablation of life-threatening ventricular arrhythmias in patients with history of myocarditis: multicentre experience with long term follow up

Grifoni G.¹; Casella M.²; Narducci ML.³; Bianchini L.²; Zanchi S.²; Negro G.²; Gasperetti A.²; Catto V.²; Conte E.²; Perna F.³; Andreini D.²; Pelargonio G.³; Basso C.⁴; Dello Russo A.²; Tondo C.²

¹IRCCS Multimedica of Milan, Milan, Italy

²Cardiology Center Monzino IRCCS, Milan, Italy

³Catholic University of the Sacred Heart, Rome, Italy

⁴University of Padova, Padua, Italy

Funding Acknowledgements: none

OnBehalf: none

Background: Ventricular tachycardia (VT) is a therapeutic challenge in patients (pts) with myocarditis.

Purpose: This multicenter registry aimed to assess the efficacy and safety of radiofrequency catheter ablation (RFCA) in patients with myocarditis and life-threatening VTs.

Methods: We analyzed retrospectively 43 pts (20 men; age, 46 [16–69] years) with a history of myocarditis and drug-refractory life-threatening VTs. Myocarditis diagnosis was confirmed in all pts by clinical criteria, cardiac-MRI and ventricular electroanatomical mapping associated to electrophysiological study. In 36 pts an endomyocardial biopsy was performed and in 25 (60%) cases, Dallas Criteria confirmed the diagnosis.

Results: Pts' characteristic was reported in Figure 1. 7 (15%) pts was admitted for cardiac arrest. 19 pts (42%) already had an ICD implanted. 33 (75%) pts underwent to RFCA for drug refractory arrhythmias; in 18 (55%) pts endocardial approach was performed while in 15 (45%) combined endocardial epicardial procedure was needed. RFCA was acutely successful in 32 pts (95%). No major complication occurred during or after RFCA. Over a median follow-up time of 34 (1–156) months, 23 pts (72%) remained VTs free. 3 (20%) treated conservatively showed VT recurrences. 7 (38%) patients with ICD received appropriate shock during follow up. Cardiovascular death occurred in 3 (6%) pts. One pt died from end stage heart failure, one died from an electrical storm despite ICD, and one experienced sudden cardiac death. Kaplan Meier analysis showed over the time a significant different course of pts treated with catheter ablation versus medical therapy in terms of combined endpoint of shock and cardiovascular death (Figure 1).

Conclusions—In pts with myocarditis, RFCA of drug-refractory life-threatening VTs is feasible, safe, and effective in long term follow up. RFCA seems to show an advantage compared to medical therapy in terms of combined end point of cardiovascular death and appropriate shock.

Abstract P1119 Figure 1

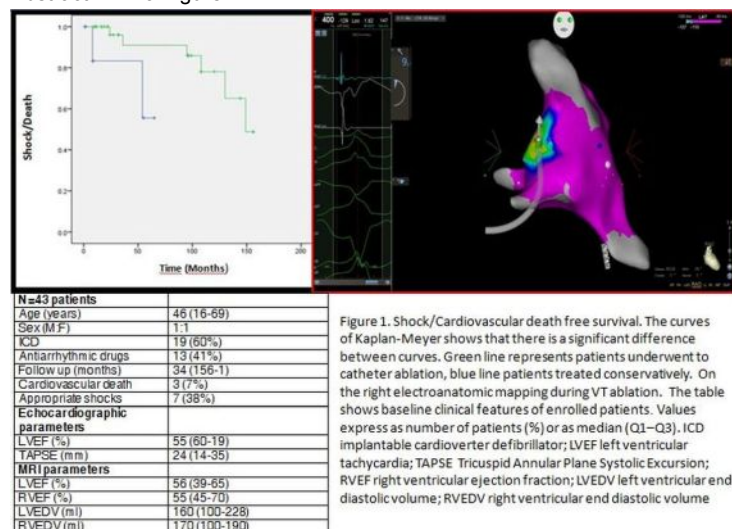


Figure 1. Shock/Cardiovascular death free survival. The curves of Kaplan-Meier shows that there is a significant difference between curves. Green line represents patients underwent to catheter ablation, blue line patients treated conservatively. On the right electroanatomic mapping during VT ablation. The table shows baseline clinical features of enrolled patients. Values express as number of patients (%) or as median (Q1–Q3). ICD implantable cardioverter defibrillator; LVEF left ventricular tachycardia; TAPSE Tricuspid Annular Plane Systolic Excursion; RVEF right ventricular ejection fraction; LVEDV left ventricular end diastolic volume; RVEDV right ventricular end diastolic volume

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1121

The potential impact of LVADs on ventricular arrhythmia characteristics and response to ICD-therapy

Androulakis AFA; Vester MPM; Wijnmaalen AP.; Schaliij MJ.; Khidir M.; Tops LF.; Beeres SLMA; De Riva M.; Zeppenfeld K.
Leiden University Medical Center, Cardiology, Leiden, Netherlands

OnBehalf: WECAM

Background/Introduction

Patients with Left ventricular assist devices (LVAD's) remain at risk for ventricular arrhythmias (VA's). Both ventricular fibrillation and monomorphic ventricular tachycardia (MVT) unresponsive to ATP may require ICD-shocks for termination. Due to the hemodynamic support provided by the LVAD, ICD shocks may occur while the patient being awake, which has an important impact on quality of life.

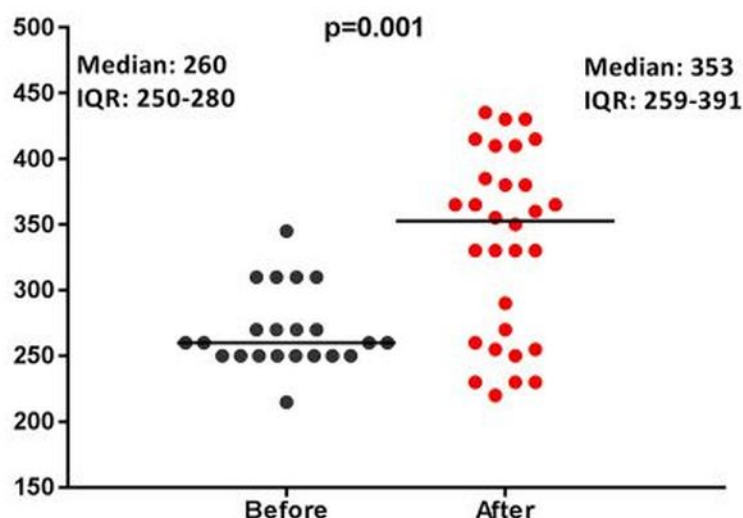
Purpose: We aimed to evaluate the characteristics of VAs and the response to ICD therapy in patients with LVADs implanted for destination therapy.

Methods: Between 2010 and 2017, consecutive patients who were discharged alive after receiving a continuous flow LVAD as destination therapy were enrolled. All VA episodes occurring 24 months before and after LVAD implantation were reviewed for type of VA, cycle length (CL) and response to ICD therapy. VAs occurring in the acute postoperative (before discharge) phase were excluded.

Results: A total of 40 patients (61 ± 9 yrs, 78% male, 16 NICM, LVEF $24 \pm 6\%$) were included. Twenty (50%) were on amiodarone at admission and 26(65%) at discharge. Before LVAD, 15/40 (38%) patients had a total of 270 VAs (median 7 per patient (IQR 4-17), 254 (94%) MVT, median CL 290ms, IQR 260-345). Twelve of 15 (80%) patients received ICD shocks for 59 VAs (median 4 per patient (IQR 2-8), 43 (73%) MVT). Twenty-two of 59 ICD shocks (37%) in 7/12 (58%) patients were delivered after ATP failed to terminate MVT, (VTCL median 260, IQR 250-280). Patients were followed for a median of 22 months [IQR 8-24]. After discharge, 18/40 (45%) patients had a total of 239 VAs (median 6 per patient (IQR 1-9), 215 (90%) MVT, median CL 310ms, IQR 259-369). Ten patients (56%) received ICD shocks for 109 VAs (median 3 per patient (IQR 1-8), 83 (76%) MVT). Of importance, in all 10 patients with ICD shocks, at least one shock occurred after ATP failure (total of 30 ICD shocks after ATP failure (median 3 per pt, IQR 1-4). Of note, the median VTCL of those MVTs unresponsive to ATP was significantly longer post-LVAD, compared to pre-LVAD (260 IQR 250-280 vs 353 IQR 259-391, $p = 0.001$).

Conclusion: Up to 45% of patients with LVAD as destination therapy had persistent or new onset VAs beyond the acute postoperative phase, being 90% episodes of MVT. Of concern, despite longer CL, MVT after LVAD were often unresponsive to ATP requiring ICD shocks in the awake state in the majority of patients. ATP failure may be partly due to an additional unexcitable barrier imposed by the LVAD cannula. Different lead position and long ATP sequences could be considered.

Abstract P1121 Figure 1



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1122

Image-integrated ventricular tachycardia ablation: results from the international MUSIC VT registry

Berte B.¹; Santangelli P.²; Bogun F.³; Dilling-Boer D.⁴; Takigawa M.⁵; Scharf C.⁶; Deneke T.⁷; Winterfield J.⁸; Kobza R.¹; Tedrow U.⁹; Stevenson W.¹⁰; Marchlinski M.²; Wilber D.¹¹; Jais P.⁵; Cochet H.⁵

¹Lucerne Cantonal Hospital, Lucerne, Switzerland

²Penn University, Pennsylvania, United States of America

³University of Michigan, Michigan, United States of America

⁴Virga Jesse Hospital, Hasselt, Belgium

⁵University of Bordeaux, Bordeaux, France

⁶Klinik Im Park, Herzgefäßzentrum, Zürich, Switzerland

⁷Heart Center Bad Neustadt, Bad Neustadt a.d. Saale, Germany

⁸Medical University of South Carolina, Charleston, United States of America

⁹Brigham and Womens Hospital, Boston, United States of America

¹⁰Vanderbilt University, Nashville, United States of America

¹¹Loyola University, Chicago, United States of America

Introduction: Single-center data have demonstrated the feasibility of image integration to provide information on anatomy and scar during ventricular tachycardia (VT) ablation. The MUSIC network was created to collaborate on an international level, centers sending imaging data to be processed by a core lab using the MUSIC software.

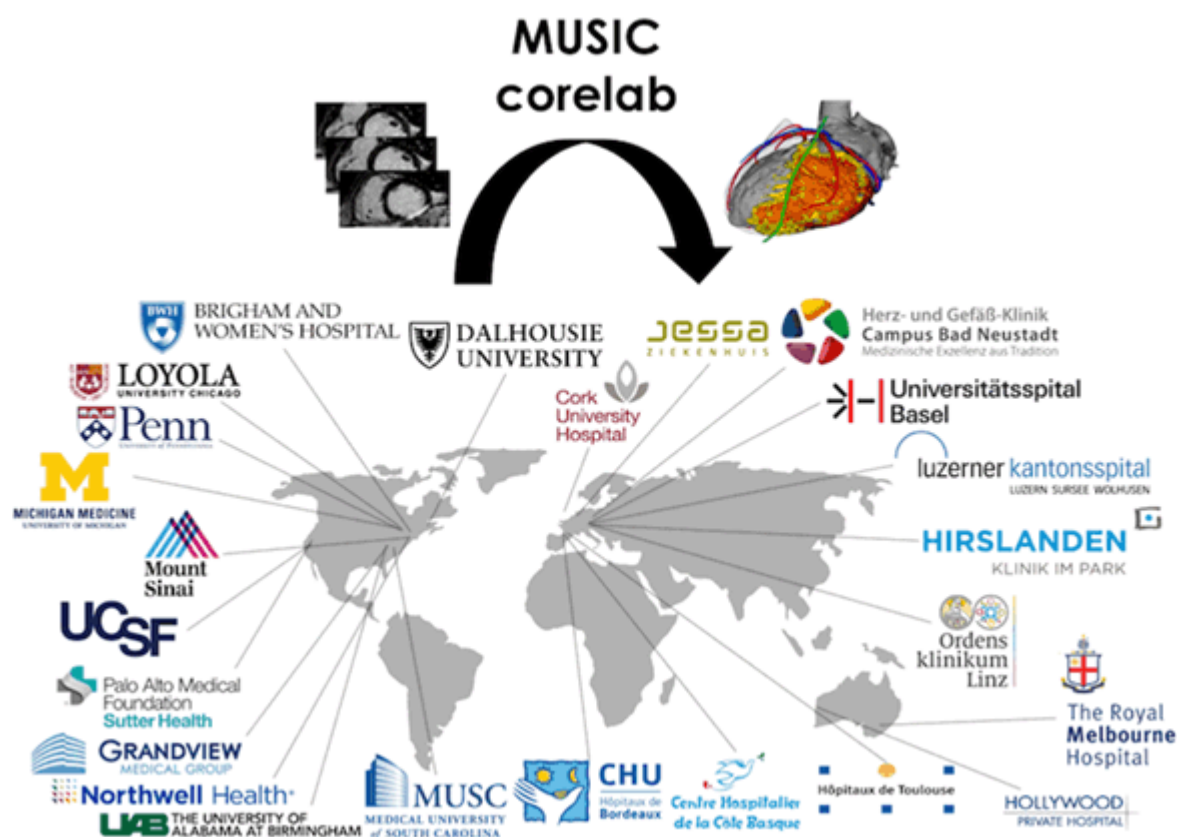
Purpose: To obtain data on the reproducibility, feasibility and efficacy of advanced image integration to guide VT ablation.

Methods: An international survey was sent to all 23 active MUSIC members. Baseline patient and center characteristics, procedural data, ablation method and follow-up were analyzed.

Results: Out of a total 1040 MUSIC-guided VT procedures (64% first, 36% redo) since the start of the network 14 months ago, data could be retrieved in 638 (76%) patients (62 ± 11 years, 85% male) from 16 (70%) centers (41% large academic, 36% mid-size academic, and 23% private clinics). The population was composed of 309 (48%) ischemic and 329 (52%) non ischemic patients. Imaging comprised arterial-enhanced CT in 82%, late iodine-enhanced CT in 11%, late gadolinium-enhanced MRI in 19%, and PET in 1%. Procedural endpoints and VT ablation strategies being highly heterogeneous across centers, procedural time and RF duration were highly variable (intra-center range 138-546 min and 15-105 min, respectively). Multi-electrode mapping catheters were used in 50% of the procedures. Acute complications occurred in 36/638 (6%). No procedure related death or phrenic nerve damage was observed. Follow-up was available for 492/638 (78%) patients. Overall, there was a 29% (141/492) VT recurrence rate and a 2% death rate after a median follow-up of 10 months (IQ1:5-IQ3:12). VT recurrence was lower in ischemic cardiomyopathy (ICM) vs non-ICM patients [52/242 (21%) vs 89/248 (36%); $p < 0.05$]. There was no difference in mortality between ICM and NICM [7/242 (3%) vs 7/248 (3%); $p = \text{NS}$].

Conclusion: In this largest registry using image-guided VT ablation, the technique is found to be reproducible, safe and effective in a diversity of centers with a VT recurrence rate of 29% at mid-term follow-up. Improved outcomes should be evaluated in a randomized trial.

Abstract P1122 Figure. The MUSIC consortium



P1123

MUSIC-guided ablation of scar-related VT: towards a shorter and more standardized procedure

Berte B.¹; Dang L.²; Hilfiker G.¹; Bondietti J.³; Jais P.⁴; Cochet H.⁴; Scharf C.²; Kobza R.¹

¹Lucerne Cantonal Hospital, Lucerne, Switzerland

²Klinik Im Park, Herzgefäßszentrum, Zürich, Switzerland

³Biosense Webster, Zug, Switzerland

⁴University of Bordeaux, Bordeaux, France

Introduction: Image integration defines the substrate for ventricular tachycardia (VT) and can help to guide the safety and efficacy of VT ablation. It has a potential advantage to create a collaboration between world-renowned centres of excellence in imaging and smaller EP ablation centres.

Purpose: The aim of this study was to analyse the feasibility, reproducibility, safety and efficacy to routinely use the MUSIC (Multimodality platform for Specific Imaging in Cardiology) imaging software in a remote setting over the MUSIC network to perform an image guided VT ablation, even in emergency settings.

Methods: Two-centre prospective non-randomized study using MUSIC-guided image integrated VT ablation using magnetic resonance imaging (DE-MRI) and multidetector computed tomography (MDCT). All consecutive patients signed informed consent and were included. Model workflow, image integration and merge, procedural data, outcome and complications were analyzed.

Results: In total, 48 patients (62 ± 15 years; 90% men; LVEF 41 ± 14%; ischemic 69%) were included. Image integration (MDCT in 100% and DE-MRI in 35%) was used in all. Procedure duration was 172 ± 48min and RF time was 31 ± 17min. A good merge was obtained in 90%. A complete voltage map was only made in 22 patients (46%). Non-inducibility was reached in 36 patients (75%) and complete LAVA elimination in 22 patients (46%). After a follow-up of 18 ± 9months, a VT recurrence was seen in 10 patients (21%) and 1 patient (2%) died of a heart attack.

Conclusion: An image-integrated VT ablation approach between a center of excellence and a remote center is routinely feasible and can result in efficient and short procedures without a decrease in quality.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1124

Outcomes of ablation of ventricular arrhythmias in presumed cardiac sarcoidosis without histologic diagnosis

Siontis K.; Rosenbaum A.; Egel M.; Blauwet L.; Killu A.; Kapa S.

Division of Cardiovascular Diseases, Mayo Clinic, Rochester, MN, United States of America

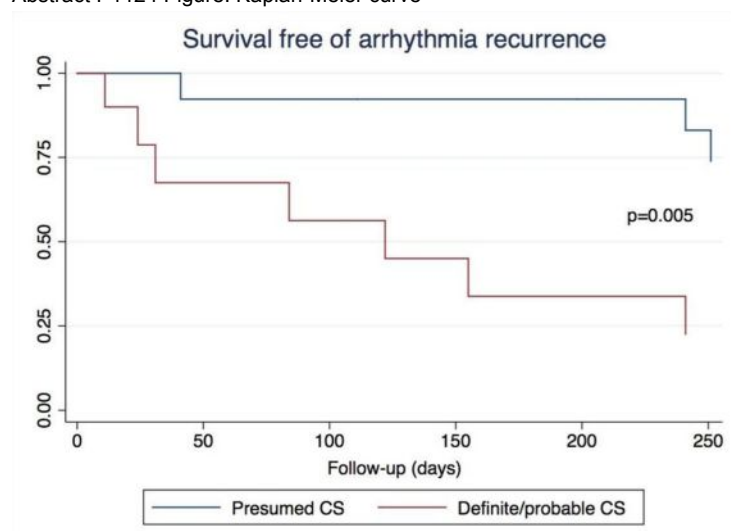
Background: In patients with ventricular arrhythmias and features of cardiac sarcoidosis (CS), histologic confirmation is not always possible and some patients are treated presumptively. The ablation outcomes in this subset of patients are not well known.

Methods: We identified patients with presumed CS based on clinical and imaging (FDG-PET, MRI) data but without positive cardiac or extracardiac biopsy, and patients with definite or probable CS (based on the HRS 2014 criteria) who underwent VT or PVC ablation at our institution (2008-2018). The arrhythmia recurrence risk was compared between the 2 groups. Recurrence was defined as persistence of ectopy burden >80% after PVC ablation and as any VT recurrence after VT ablation.

Results: We included 14 patients with presumed CS (VT n = 9, PVC n = 5) and 10 with definite/probable CS (VT n = 7, PVC n = 3). In the respective groups, 6 and 5 patients were treated with immunosuppression at the time of ablation. After median 8 months, 6 (43%) patients with presumed CS and 7 (70%) patients with definite/probable CS had recurrent arrhythmias ($p = 0.005$). Presumed CS was associated with lower recurrence risk compared to definite/probable CS after adjustment for LVEF and immunosuppression use (HR 0.18, 95% CI 0.05-0.75).

Conclusion: Patients with presumed CS without a positive biopsy may experience favorable outcomes with ablation and possible adjunctive immunosuppression as compared to definite/probable CS. A lack of histologic diagnosis should not preclude prompt therapeutic intervention in this group.

Abstract P1124 Figure. Kaplan-Meier curve



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1125

Bipolar ablation of refractory arrhythmias guided by temperature measurements from a return electrode

Futyma PR.¹; Gluszczyk R.¹; Ciapala K.¹; Futyma M.¹; Kulakowski P.²

¹St. Joseph's Heart Center, Invasive Cardiology Department, Rzeszów, Poland

²Grochowski Hospital, Postgraduate Medical School, Warsaw, Poland

Background: Bipolar radiofrequency catheter ablation (Bi-RFCA) recently emerged as an alternative for treatment of arrhythmias resistant to conventional approach. The safety studies on Bi-RFCA do not exist.

Purpose: To determine safety profile of Bi-RFCA regarding temperature measurements obtained from non-irrigated return electrodes (RE).

Methods: The study group consisted of consecutive patients after failure of conventional RFCA who underwent Bi-RFCA.

Results: Out of 1385 catheter ablations performed in our center between 2015-2018, we ultimately enrolled 18 highly symptomatic patients to undergo Bi-RFCA due to refractory premature ventricular complexes/ventricular tachycardia (15 patients) or typical atrial flutter (3 patients). Non-irrigated catheters (4mm in 14 patients and 8mm in 4 patients) were used as RE in this study. The measurements from RE were obtained in all subjects. There were no complications during Bi-RFCA. Maximal temperatures measured from RE were significantly higher in 4mm vs 8mm group ($63 \pm 16^\circ\text{C}$ vs $43 \pm 4^\circ\text{C}$, $p = 0,025$). A significant rise of temperature preventing further Bi-RFCA occurred in 3 patients from 4mm group – a 4mm RE was exchanged for 8mm catheter in two patients, whereas change in polarity of two electrodes was sufficient in the remaining one. A temperature rise above 60°C occurred in 4mm group only (7 vs 0, $p = 0,05$). Additionally, two steam-pops occurred in 4mm group, these however were not associated with any complications.

Conclusions: The use of 8mm as RE for Bi-RFCA is associated with lower temperatures of return catheter and with lower incidence of significant temperature rise. This may suggest a better safety profile of 8mm catheters used in bipolar setting. These findings, as well as safety/efficacy balance, require further studies.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1126

Local impedance, but not generator impedance supports substrate mapping and facilitates monitoring of ablation in patients with ventricular tachycardia

Munkler P.; Gunawardene MA.; Klatt N.; Schwarzl JM.; Akbulak RÖ.; Dinshaw L.; Hartmann J.; Jungen C.; Jularic M.; Kahle AK.; Moser J.; Schaeffer BN.; Eickholt C.; Willems S.; Meyer C.

University Heart Center Hamburg, Hamburg, Germany

Funding Acknowledgements: DZHK (German Centre for Cardiovascular Research) [FKZ 81Z4710141 and 81X2710149]

Background: Local myocardial electrical impedance has been found to be predictive of lesion formation during radiofrequency current (RFC) application. Josephson and colleagues demonstrated in a sheep model of myocardial infarction the potential value of local impedance (LI) to distinguish between healthy and diseased tissue. The use of the novel parameter LI for substrate characterization in patients and monitoring of RFC-application in ablation of ventricular tachycardia (VT) has so far not been investigated.

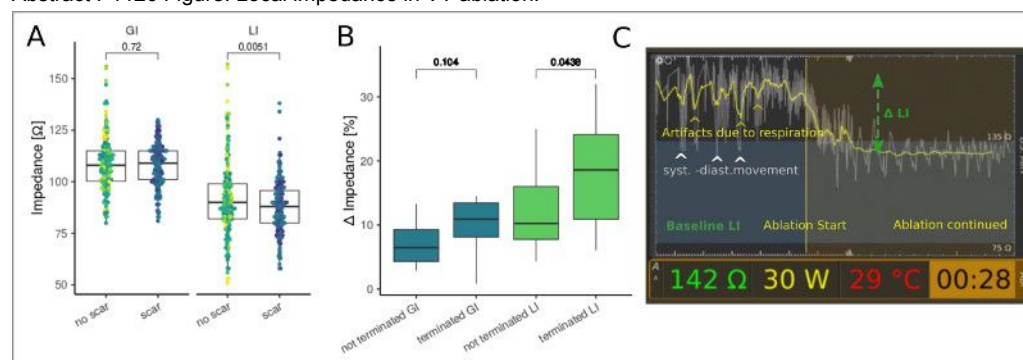
Purpose: Generator Impedance (GI) is a well-established parameter to assess RFC-application in patients undergoing catheter ablation of ventricular tachycardia. To investigate the clinical utility of LI, measured from an ablation catheter with three-incorporated mini-electrodes, we examined the relation between LI and GI in catheter ablation of VT.

Methods: Twenty-six consecutive patients with recurrent VT underwent high-density 3D-mapping and catheter ablation of VT. GI was measured conventionally while simultaneously LI was measured from the tip of the ablation catheter. RFC-applications (n = 568) were analysed for baseline impedance, Δ impedance under ablation and drop rate (Δ impedance/time). In all patients, a 64-electrode mini-basket catheter was used for substrate and VT mapping. Both GI and LI were assessed in scarred vs non-scarred myocardium as defined by local bipolar voltage ($<0.1\text{mV}$ or $\geq 0.1\text{mV}$, respectively) for substrate characterization. Δ GI vs Δ LI and GI drop rate vs LI drop rate were compared for RFC-applications with termination of VT vs RFC-applications without termination.

Results: LI was lower in regions of dense scar defined by a local bipolar voltage $<0.1\text{mV}$ (88.0Ω [IQR 80.0–95.8]) compared to non-scarred myocardium (90Ω [IQR 82.0–99.0]) ($p = 0.005$). The Δ LI drop correlated with baseline LI ($R^2 = 0.51$ [CI 0.44 – 0.57], $p < 0.001$). In 10/26 procedures VT was successfully terminated by RFC-application. Δ LI was higher in RFC-applications terminating a VT (18Ω [IQR 9.4 – 26.0] vs. 13Ω [IQR 8.85–18.0], $p = 0.04$) while no significant difference could be detected for Δ GI for terminating RFC-applications (10Ω [IQR 8.5–15.5] vs RFC-applications not terminating the VT (8Ω [IQR 6.0–11.0], $p = 0.10$).

Conclusion: LI but not GI allows intraprocedural substrate mapping. Compared to non-terminating RFC-applications the impedance drop as well as drop rate of LI but not GI is higher during VT termination.

Abstract P1126 Figure. Local impedance in VT ablation.



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1127

Ablation of ventricular tachycardia in patients with structural heart disease leads to release of S100B from intracardiac nerves

Scherschel K.; Gessler N.; Hedenus K.; Jungen C.; Klatt N.; Hartmann J.; Eickholt C.; Willems S.; Meyer C.

University Heart Center Hamburg, Clinic for Cardiology / Electrophysiology, Hamburg, Germany

Background: Increased heterogeneity of autonomic innervation is suggested to contribute to the generation of ventricular tachycardia (VT). S100B is an alarmin expressed in Schwann cells and an established surrogate parameter for neuronal damage.

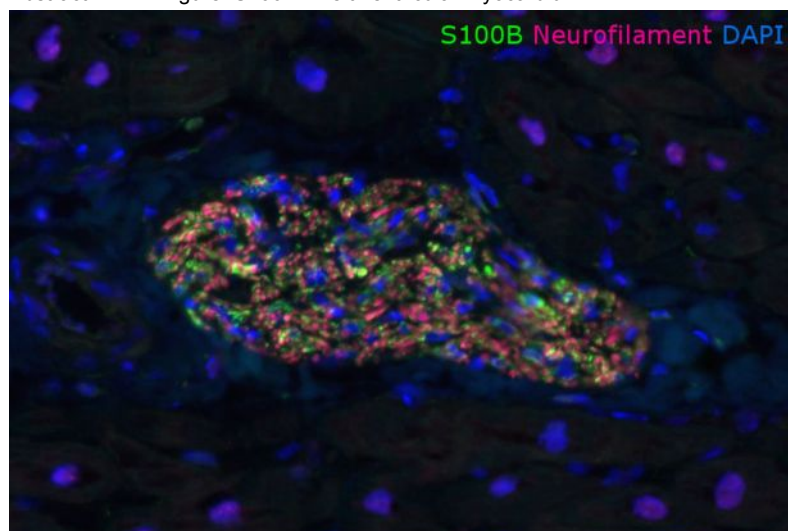
Purpose: We aimed to investigate whether S100B is released during radiofrequency-based ablation of VTs.

Methods: 14 Patients (all male, 66.2 ± 2.7 years old) with structural heart disease presenting into our clinic for an ablation in the left ventricle were included. Plasma samples were collected from venous sheaths immediately before and after ablation. S100B levels were assessed using ELISA. Immunohistochemistry against S100B was performed in a sample of left ventricular human myocardium.

Results: Higher levels of S100B were found in plasma samples after VT ablation compared to before ablation (51.7 ± 9.4 vs 97.2 ± 18.0 pg/ml; $P = 0.0091$). No differences were detectable in S100B release between patients with ischemic ($n = 8$) or non-ischemic cardiomyopathy ($n = 6$). Immunohistochemistry confirmed S100B expression in human myocardium in Schwann cells ensheathing myocardial nerves.

Conclusion: These findings suggest that S100B is released during VT ablation by the damage of myocardial nerves. Post-ablation S100B levels might be used to characterize autonomic innervation of ablated areas.

Abstract P1127 Figure. S100B in left ventricular myocardium



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1128

Myocardial calcification is associated with endocardial ablation failure in post-myocardial infarction ventricular tachycardia

De Riva Silva M.; Naruse Y.; Ebert M.; Montero-Cabezas JM.; Wijnmaalen AP.; Trines SA.; Schalijs MJ.; Zeppenfeld K.

Leiden University Medical Center, Department of Cardiology, Leiden, Netherlands

Background: In patients with post-myocardial infarction (MI) ventricular tachycardia (VT), the presence of myocardial calcification (MC) protecting a subepicardial substrate for VT might be a cause of endocardial ablation failure requiring therapy escalation (TE).

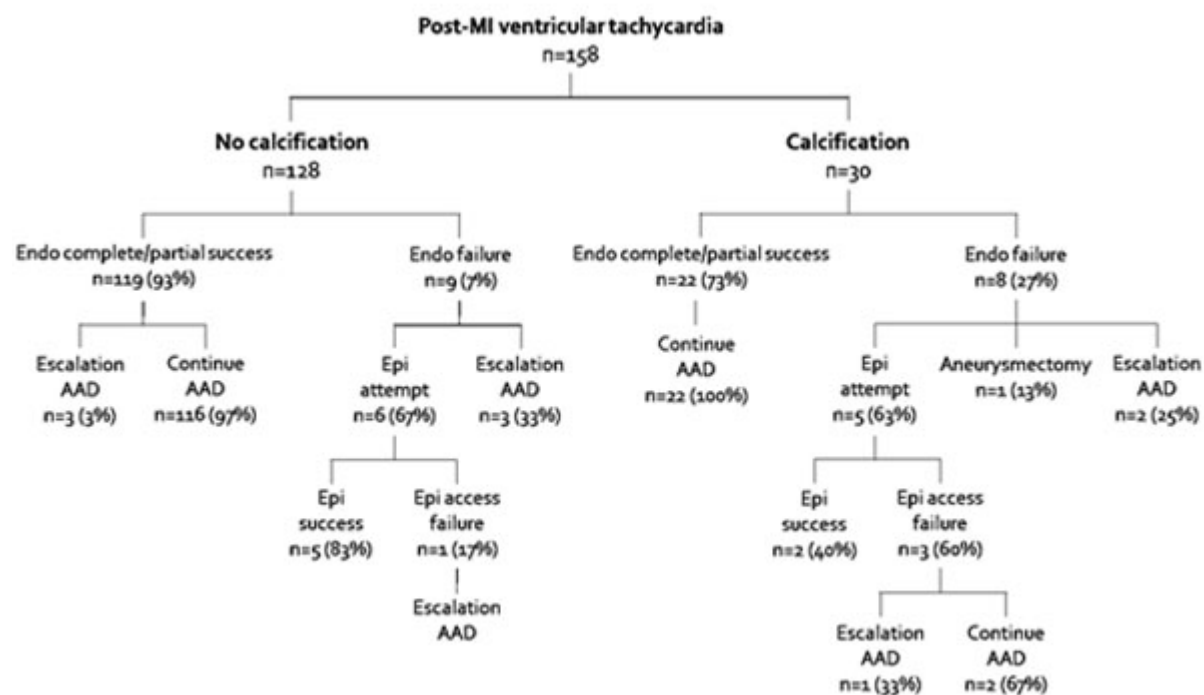
Objectives: The aims of our study were to assess the prevalence of MC in a consecutive cohort of patients referred for ablation of post-MI VT and to evaluate the impact of MC on the acute and long-term outcome of endocardial ablation.

Methods: Consecutive post-MI patients referred for VT ablation (2009-2016) were included. In all, fluoroscopy recordings in 7 standard views obtained during pre-procedural coronary angiograms and during ablation were reviewed. MC was defined as the presence of a distinct radiopaque area that moved synchronously with the cardiac contraction. Calcifications corresponding to the valvular annuli or the trajectory of an epicardial coronary artery were excluded. After ablation, complete acute success was defined as non-inducibility of any VT, partial success as inducibility of ≥ 1 non-clinical VT and procedural failure as persistent inducibility of the clinical VT. TE was defined as escalation of anti-arrhythmic drugs and/or epicardial ablation and/or arrhythmia surgery after endocardial ablation. Patients were followed for VT recurrence and mortality.

Results: Out of 158 patients (68 ± 9 years, 87% men, LVEF $33 \pm 12\%$) included, 30 (19%) had MC. Patients with MC were younger (64 vs. 69 years; $P = 0.019$), had had more often an anterior MI (63% vs. 36%; $P = 0.008$) and had undergone more often a prior VT ablation attempt (28% vs. 11%; $P = 0.038$). After endocardial ablation, only 6 patients (20%) with MC were non-inducible (compared to 56 (44%) without; $P = 0.033$) and of importance, 8 (27%) remained inducible for the clinical VT (compared to 9 (6%) patients without; $P = 0.003$) requiring escalation of therapy (figure 1). After a median of 31 months, 62 patients (40%) had VT recurrence and 47 (30%) died. Patients with MC had a higher incidence of the composite endpoint of VT recurrence or TE at 12-month follow-up (66% vs. 34%; $P = 0.001$). Presence of MC (HR 1.84; $P = 0.026$), a lower LV function (HR 1.03 per 1% decrease; $P = 0.021$) and non-complete procedural success (HR 2.12; $P = 0.012$) were independently associated with a higher incidence of the composite endpoint of VT recurrence or TE.

Conclusion: MC was present in 19% of post-MI patients referred for VT ablation and was associated with a high incidence of endocardial ablation failure. Careful assessment of pre-procedural coronary angiograms for MC may be therefore useful to plan the procedure since in up to 66% of patients with MC an epicardial access, when possible, might be justified.

Abstract P1128 Figure. Treatment after endocardial ablation



Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1129

Clinical outcomes of stereotactic radio-ablation for the management of refractory ventricular tachycardia

Jumeau R.¹; Ozsahin M.¹; Bourhis J.¹; Vallet V.²; Zeverino M.²; Moeckli R.²; Duclos F.¹; Schwitter J.³; Le Bloa M.⁴; Bisch L.⁴; Pascale P.⁴; Pruvot E.⁴

¹University Hospital Centre Vaudois (CHUV), Radiation Oncology, Lausanne, Switzerland

²University Hospital Centre Vaudois (CHUV), Radiation Physics, Lausanne, Switzerland

³University Hospital Centre Vaudois (CHUV), Cardiac MR center, Lausanne, Switzerland

⁴University Hospital Centre Vaudois (CHUV), Cardiology, Lausanne, Switzerland

Introduction: Ventricular tachycardia (VT) caused by myocardial scarring bears a significant risk of mortality and morbidity that can be partially controlled by the implantation of a cardioverter-defibrillator (ICD). Recently, stereotactic arrhythmia radio-ablation (STAR) appeared as a promising tool for the management of VT refractory to antiarrhythmic drugs (AADs) and catheter ablation (CA). We present herein the outcomes of our series of patients treated under an institutional STAR program for refractory VT.

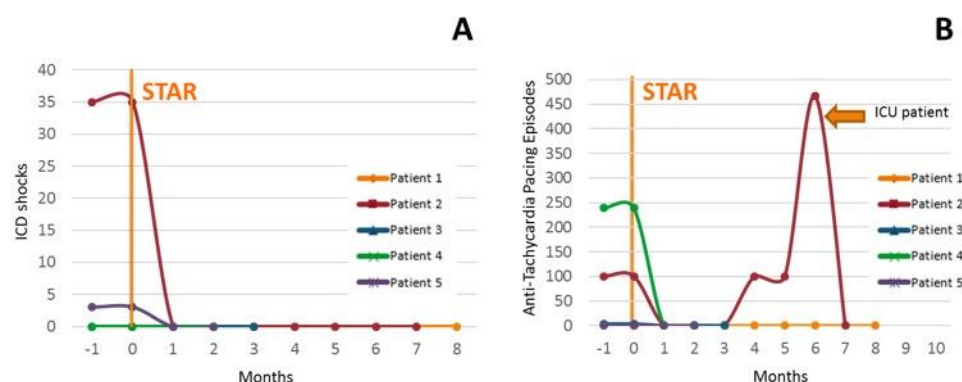
Material and Methods:

Enrolled patients suffered from recurrent VT or electrical storm (ES) refractory to CA and AADs. Before the procedure, an electroanatomic mapping (EAM) was performed to localize the VT substrate (VT-sub). All patients underwent a planning CT co-registered with a cardiac MRI or a cardiac CT to help in volume definition. For each case, the cardiologist delineated the VT-sub according to the EAM data. A median dose of 25 Gy (range, 20–25 Gy) was delivered to the VT-sub.

Results: Since September 2017, five patients with VT or ES refractory to AADs and CA were treated. Four patients were elective, while another one, hospitalized in the intensive care unit (ICU), was intubated because of an ES with multiple ICD shocks refractory to CA. VT was due to an ischemic cardiomyopathy in two patients, to an inflammatory cardiomyopathy in two patients and to an idiopathic cardiomyopathy in the ICU patient. In all patients, STAR was successfully delivered using near real-time ICD lead tracking with an average time of 54 minutes. The median ablation volume was 22 cc (range, 19–35 cc). After a median follow-up of 5 months (range, 4–11), the elective patients did not experience any sustained VT recurrence or electrical shock (Panel A). The ICU patient was extubated 3 days after STAR and remained free of ICD shocks during 4 months; he presented, however, a new ES episode 19 weeks (Panel B) after the procedure related to a remote VT-sub successfully treated by CA. Importantly, after ICD interrogation, no sustained VT episodes arising from the irradiated site were detected in all patients.

Conclusion: STAR appears to be an efficient and promising tool for the treatment of refractory VT caused by myocardial scarring. Recurrence was observed only in non-ischemic cardiomyopathy at a site remote from the irradiated volume.

Abstract P1129 Figure.



P1130

Biological treatment of Ventricular Tachycardia. Study in a post-myocardial infarction swine model

Ruiz Hernandez PM.¹; Avila P.¹; Loughlin G.¹; Fernandez-Portales J.²; Crisostomo V.²; Fernandez-Aviles F.¹; Arenal A.¹

¹University Hospital Gregorio Marañon, Cardiology, Madrid, Spain

²Jesus Uson Minimally Invasive Surgery Centre, Caceres, Spain

Introduction: The risk of sudden death is higher in the first months after a myocardial infarction. However, ICD therapy has not been able to reduce mortality in this period. Cardiospheres Derived Cells (CDC), which have been shown to reduce ventricular fibrosis and increase cardiac viability, could prevent the development of the substrate of ventricular tachycardia (VT).

Purpose: To evaluate the effect of CDC on the substrate of VT after acute myocardial infarction.

Methods: 48 pigs were studied and analyzed in a model of acute myocardial infarction, with transient occlusion of the anterior descending artery. At 4 weeks, a basal MRI with late enhancement was performed, and the animals were randomized to a control group (n: 11), intra-coronary (IC) CDC (n: 9), trans-myocardial (TM) CDC (n: 10), IC + TM CDC (n: 10) or placebo (n: 8). At 16 weeks, a second MRI and an electrophysiological study were performed. In addition, control and IC + TM groups underwent an epicardial optical mapping study to evaluate the conduction velocity (CV) and action potential duration (APD) in heterogeneous tissue (HT).

Results: The dense scar increment between weeks 4 and 16 was higher in the control group ($77 \pm 73\%$) than in the IC + TM group ($31 \pm 23\%$, $p:0.05$) and in the TM group ($20 \pm 18\%$, $p:0.05$). VT inducibility was higher in the control group (100%) than in the IC group (22%, $p:0.002$) and the IC + TM group (40%, $p:0.01$). In the IC + TM group, the CV of the epicardial HT was faster (53 ± 5 vs. 45 ± 6 cm/s, $p:0.01$) and the APD was longer (280 ± 30 ms vs. 220 ± 40 ms; $p:0.01$) than in the control group.

Conclusions: CDC therapy a few weeks after a myocardial infarction modifies the VT substrate and reduces VT inducibility. These data support the use of CDC in the prevention of early sudden death after myocardial infarction.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1131

Enhanced ventricular tachycardia substrate resolution with a novel high density grid-style mapping catheter

Adlan A.¹; Dowd R.¹; Panchal G.¹; Aldhoon B.²; Foster W.²; Yusuf S.¹; Panikker S.¹; Osman F.¹; Dhanjal T.¹

¹University Hospitals of Coventry and Warwickshire NHS Trust, Department of Cardiology, Coventry, United Kingdom

²Worcestershire Acute Hospitals NHS Trust, Department of Cardiology, Worcester, United Kingdom

Background: Defining diastolic slow conduction channels within the borderzone (BZ) of scar dependent re-entrant ventricular tachycardia (VT) is key for effective mapping and ablation strategies. Understanding wavefront propagation is driving advances in high density (HD) mapping. The newly developed Advisor HD Grid Mapping Catheter (HD GRID) has equidistant spacing of 16, 1mm electrodes in a 4X4 3mm interspaced arrangement allowing bipolar recordings along and uniquely across the splines (orthogonal vector) to facilitate substrate mapping in a WAVE Configuration (WAVE).

Purpose: To determine the relative importance of the WAVE Configuration compared to the STANDARD Linear-Only Bipolar Configuration (STANDARD) in defining VT substrate.

Methods: Ten patients with VT (8 ischaemic cardiomyopathy/2 outflow tract) underwent VT ablation with left and/or right ventricular endocardial mapping using the HD GRID. Substrate maps were performed using WAVE. Post-procedure the voltage map was remapped in the STANDARD configuration using the turbomap function. Detailed post-hoc analysis of the WAVE and STANDARD substrate maps were performed blinded to the configuration. Quantification of total scar area (TSA), BZ area (BZA) and dense scar area (DSA) with qualitative assessment of scar channel definition was performed.

Results: When compared to STANDARD, WAVE Configuration resulted in: 1) more points collected (mean difference $\pm$ SD $+51 \pm 24\%$, $p = 0.005$, Table 1) but fewer used in final map construction ($-16 \pm 9\%$, $p = 0.005$); 2) smaller TSA ($-8 \pm 10\%$, $p = 0.038$) and DSA ($-21 \pm 16\%$, $p = 0.008$); 3) higher proportion of TSA defined as BZ (BZA/TSA $+7 \pm 7\%$, $p = 0.038$); and 4) clearer scar channel definition (Figure 1).

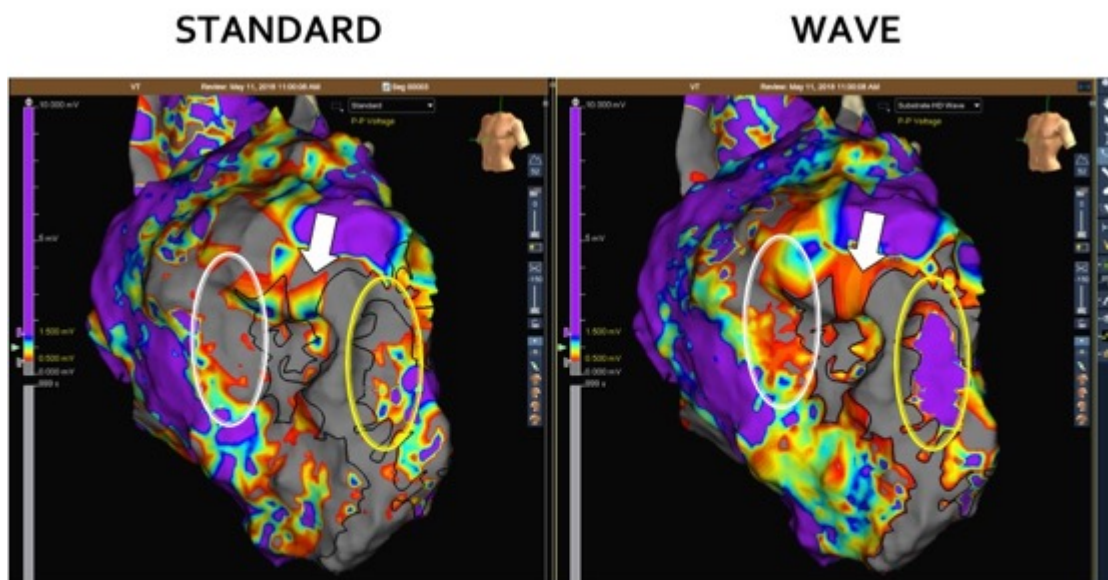
Conclusions: WAVE Configuration compared to a standard linear multipolar configuration provides more efficient point acquisition and greater VT substrate definition of the BZ particularly at the low voltage range where channel definition within scar is essential.

Table 1.

	STANDARD	WAVE	% Difference	P value
Points collected	19 788 (2970-27 278)	28 044 (3994-40 518)	$+51 \pm 14$	0.005
Points used	1947 (763-4277)	1605 (655-3806)	-16 ± 9	0.005
TSA, cm ²	52 (31-77)	49 (26-77)	-8 ± 10	0.038
DSA, cm ²	24 (20-54)	20 (13-48)	-21 ± 16	0.008
BZA, cm ²	17 (11-28)	23 (9-34)	$+12 \pm 28$	0.051
BZA/TSA %	33 (27-56)	37 (33-69)	$+7 \pm 7$	0.038

Median (interquartile range) or mean $\pm$ SD. Wilcoxon signed rank test. $P < 0.05$ statistically significant.

Abstract P1131 Figure 1



The STANDARD map shows 1 channel (white arrow) transecting the dense scar region. This channel is better defined using the orthogonal vector however, in addition, HD WAVE has highlighted a second parallel channel to the left (white circle) and normal voltage myocardium to the right (yellow circle).

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1132

Single-center experience with zero-fluoroscopy catheter ablation of ventricular arrhythmias

Prolic Kalinsek T.¹; Jan M.²; Zizek D.³; Antolic B.³; Rupar K.²

¹University of Ljubljana, Ljubljana, Slovenia

²University Medical Centre of Ljubljana, Clinical Department of Cardiovascular Surgery, Ljubljana, Slovenia

³University Medical Centre of Ljubljana, Department of Cardiology, Ljubljana, Slovenia

Introduction: Catheter ablation (CA) of ventricular arrhythmia (VA) is regarded as a complex and time-consuming electrophysiological procedure. Since it is traditionally performed with the aid of the X-ray fluoroscopy, potential radiation exposure for the patient and the operator could be significant.

Purpose: Our aim was to assess the feasibility and safety of zero-fluoroscopy CA for treatment of VA.

Methods: Nineteen patients with symptomatic VAs (7 ischemic heart disease and 12 with idiopathic ventricular ectopy (VE), 14 male (73.6%), mean age 55.0 ± 3.9 years) underwent CA procedure from March of 2017 until June 2018. All procedures were performed with the three-dimensional (3D) electroanatomical mapping (EAM) system with the aid of the intracardiac echocardiography (ICE) without any use of the X-ray fluoroscopy. Acute procedural endpoints for VE were termination and non-inducibility of arrhythmia and for VT substrate modification and non-inducibility of arrhythmia.

Results: Procedural endpoints were reached in 18 patients (94.7%). One patient with idiopathic VE originating from the left ventricular out-flow tract had a stenotic stented aortic bioprosthesis which prevented us from reaching the presumed origin of the ectopy. During the follow up of 3.8 ± 0.9 months two patients (10.5%) with idiopathic VE had early recurrences and required repeat ablation procedures. The average procedural duration was 160.3 ± 20.8 minutes. One patient developed pseudoaneurysm at the puncture site of the femoral artery after the procedure (4.8%) and required surgical intervention.

Conclusions: Zero-fluoroscopy CA for the treatment of VAs performed with the use of 3D EAM and ICE seems feasible and safe, with good short-term success.

Subject: Poster session 2 -- Ventricular Arrhythmias and SCD - Treatment

P1133

Cardiac sympathetic denervation in patients with structural heart disease and refractory ventricular arrhythmias: single center experience

Yalin K.; Liosis S.; Palade E.; Sawan N.; Eitel C.; Heeger C.; Vogler J.

Medical University, Lübeck Heart Center, Medical Clinic II (Cardiology/Angiology/Intensive Care Medicine), Lübeck, Germany

Funding Acknowledgements: None

Introduction: Cardiac sympathetic denervation (CSD) is an effective therapy for selected patients with drug refractory ventricular arrhythmias (VA). Data about the role of CSD in patients with structural heart disease and VAs is sparse. We herein present our experience of CSD in patients with structural heart disease and VAs despite prior ablation procedure.

Methods: A total of seven patients (mean age 64.2 ± 18.2 , mean LVEF $30 \pm 13\%$) with nonischemic cardiomyopathy (NICM) ($n = 6$) and hypertrophic cardiomyopathy (HCM) ($n = 1$) underwent CSD (left sided in six and bilateral in one patient) due to refractory VA despite prior VT ablation (mean number of procedures per patient: 1.1 ± 0.8).

Results: Mean pre-CSD VA burden was 16.8 ± 13.4 episodes of sustained VA per month. During a follow-up of 11.2 ± 7.9 months, three patients remained free from VA recurrences. Two patients experienced single ICD shock due to a polymorphic VT (possibly triggered by severe hypokalemia in one patient). One patient had five episodes of slow VT under amiodarone therapy (three of them terminated by antitachycardia pacing) and underwent endo-epicardial reablation. One patient died one month after CSD due to electrical storm and cardiogenic shock. The incidence of VA and ICD shocks reduced from 16.8 ± 13.4 and 13.4 ± 14.1 prior to CSD to 1.5 ± 2.1 and 1.0 ± 1.1 after CSD. No major complications of CSD occurred. No patient suffered from Horner syndrome.

Conclusion: Our series illustrates CSD may help to reduce VAs in patients with structural heart disease refractory to antiarrhythmic drugs and catheter ablation. Further larger studies are required to confirm these findings.

Case details

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Age	58	55	79	30	69	79	80
Substrate	NICM	NICM	NICM	HOCMP	NICM	NICM	NICM
LVEF (%)	35	30	25	55	30	15	20
Arrhythmia	MMVT	PMVT	MMVT (3 different morphologies)	PVC triggered PMVT	MMVT	MMVT and PMVT	Short couple PVC induced VF
Arrhythmia Burden	8 VTs/week	45 VTS/ 2 weeks	21 VTs/ 1 week	10 VTs/month	18 VTs a day	8 VTs/3 months	5 episode/3 weeks
Antiarrhythmic drugs failed	Amiodarone	Amiodarone	Amiodarone, lidocaine	Amiodarone	Amiodarone, mexiletine	Amiodarone	Amiodarone
Ablation	Endo	No	Endo	Endo	2 Endo, 1 epi	Endo	Endo
CSD	Left	Left	Left	Bilateral	Left	Left	Left
Follow-up	19 m no VAs	12 m one VT (possible hypokalemia)	1 m died (Electrical storm and cardiogenic shock)	18 m single shock due to PMVT	19 m 5 episodes of slow VTs (3 episode terminated by ATP)	1 m no VAs death due to cardiogenic shock	9 m no VAs

Case details. HCM: hypertrophic cardiomyopathy, MMVT: monomorphic ventricular tachycardia, NICM: nonischemic cardiomyopathy, PMVT: polymorphic ventricular tachycardia, VA: ventricular arrhythmia, VF: ventricular fibrillation.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1134

Mid-term clinical outcomes of subcutaneous versus transvenous implantable defibrillator therapy in young patients

Ramos Maqueda J.; Cabrera Ramos M.; Jordan Martinez L.; Macias Ruiz R.; Jimenez Jaimez J.; Sanchez Millan P.; Molina Lerma M.; Tercedor Sanchez L.; Alvarez Lopez M.

Hospital Universitario Virgen de las Nieves, Granada, Spain

Background and Purpose: The subcutaneous implantable cardioverter-defibrillator (S-ICD) was developed to reduce lead-related complications associated with transvenous ICD (TV-ICD). Most ICDs are implanted in young patients who may be more likely to experience complications and inappropriate shocks because of their active lifestyle. Our aim is to compare mid-term clinical outcomes of S-ICD and TV-ICD therapy in a young patients cohort.

Methods: Retrospective observational analysis including consecutive patients with an age between 15 and 55 years with ICD indication and no indication for pacing.

Results:

The primary analysis yielded 65 patients with balanced baseline characteristics (Table 1), with mean age 42 ± 11 years and mean left ventricular ejection fraction $37 \pm 13\%$. The follow-up resulted in mean 22 ± 14 months in the S-ICD group vs. 28 ± 19 months in the TV-ICD group ($p = 0.43$).

Appropriate shocks occurred in 12.9% of S-ICD vs. 11.7% in TV-ICD patients (only 1 patient benefitted of antitachycardia pacing as an appropriate therapy) ($p = 0.59$). Inappropriate shocks occurred in 6.4% in S-ICD vs. 11.7% in TV-ICD patients ($p = 0.38$). Complications that required device extraction occurred in 3.2% of S-ICD (1 patient with infection) vs 11.7% of TV-ICD patients (3 patients with infection and 1 with lead dysfunction) ($p = 0.20$).

Conclusions:

Rates of appropriate and inappropriate shocks were similar between S-ICD and TV-ICD and there was no difference in the complication rate between the two groups.

Table 1

		S - ICD n= 31	TV - ICD n = 34	p Value
Baseline demographic data	Age, years	40 ± 11	44 ± 10	0.14
	Male	23 (74)	26 (76)	0.80
	QRS (ms)	100	96	0.61
	Left ventricular ejection fraction	37.6 ± 11.5	35.4 ± 15	0.50
	Hypertension	41.9 (13)	35.2 (12)	0.61
	Diabetes	16.1 (5)	23.5 (8)	0.54
Indication	Primary prevention	80.6 (25)	79.4 (27)	0.57
Diagnosis	Ischaemic cardiomyopathy	29 (9)	47 (16)	0.20
	Non-ischemic dilated cardiomyopathy	16.1 (5)	14.7 (5)	0.57
	Hypertrophic cardiomyopathy	12.9 (4)	17.6 (6)	0.73
	Channelopathy	9.6 (3)	2.9 (1)	0.34
	Other	32.2 (10)	17.6 (6)	0.25

Values are mean $\pm$ SD or % (n).

P1136

Implantable cardioverter defibrillators and cardiac resynchronisation therapy in patients with dilated cardiomyopathy: efficiency in prevention of sudden cardiac death

Solovyova EA.; Blagova OV.; Zaklyazminskaya EV.

I.M. Sechenov First Moscow State Medical University, Moscow, Russian Federation

Background. Indications for ICD implantation and impact of interventions remain controversial issue in patients with dilated cardiomyopathy (DCM).

Purpose: to assess the appropriate shocks rate (ASR), possible predictors of shocks, efficiency of ICD/CRTD in prevention of sudden cardiac death, and impact on the total mortality in patients with dilated cardiomyopathy.

Methods: 274 patients with DCM syndrome were included (188 males; average age 48.1 ± 12.6 years, between 16 and 77 years old). The average LVEF was $38.1 \pm 12.0\%$ and LV EDD 6.5 ± 0.8 cm. ICD/CRTD were implanted in 73 (27%, 39/34) patients (51 males, 48.6 ± 12.7 years, LV EDD 6.7 ± 0.8 cm, LVEF $32.8 \pm 10.6\%$). The 201 (73%) patients without devices were a comparison group (137 males, 48 ± 12.5 years, LV EDD 6.46 ± 0.8 cm, LVEF $40.2 \pm 11.8\%$). The average follow-up was 13 [6; 120] months.

Results. The total mortality in patients with DCM syndrome was 19.6%, death + transplantation 17%, SCD 2.2%. The total mortality in patients with devices (ICD/CRTD) was 26% (28/23.5%), death + transplantation 28.7% (33/23.5%), SCD 1.3% (2.6/0%). The total mortality in patients without devices was 17%, death + transplantation 20%, SCD 2.5%. There were no significant differences except the endpoint «SCD» between patients with devices and comparison group. The rate of SCD in comparison group was much higher, $p < 0.001$. The ASR was 17.6%. The high rate of SCD + ASR in study group (18.7%) vs 2, 5% of SCD in comparison group show the correct selection for devices. Thus, the frequency of primary endpoint «death + transplantation + ASR» in study group was much higher 46% vs 20%, $p < 0.001$. The predictors of ASR were the genetic nature of DCM syndrome (isolated or in combination with myocarditis) in 30/67% in comparison with 20/35% in patients without ASR ($p < 0.05$). Primary DCM was represented by non-compact myocardium ($n = 59$, 53%), arrhythmogenic right ventricular dysplasia ($n = 8$, 7.1%), hypertrabeculated left ventricular myocardium ($n = 29$, 26%), TTR - amyloidosis ($n = 1$, 0.9%) and myopathy ($n = 2$, 1.8%). The pathogenic mutations in the genes LMNA ($n = 1$), DES ($n = 2$), DSP ($n = 2$), EMD ($n = 2$), MUH7 + MyBPC3 ($n = 1$), MyBPC3 ($n = 4$) were detected in 12 patients (9.9%). In 14 patients (12.6%) the nature of primary DCM has not been identified. The average LVEF was higher in patients with ASR ($36.5 \pm 9.6\%$) in comparison with patients without ASR ($24.5 \pm 7.7\%$), $p < 0.01$. The LV EDD was lower in patients with ASR (6.1 ± 0.6 cm vs 6.8 ± 0.8 cm, $p < 0.05$). The age difference of patients in both groups (48.9 ± 12.8 vs 48.7 ± 12.8 years) and NYHA class (2.6 ± 0.7 vs 2.8 ± 0.8) were not significant.

Conclusion. The genetic nature of DCM syndrome is an important predictor of appropriate shocks. The present selection criteria for ICD implantation mainly based on the assessment of LVEF does not have sufficient predictive value: appropriate shocks developed in patients with higher LVEF. As independent criteria for ICD implantation it is necessary to use the genetic nature of DCM.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1137

Time to therapy delivery and effectiveness of subcutaneous implantable cardioverter defibrillator

Diemberger I.¹; Ottaviano L.²; Pieragnoli P.³; Francia P.⁴; Rago A.⁵; Migliore F.⁶; Tavoletta V.⁵; De Filippo P.⁷; Capucci A.⁸; Caravati F.⁹; Bon-
giorni MG.¹⁰; Palmisano P.¹¹; Sala S.¹²; Milani M.¹³; Ziacchi M.¹

¹Institute of Cardiology University of Bologna, Bologna, Italy

²Sant'Ambrogio Clinical Institute, Milan, Italy

³Careggi University Hospital (AOUC), Florence, Italy

⁴Sant'Andrea Hospital, Rome, Italy

⁵Vincenzo Monaldi Hospital, Naples, Italy

⁶University Hospital of Padova, Padua, Italy

⁷Ospedale Papa Giovanni XXIII, Bergamo, Italy

⁸University Hospital Riuniti of Ancona, Ancona, Italy

⁹Di Circolo Hospital, Varese, Italy

¹⁰Azienda Ospedaliero-Universitaria Pisana, Pisa, Italy

¹¹Cardinale G. Panico Hospital, Tricase, Italy

¹²San Raffaele Hospital of Milan (IRCCS), Milan, Italy

¹³Boston Scientific Italia, Milan, Italy

Background: The subcutaneous implantable cardioverter-defibrillator (S-ICD) represents an effective alternative to a transvenous device. At the time of S-ICD implantation, ventricular fibrillation (VF) is induced and successful termination of VF is confirmed by means of a shock usually delivered at 65 J. A previous study reported cases of sensing delay leading to prolonged time to therapy during defibrillation testing.

Purpose: Evaluate the time to therapy, identify possible predictors of delay and investigate the impact of delayed therapy on VF conversion success.

Methods: We analyzed consecutive S-ICD patients who underwent VF induction at implantation and had an initial conversion testing at a shock energy of 65 J in 53 centers from 2013 to 2018.

Results: The analysis was performed in 570 patients (82% male, 48 ± 15 years, BMI 25 ± 6 Kg/m², LVEF $47 \pm 17\%$, dilated cardiomyopathy 46%, diabetes 10%, chronic kidney disease 9%). General anesthesia was used in 29% of patients, the 2-incision implantation technique was adopted in 86% of procedures, with sub- or inter-muscular positioning of the generator in 74% of patients. Sensing from the primary vector was programmed in 60% of patients. Cardioversion was successful at a shock energy of 65 J in 557 (97.7%) patients. In 12 patients the shock did not convert VF and in 1 patient the shock was not delivered due to noise from entrapped subcutaneous air surrounding the electrodes. All failures were successfully managed by reprogramming or repositioning the device. The mean time to therapy was 15 ± 3 s and it exceeded 18 s in 52 (9%) patients. For the sake of comparison, previous study reported a rate of 18% of patients with delays >18 s. On logistic regression analysis of clinical characteristics and implantation variables, the only predictor of delayed therapy (>18s) was ejection fraction <35% (odds ratio, 1.89; 95% CI, 1.01-3.50; $p = 0.043$). The effectiveness at ≤ 65 J was comparable between patients with times to therapy <18 s vs. >18 s (98.2% vs. 94.1%, $p = 0.084$).

Conclusions: In this analysis we observed that in a large population of S-ICD patients, delayed therapy during defibrillation testing occurred less frequently than previously reported. Delayed therapy occurred more frequently in patients with systolic dysfunction but was not associated with other patient characteristics or implantation technique, and was not associated with lower VF conversion success.

P1138

Appropriate and inappropriate ICD therapy with evidence-based programming: a real-world comparison with trial data

Chapman M.; Patterson Z.; Beaney E.; Bates MGD; Thornley AR.; Dewhurst M.; James S.; Turley AJ.; Linker NJ.

James Cook University Hospital, Cardiology, Middlesbrough, United Kingdom

Introduction: Both appropriate and inappropriate ICD therapies are associated with increased mortality. MADIT-RIT and PainFree SST showed that with novel programming strategies, inappropriate therapy can be as low as 2.3%/yr. Both trials featured exclusion criteria that may limit application of research findings to a real-world population. We retrospectively compared both appropriate and inappropriate therapy rates to the published data.

Method: Data were collected retrospectively from all patients implanted with an ICD or CRT-D between June 2014 and May 2017. Patients were included for analysis if their device was programmed to the detection intervals and duration of PainFree SST or the delayed therapy arm of MADIT-RIT (arm C) as per local practice. Patients were excluded if they hadn't attended our clinic within the last year. All transmissions were analysed by a senior physiologist and a cardiologist. Devices programmed to PainFree SST were split into VR devices and DR/CRT. As total numbers in each arm were relatively small, data were pooled for meta-analysis using an inverse variance model to apply weighting.

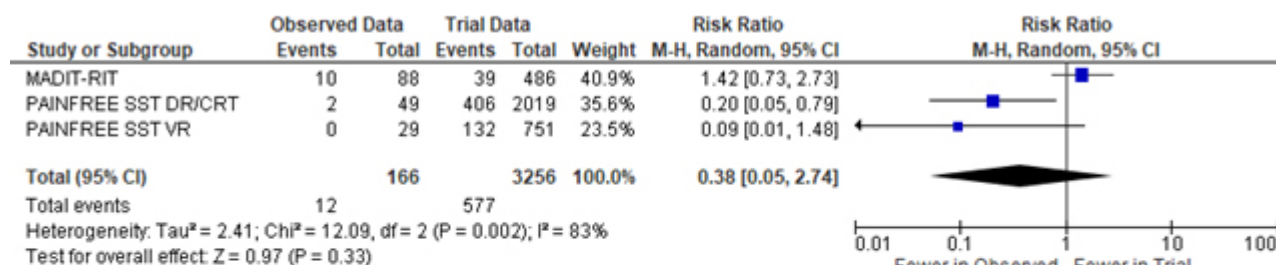
Results: 166 patients were included, mean age at implantation 65.8 (± 10.2) years, 79% male. All patients met international guidance for defibrillator therapy at first ICD implant. 86% were de-novo implants, 10% generator changes and 4% upgrades. 85% were primary prevention devices at initial implant. A CRT device was implanted in 39% (of which 83% had an atrial lead), VR in 45% and DR 16%. 88 patients were programmed as per MADIT-RIT and 78 as per PainFree SST. 35% of patients had a known history of supra-ventricular tachycardia at implant (vs 37% in PainFree SST and only 10% in MADIT-RIT, where permanent and recent AF patients were excluded). Mean follow-up was 2.1 years (± 0.8) compared to 1.8 years in Painfree SST and 1.4 years in MADIT-RIT. In total, 9 patients received 68 appropriate shocks and a further 3 patients received appropriate ATP. Inappropriate therapy was only seen in 2 patients (1 inappropriate shock and 1 inappropriate ATP, both for atrial tachycardia). Figure one highlights both appropriate and inappropriate shock rates in the observed group vs trial group.

Conclusion: There is an observed trend towards fewer inappropriate shocks and therapies than quoted in previous clinical trials, despite a greater observational period and a higher proportion of patients with pre-existing supra-ventricular arrhythmia in this real-world cohort.

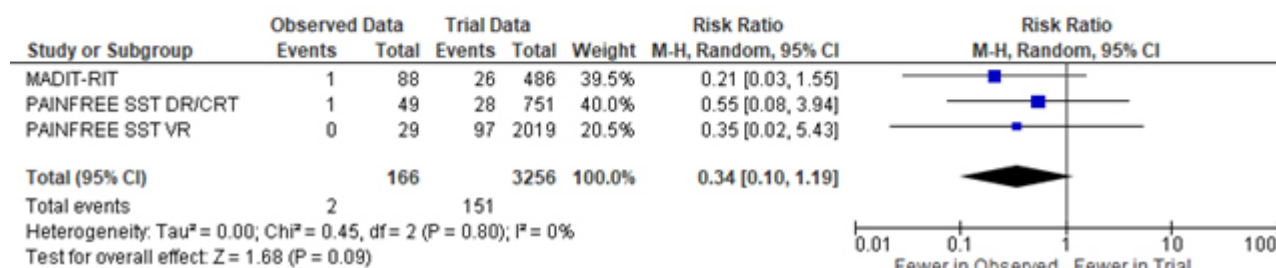
Appropriate therapy also appears less frequent than previously reported, although marked heterogeneity exists between groups and this data should be interpreted with caution.

Abstract P1138 Figure one

Appropriate ICD Therapy



Inappropriate ICD Therapy



P1139

Determinants of battery longevity of internal cardioverter defibrillators with and without cardiac resynchronization capabilities

Brenner R.; Hueppi J.; Jaeger-Rhomberg F.; Altmann D.; Ammann P.

Kantonsspital, St Gallen, Switzerland

Introduction

Reoperations of Internal Cardioverter Defibrillators (ICD) with and without cardiac resynchronization therapy (CRT) capabilities, e.g. due to battery depletion, are associated with a higher risk of complications compared to de novo implantations. Infections are of particular concerns in this regard. Therefore, battery longevity should be a pivotal consideration in choosing an ICD/CRT.

Purpose: We aimed to assess the battery longevity of all ICDs and CRT with defibrillator function (CRTD) in our center and to search for factors related to battery longevity.

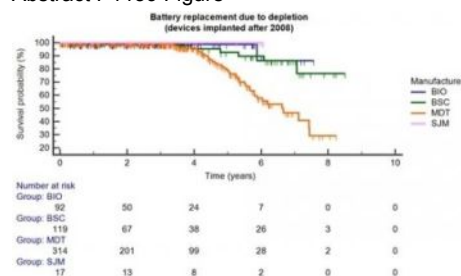
Methods: All ICD/CRTDs followed-up in our center between Jan 2004 and Dec 2015 were considered for evaluation. Routine in-house follow-up examinations were done every 6 months. All impulse generator changes secondary to battery depletion were considered endpoints; in case of other reasons for generator replacement, the events were censored. For the current analysis, the time of implantation, type of device and manufacturer were considered factors related to battery longevity.

Results: Of 864 device operations, 185 (21.4%) were impulse generator replacements due to battery depletion. 35% were CRTD, 48% single chamber ICDs, and 17% dual chamber ICDs. The overall 5-year battery survival rate was 79.7% with a median survival rate of 6.8 (95% CI 6.3-7.2) years. Expectedly, single chamber ICDs had a significantly longer battery 5-year survival rate compared to dual chamber (91.9% vs 73.3%, $p < 0.001$) and CRTD devices (63.7%, $p < 0.001$). Devices implanted before Jan 2008 (25.8% of all assessed devices) had a shorter battery longevity compared to devices implanted afterwards (85.9% vs 71.8%, $p < 0.001$). Whereas Medtronic (MDT) devices had overall a longer battery longevity in devices implanted before 2008 compared to devices from Boston Scientific (BSC, HR for time until battery replacement 0.48, 95% CI 0.32, 0.73), BSC (HR 0.25, 95% CI 0.13, 0.47) and Biotronik (BIO) devices (HR 0.19, 95% CI 0.1, 0.46) surpassed MDT devices after 2008 (figure). The significant difference between BSC and MDT in contemporary devices was only evident in CRTD (5-year-battery longevity BSC CRT 100% vs MDT 60.3%, $p < 0.001$, BSC ICD 92% vs MDT 100%, $p = \text{n.s.}$).

Conclusion

Battery longevity is related to the device type, time of implantation and manufacturer. Interestingly, adoption of a new battery technology in BSC devices in 2008 lead to a significant gain of battery longevity compared to the Medtronic devices, but was only evident in CRTD.

Abstract P1139 Figure



P1140

Day case complex devices - The state of the UK

Waight M.¹; Elawady A.¹; Gage H.²; Touray M.²; Adhya S.¹

¹Medway Maritime Hospital, London, United Kingdom

²University of Surrey, Health economics, Guildford, United Kingdom

Funding Acknowledgements: Nil

Introduction: Simple pacemakers have been implanted as day case procedures in the UK since 1989. More recently, some centres have reported success with implanting complex cardiac devices including implantable cardioverter-defibrillator (ICD) and cardiac resynchronisation therapy (CRT) as day cases. This practice improves patient satisfaction, while not compromising on safety. Just how widespread day case complex device therapy is across the UK has not been assessed.

Purpose: We assess how many centres in the UK are performing complex cardiac devices as a day case as well as the potential cost saving implications if this practice were to be adopted across the country.

Methods: A freedom of information request was sent to all UK centres which implant cardiac devices asking them the following questions:

1) Does your hospital perform complex cardiac devices as a day case procedure? (ICD, CRT-P or CRT-D)

2) Do you have a trust protocol for this procedure?

3) What proportion of complex devices are performed as a day case as compared to overnight stay?

<25%

25-50%

50-75%

75%

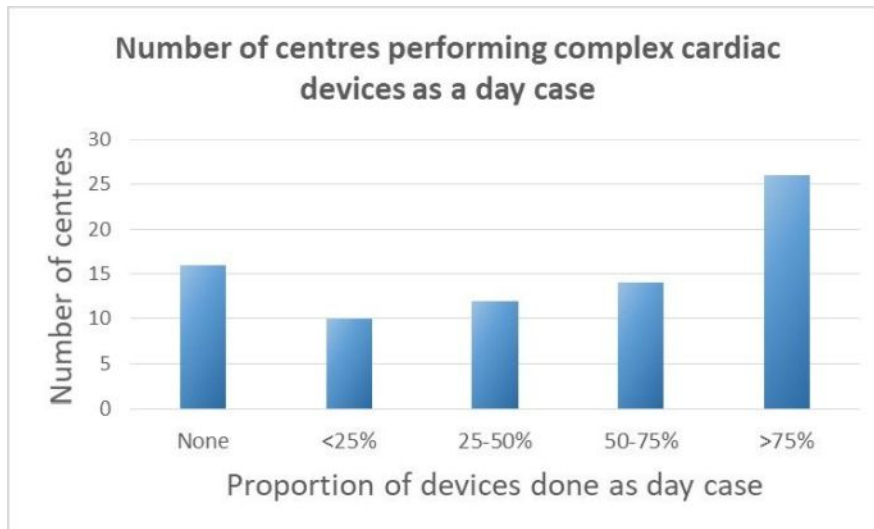
The costs of implanting complex cardiac devices as day case procedures as well as overnight stay were assessed using the NHS England National Tariff workbook for 2016-2017 and relative cost savings were calculated assuming all UK centres were to perform 87.5% of their complex devices as day cases.

Results

198 centres were identified. 98 were excluded as they do not perform complex cardiac devices, were paediatric centres or implanted less than 20 complex cardiac devices per year. We sent the FOI request to the remaining 100 centres. 80% responded to the request. 80% of centres already implant complex cardiac devices as a day case. 64.06% of centres have a protocol for this. 10 centres (16.13%) do <25% of complex devices as day case. 12 centres (19.35%) do 25-50%. 14 centres (22.58%) do 50-75% and 26 centres (41.94%) do >75%. Those centres doing <25% as day case implant a total of 1492 devices per year. Those doing 25-50% implant 1922. Those doing 50-75% implant 2316 and those doing >75% as day case implant 3582 per year. Those centres which do not do any complex devices as a day case insert 2158 devices per year. Implanting a complex cardiac device as a day case (average cost £4981) as opposed to overnight stay (£6017) saves on average £1035 per device. An estimated 11,470 complex devices are implanted each year in the UK, with 5490 (47.86%) currently being implanted as a day case. If 87.5% of devices were implanted as day case, then a potential annual saving of £4,705,110 could be made across the UK.

Conclusions: As a practice, day case complex cardiac devices is already widespread across the UK, but to varying degrees. Currently, less than half of all complex devices are being implanted as a day case. Potential savings of £1035 per device can be made by switching to day case. This practice could save the UK £4,705,110 per year as well as improving the patient experience.

Abstract P1140 Figure. UK daycase complex devices proportions



P1141

Screening data correlates with inappropriate therapy occurrence after subcutaneous implantable cardioverter defibrillator implantation: a single center experience

Carabelli A.; Jacon P.; Venier S.; Dugenet F.; Jabeur M.; Sarr S.; Defaye P.

University Hospital of Grenoble, Grenoble, France

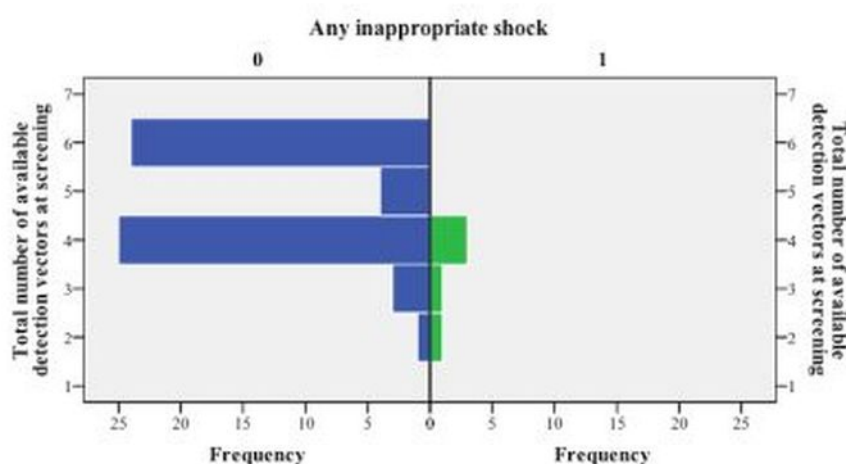
Purpose: Subcutaneous Implantable Cardioverter Defibrillators (S-ICD) is considered as a reliable alternative to transvenous ICD in patients without indication of cardiac stimulation, resynchronization or anti-tachycardia pacing. However higher inappropriate shocks rate after S-ICD implantation have been reported compared with standard systems. We aimed at comparing pre-implantation screening data of patients with an inappropriate shock event during follow-up (FU) with uneventful patients.

Methods: S-ICD recipients with complete implantation and FU data above 2 months were included in this single center study. Patients were followed with remote monitoring.

Results: 62 S-ICD recipients implanted between 2014 and 2018 were included. Patients were $51,2 \pm 11,4$ years old, 50 (81%) were men. 18 patients (29%) had a secondary prevention indication. $4,7 \pm 1,2$ detection vectors were available at pre-implantation screening, $2,35 \pm 0,66$ at the left lead sternal implantation site and $2,35 \pm 0,66$ at the right lead sternal site. 58 patients (94%) had the lead implanted at the left sternal site. 9 patients (15%) had at least one shock during a mean follow-up of $13 \pm 10,4$ months. There were 23 appropriate therapies in 4 different patients (6,5%) and 11 inappropriate therapies in 5 different patients (8,1%). 3 inappropriate shock recipients had a primary prevention indication, 2 patients an ischemic cardiomyopathy, 2 a hypertrophic cardiomyopathy and 1 a dilated cardiomyopathy. Identified causes of inappropriate therapies were noise oversensing in 2 patients and rapid supraventricular arrhythmias in 3 patients. The mean number of total detection vectors available at pre-implantation screening was significantly lower in patients with history of inappropriate shock than in other S-ICD recipients ($3,4 \pm 0,89$ versus $4,8 \pm 1,1$; $p < 0,01$; Figure). Less detection vectors were available at left sternal lead implantation site at pre-implantation screening in inappropriate shock recipients versus other patients ($1,6 \pm 0,89$ versus $2,42 \pm 0,6$; $p < 0,01$). $1,8 \pm 0,45$ versus $2,4 \pm 0,65$ vectors were available at right sternal lead implantation site in patients with a history of inappropriate shock versus others ($p < 0,05$).

Conclusion: In this 62 S-ICD recipients cohort from a single center we identified a significantly lower number of available detection options at pre-implantation screening in patients with history of inappropriate shock than in other patients. This data may reflect a higher risk of inappropriate shocks in patients with a low number of detection vectors available at screening and will need further investigations and confirmation.

Abstract P1141 Figure. Inappropriate shocks and screening data



Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1142

High rate of shocks after subcutaneous internal cardioverter defibrillator implantation: a monocentric, real life experience

Jacon P.; Carabelli A.; Venier S.; Dugenet F.; Sarr S.; Jabeur M.; Defaye P.

University Hospital of Grenoble, Grenoble, France

Purpose: The subcutaneous implantable cardioverter defibrillator (S-ICD) is accepted as a reliable alternative to transvenous ICDs for patients (pts) with ICD indication when pacing therapy, cardiac resynchronization therapy or antitachycardia pacing is not needed. Little is known about appropriate (ap) and inappropriate (inap) shocks rate in the real life setting.

Methods: We analyzed mid-term results after S-ICD implantation. All pts implanted with an S-ICD and a follow-up (FU) above 2 months were included, they were followed with remote monitoring (RM).

Results: 99 pts were implanted with an S-ICD between 2013 and 2017 (male 82%, 50 ± 11 y.old). Indications were: primary prevention 72 %, secondary prevention 28% (ischemic cardiomyopathy 37%, hypertrophic 5%, dilated 35% channelopathy 5%). 12 pts had prior sternotomy, and 12 pts had previous endovascular ICD.

91 pts were implanted with a two incision procedure, 8 with three incisions. A defibrillation test (DFT) was not performed in 12 pts for safety reasons (non optimal anticoagulation in AF pts, or frailty). 100% of implantations were successful with good postoperative detection and 100% DFT success when attempted. There were no post procedural complications. S-ICDs were programmed with 2 zones of therapy (conditional zone 209 ± 10 bpm, VF zone 236 ± 9 bpm). 86% were followed by RM.

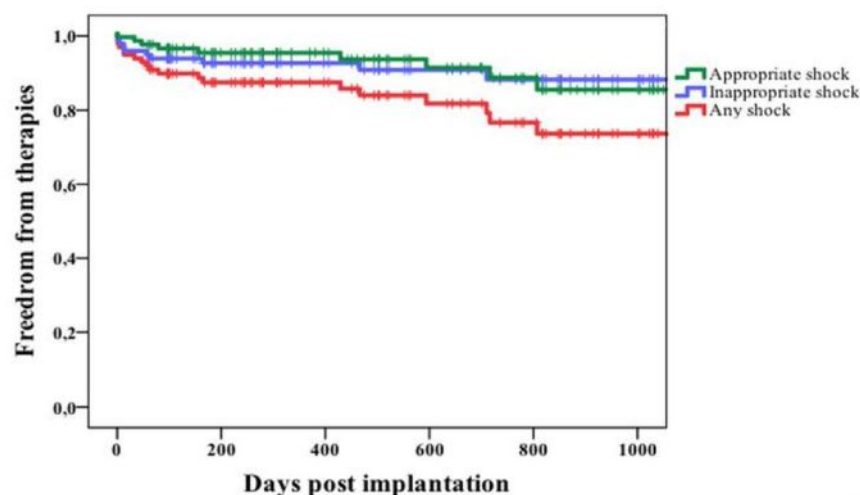
19 (19%) pts had at least one therapy during a mean FU of 19 ± 11 months: 8 (8%) pts an ap shock, 10 (10%) an inap shock and 1 (1%) experienced both ap and inap shocks.

43 Ap shocks occurred in 9 patients: $4,7 \pm 3,5$ per pt, mostly multiple (per episode, N = 1 for 2 pts only, N = 9 for 1 pt, N = 11 for 1 pt), the first shock occurred after a mean $10,6 \pm 10,7$ months FU period. 6 pts experienced several episodes. 5 patients were referred for VT ablation, 1 for a conversion to endovascular ICD. In this population, 1 pt died following rhythmic storm, 1 after VT ablation procedure.

Over 11 pts with inap shocks, time to the first event is $13,6 \pm 19,8$ months with 4 events within the first FU month. There were $1,6 \pm 1,2$ inap shocks per pt, mostly in one episode. 7 pts experienced 1 inap shock, 3 pts 2 shocks and 1 pt 5 shocks. Causes were: 3 supraventricular arrhythmias, 1 T wave and 7 noise oversensing. One pt with noise oversensing experienced 5 shocks. One inap event resulted in ICD deactivation and one in a fatal ventricular fibrillation (electromechanical dissociation after unsuccessful safety shocks). Reprogramming (such as vector change or exercise template storage) and medical therapy options were efficient in other pts.

Conclusion: In this 99 S-ICD recipients cohort from a single center the rate of shocks was 19%. Although it may reflect the severity of patients implanted, further investigations are needed to explain this unusual real life high rate of therapies, especially concerning 11% inap shocks.

Abstract P1142 Figure. SICD therapies during the first 3 years



P1143

Prognosis of ischemic patients implanted with a prophylactic defibrillator according to the type of myocardial infarction; insights from the Very-High-Rate registry

Clementy N.; David C.; Bisson A.; Pierre B.; Bernard A.; Angoulvant D.; Fauchier L.; Babuty D.

Tours Regional University Hospital, Hospital Trousseau, Department of Cardiology, Tours, France

Introduction: Implantable cardioverter defibrillator (ICD) is recommended in primary prevention patients with an ischemic cardiomyopathy and reduced left ventricular ejection fraction (LVEF).

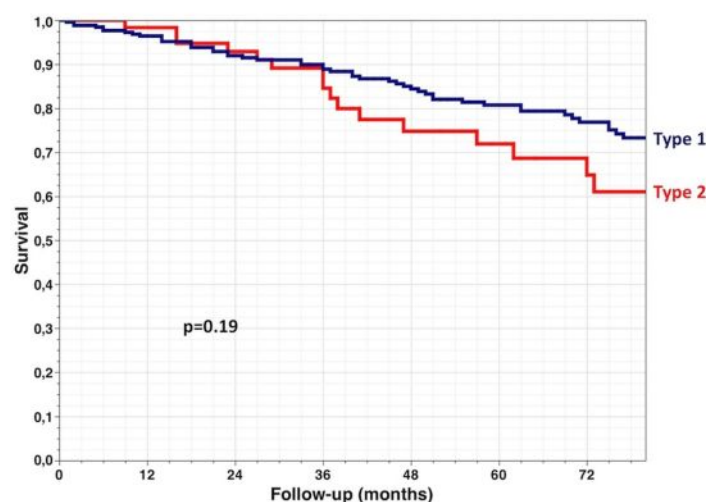
Purpose: We sought to compare the prognosis of ischemic patients implanted with a prophylactic ICD according to the type of myocardial infarction (MI).

Methods: Patients from the Very-High-Rate registry implanted with a prophylactic ICD for an ischemic cardiomyopathy between 2006 and 2016 were retrospectively included. Cardiac resynchronization therapy patients were excluded. Patients without type 2 MI were matched (1:4) with patients with type 1 MI using propensity score. The following events were collected: death, hospitalization for heart failure, cardiac transplantation, and appropriated therapies on ventricular arrhythmia (≥ 220 beats-per-minute).

Results: Among 571 consecutive ischemic patients, 65 type 2 were matched to 260 type 1 patients. After a mean follow up of 55 ± 36 months, 63 patients (24%) died in the type 1 group, 18 (28%) in the type 2 group ($p = 0.19$). Survival rate from appropriate therapies on high-rate ventricular arrhythmias was significantly lower in the type 2 group ($p = 0.04$).

Conclusion: Patients implanted with a prophylactic ICD for severe ischemic cardiomyopathy have similar outcomes, whether type 1 or type 2 MI patients. Low left ventricular function, rather than clinical presentation, should indicate ICD implantation in post-MI patients.

Abstract P1143 Figure. Survival (all cause death)



Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1144

Early predictors of prophylactic defibrillator implantation six weeks after acute myocardial infarction

Clementy N.; Bensaid R.; Bisson A.; Pierre B.; Bernard A.; Fauchier L.; Angoulvant D.; Babuty D.

Tours Regional University Hospital, Hospital Trousseau, Department of Cardiology, Tours, France

Introduction: A reduced left ventricular ejection fraction (LVEF) $\leq 35\%$ at least 6 weeks after an acute myocardial infarction (MI) indicates the implantation of a cardioverter-defibrillator (ICD) in primary prevention of sudden death.

Purpose: We sought to study the baseline parameters associated with LVEF recovery ≥ 6 weeks post-MI.

Methods: All patients hospitalized for ST-segment elevation myocardial infarction with an LVEF $\leq 35\%$ at discharge at the CHRU Tours between 2010 and 2017 were retrospectively included. Patients were categorized after a 6-week follow-up period in 2 groups: those with a formal indication for implantation of an ICD (ICD+ group); those with no further indication of ICD due to LVEF recovery $> 35\%$ (ICD- group).

Results: 149 patients were included, 52 in the ICD+ group and 97 in the ICD- group. After multivariate analysis, the independent predictive factors for persistence of a prophylactic ICD indication were LVEF at discharge from hospital $\leq 25\%$ (adjusted OR = 6.23 [2.47-17.0], $p < 0.0001$) and a CPK peak at the acute phase > 4600 UI/L (adjusted OR = 9.99 [4.27-25.3], $p < 0.0001$).

Conclusion: The association of a severely reduced LVEF and a major increase in cardiac enzymes release at the acute phase of MI may prompt an early prophylactic ICD implantation.

P1145**Evolution and triggers of appropriate ICD shocks in patients with arrhythmogenic cardiomyopathy during long-term follow-up**

Hofer D.; Molitor N.; Akdis D.; Brunckhorst C.; Duru F.; Saguner A.

University Hospital Zurich, Zurich, Switzerland

Introduction

Arrhythmogenic cardiomyopathy (ACM) is a life-threatening disease exposing patients at risk for arrhythmias and heart failure. Implantable cardiac defibrillators (ICD) can prevent sudden cardiac death in ACM, but the evolution and triggers of arrhythmic events are not well described.

Purpose

To describe the incidence, evolution and triggers of appropriate ICD shocks in patients with ACM to identify targets for future treatment optimization.

Methods

We retrospectively analysed a cohort of genotype and phenotype positive definite ACM patients with ICDs for the occurrence of appropriate shocks. We used every available device interrogation for data collection.

Results

37 appropriate ICD shocks occurred in 15 of 26 patients (58%, Table 1) during a mean follow up of 10 ± 7.3 years. Mean time to first shock was 2.8 years (range 0-15). 68% of appropriate shocks occurred within 5 years after ICD implantation, and the amount of appropriate shocks adjusted for the number of patients at follow up declined consistently over time (Figure 1). All shocks occurred during daytime and the majority during summer (38%) vs. winter (22%, $p = 0.127$). We identified a high rate (86%) of potentially reversible triggers in 32 of 37 episodes (sports activity 56%, hypokalaemia 34% and infection 9%).

Conclusions

The risk of appropriate ICD shocks in ACM persists over years after ICD implantation. However, although ACM is a progressive disease, appropriate ICD shocks decline over time, which may reflect optimization of treatment and ICD programming. Arrhythmic episodes occur more often in summer, during daytime, and reversible triggers are frequent. Whether sports restriction, potassium substitution and early treatment of infections might reduce arrhythmic burden, deserves further investigation.

Table 1: Baseline characteristics (n = 26)

Mean age at diagnosis	37.2
Male	46%
Definite ACM (diagnostic criteria 2010)	100%
Secondary Prevention	57%
LVEF < 50% (Echocardiography)	22%
Betablocker	54%
Amiodarone	27%
ACE-inhibitor/Aldosterone-antagonist	24%
Sustained ventricular tachycardia pre-ICD	62%
VT on electrophysiological study pre-ICD	43%
Sudden cardiac arrest pre-ICD	5%

Abstract P1145 Figure 1

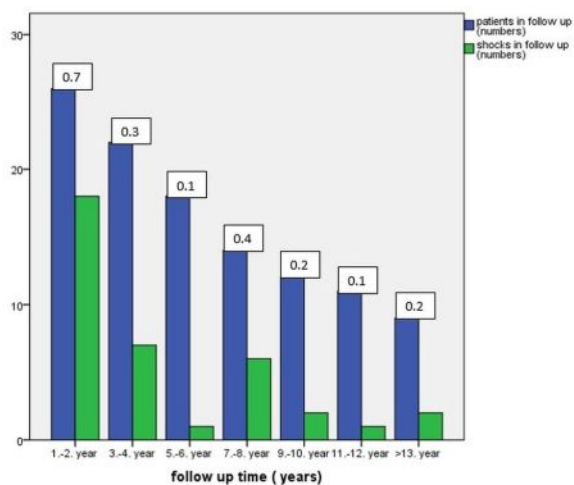


Figure 1: Number of patients, number of appropriate ICD shocks and arrhythmic-burden-quotient (shocks/number of patients) within 2-year periods during follow up.

P1146

Adequate ICD treatments after the use of the wearable cardioverter-defibrillator - First results from the swiss nationwide WCD registry

Kovacs B.¹; Burri H.²; Haegeli L.³; Reek S.⁴; Krasniqi N.⁵; Eriksson U.⁵; Duru F.¹

¹University Heart Center, Zurich, Switzerland

²University of Geneva, Cardiology, Geneva, Switzerland

³Cantonal Hospital Aarau, Cardiology, Aarau, Switzerland

⁴Hirslanden Medical Center, Cardiology, Aarau, Switzerland

⁵GZO Zurich Regional Health Center, Cardiology, Wetzikon, Switzerland

Introduction: The wearable cardioverter-defibrillator (WCD) offers an efficacious temporary protection from arrhythmogenic death when an implantable cardioverter-defibrillator (ICD) cannot (yet) be used. The role of WCD and the patients most likely to benefit from it remains up to debate. Little is known about the rate of device implantation as well as the incidence of adequate treatments after WCD use.

Purpose: This is the first study reporting on the indications and outcomes of the use of the WCD in our country focusing on device implantation rate and following treatments.

Methods: We retrospectively reviewed the indications and outcomes at four medical centers prescribing WCDs over the past four years. Data on therapy adherence, outcomes and number of therapies by WCD and (if implanted) ICD are reported.

Results: 262 patients were included in our study. The mean age was 58 ± 13 years, 15% were female. Indications of WCD use were reduced ejection fraction due to ischemic cardiomyopathy (ICM) (45%), non-ischemic cardiomyopathy (NICM) (28%), inherited/congenital heart disease (0.4%), documented or suspected ventricular arrhythmia without the indication for ICD (6 and 5%, respectively), bridge to either device implantation (7%) or heart transplantation (0.8%), or other (7.8%). The median wear-time was 22.6 hours per day (interquartile range [IQR] 19.8 to 23.2 hours per day) over a median of 60 days (IQR 35-93). The number of adequate treatment by the WCD was only three (1%) while no inadequate treatments occurred. 45% of patients were implanted with an ICD. During a median follow-up of 432 days (IQR 247-708), adequate treatment occurred in 10% of implanted patients after a median of 110 days (IQR 13-256). Inadequate treatments occurred in 1.6% after a median of 378 days (IQR 201-556). Therapy by ICD was most frequent for ICM patients (50% of treated patients) as initial WCD indication.

Conclusions: ICM was the most common indication for WCD use in the national cohort. Despite the rather long wear-times, the rate of adequate therapy by the WCD was low. Adequate discharges were observed in 10% of ICD recipients after several months, which may question the role of very early WCD use for ICM.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1147

Subcutaneous implantable cardioverter defibrillator in patients with arrhythmogenic right ventricular cardiomyopathy: results from an Italian multicenter registry

Migliore F.¹; Viani S.²; Bongiorno MG.²; Zorzi A.¹; Silvetti MS.³; Francia P.⁴; D'Onofrio A.⁵; De Franceschi P.¹; Donzelli S.⁶; Ricciardi G.⁷; Menardi E.⁸; Illiceto S.¹; Bertaglia E.¹; Diemberger I.⁹; Corrado D.¹

¹Departement of Cardiac, Thoracic and Vascular Sciences, University of Padova, Padova, Italy

²University Hospital of Pisa, Cardiology Division, Cardio-Thoracic and Vascular Department, Pisa, Italy

³Bambino Gesù Childrens Hospital, Cardiology and Arrhythmology Unit, Rome, Italy

⁴Sapienza University of Rome, Division of Cardiology, Rome, Italy

⁵Vincenzo Monaldi Hospital, Division of Cardiology, Naples, Italy

⁶S. Maria Hospital, Terni, Italy

⁷University of Florence, Florence, Italy

⁸Santa Croce E Carle Hospital, Cuneo, Italy

⁹University Hospital Policlinic S. Orsola-Malpighi, Institute of Cardiology, Department of Experimental, Diagnostic and Specialty Medicine,, Bologna, Italy

Background: Despite expanding indication of the S-ICD in clinical practice, limited data exists on safe and efficacy of S-ICD in arrhythmogenic right ventricular cardiomyopathy (ARVC) patients.

Purpose: The aim of this multicenter study was to evaluate the safety and efficacy of S-ICD in ARVC patients.

Methods: The study population included 44 consecutive definitive ARVC patients according to the 2010 ITF criteria (57% male, mean age 37 ± 17 years [range 10–75 years]) who received an S-ICD implantation. Eighteen (41%) patients were implanted for secondary prevention.

Results: At implant, all inducible patients (34/44) had conversion of induced ventricular fibrillation (VF) at 65 J. No early complications occurred. During a median follow-up of 12 months (7–19), 3 (6.8%) patients experienced complications requiring surgical revision. No local or systemic device-related infections were observed. Six patients (14%) received a total of 61 appropriate and successful shock on ventricular arrhythmias (VA). Six (14%) patients experienced 8 inappropriate shocks for oversensing of cardiac signal (4 cases) and non-cardiac signal (4 cases) with one patient requiring device explantation. No patients had the device explantation due to the need for antitachycardia pacing.

Conclusions: according to our study results, S-ICD is safe and effective in terminating both induced VF and spontaneous VA in ARVC patients suggesting that S-ICD is a potential valid alternative to transvenous ICD. Proper pre-implantation ECG screening, better device programming, and software upgrade offer the potential to reduce the relative high rates of inappropriate shocks and surgical reintervention observed in our ARVC patients.

P1148

Multicenter experience with the second generation of subcutaneous implantable cardioverter defibrillator and intermuscular two-incision implantation technique: safety and efficacy

Migliore F.¹; Mattesi G.¹; De Franceschi P.¹; Allocca G.²; Calzolari V.³; Facchin D.⁴; Marras E.⁵; De Lazzari M.¹; Testolina M.¹; Zanon F.⁶; Siciliano M.⁷; Illiceto S.¹; Bertaglia E.¹; Zecchin M.⁸

¹Departement of Cardiac, Thoracic and Vascular Sciences, University of Padova, Padova, Italy

²Conegliano General Hospital, Conegliano, Italy

³Hospital Santa Maria di Ca Foncello, Treviso, Italy

⁴University of Udine, Udine, Italy

⁵Hospital dell'Angelo, Mestre-Venice, Italy

⁶General Hospital of Rovigo, Rovigo, Italy

⁷Hospital of Camposampiero, Camposampiero, Italy

⁸University of Trieste, Trieste, Italy

Background: The recently developed new generation of S-ICD and the intermuscular two-incision implantation technique demonstrate potential favourable features reducing inappropriate shocks and complications. However, data concerning large patient populations are lacking.

Purpose: The aim of this multicenter prospective study was to evaluate the safety, efficacy and outcome of the second generation S-ICD using the intermuscular two-incision technique in a large population study.

Methods: The study population included 101 consecutive patients (75% male, mean age 45 ± 13 years) who received second generation of S-ICD implantation using the intermuscular two-incision technique as an alternative to the standard implantation technique.

Results: Twenty-nine (29%) patients were implanted for secondary prevention. Twenty-four (24%) patients had previously transvenous ICD implanted. All patients were implanted without any procedure-related complications. Defibrillation test was performed in 80 (79%) patients and ventricular tachycardia was successfully converted at ≤ 65 J in 98.75% (79/80) of patients without pulse generator adjustments. During a median follow-up of 21 ± 10 months, no complications requiring surgical revision nor local or systemic device-related infections were observed. Ten patients (9.9%) received appropriate and successful shocks on ventricular arrhythmias. Three (2.9%) patients experienced inappropriate shocks for oversensing of cardiac signal ($n = 1$), non-cardiac signal ($n = 1$) and combination of both cardiac and non cardiac signal ($n = 1$), with one patient requiring device explantation. No patients required device explantation because of antitachycardia pacing indication.

Conclusions: According to our multicenter study, second generation S-ICD implanted with the intermuscular two-incision technique is a safe and effective combination potentially reducing complications including inappropriate shocks.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1149

Difference in reliability of wavelet algorithm for discrimination between modern implantable cardioverter defibrillator with or without resynchronization

Oginosawa Y.¹; Abe H.²; Kohno R.²; Ohe H.¹; Tsukahara K.¹; Otsuji Y.¹

¹University of Occupational and Environmental Health, The 2nd Department of Internal Medicine, Kitakyushu, Japan

²University of Occupational and Environmental Health, The Division of Heart Rhythm Management, Kitakyushu, Japan

OnBehalf: DEFENSE study investigators

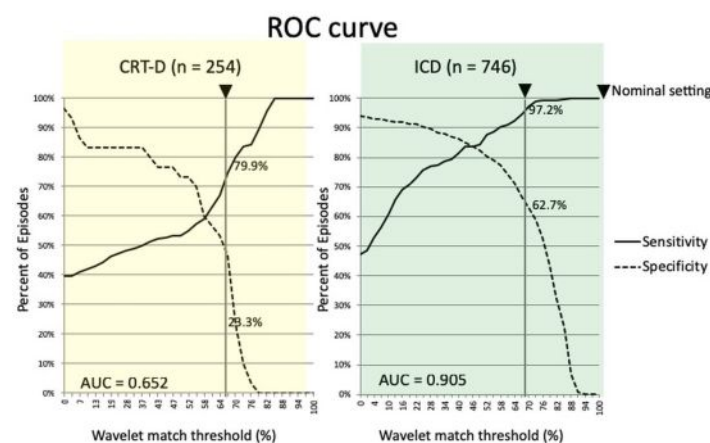
Backgrounds: Discriminating Algorithms are important to avoid unnecessary therapy of implantable cardioverter defibrillator (ICD). Recently, we have reported that the usefulness of current algorithms including wavelet analysis by a multicenter prospective observational study, however, there was a few inappropriate withholdings by wavelet algorithm in patients with cardiac resynchronization therapy with defibrillator (CRT-D). The aim of this study was to compare the characteristics and reliability of wavelet algorithm between ICD and CRT-D.

Methods: Device-stored episodes of tachyarrhythmias with wavelet data were analyzed.

Results: 1,000 tachyarrhythmia (VT/VF 514 and the others 486) episodes were recorded in 71 out of 182 patients. The wavelet score of VT/VF episodes was significantly lower than the others such as supraventricular tachycardia (25 +/- 1 vs 68 +/- 1 %), and significantly high in patients with CRT-D compared with ICD. The sensitivity and specificity were different between those devices (Figure 1).

Conclusions: Wavelet algorithm is reliable for ICD patients. Alternative setting of wavelet match threshold should be considered in CRT-D patients.

Abstract P1149 Figure 1



Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1151

Rate responsive pacing and atrial high rate episodes in CRT patients. Lowering heart rate is key

Biffi M.¹; D'Onofrio A.²; Pignalberi C.³; Pisano E.⁴; Iacopino S.⁵; Curnis A.⁶; Senatore G.⁷; Capucci A.⁸; Della Bella P.⁹; Calvi V.¹⁰; Zanotto G.¹¹; Caravati F.¹²; Giacomelli D.¹³; Gargaro A.¹³; Solimene F.¹⁴

¹Institute of Cardiovascular Diseases of Bologna, Bologna, Italy

²AO dei Colli-Monaldi Hospital, Naples, Italy

³San Filippo Neri Hospital, Rome, Italy

⁴Vito Fazzi Hospital, Lecce, Italy

⁵Maria Cecilia Hospital, Cotignola, Italy

⁶Civil Hospital of Brescia, Brescia, Italy

⁷Civic Hospital of Cirié, Cirié (Turin), Italy

⁸University Hospital Riuniti of Ancona, Ancona, Italy

⁹San Raffaele Hospital of Milan (IRCCS), Milan, Italy

¹⁰University Hospital Vittorio Emanuele, Catania, Italy

¹¹Legnago Hospital, Legnago, Italy

¹²Di Circolo Hospital, Varese, Italy

¹³BIOTRONIK Italia, Clinical Research, Vimodrone, Italy

¹⁴Montevergine Cardiology Clinic, Mercogliano, Italy

Funding Acknowledgements: This was an independent study. No external funding was obtained for this project.

OnBehalf: Home Monitoring Expert Alliance

Background: The role of atrial rate-responsive (RR) pacing in cardiac resynchronization therapy (CRT) is unclear due to the favorable effect of rate lowering in systolic heart failure. Atrial high rate episode (AHRE) onset in CRT recipients is particularly worrisome since they cause loss of CRT, beyond representing a stroke risk factor.

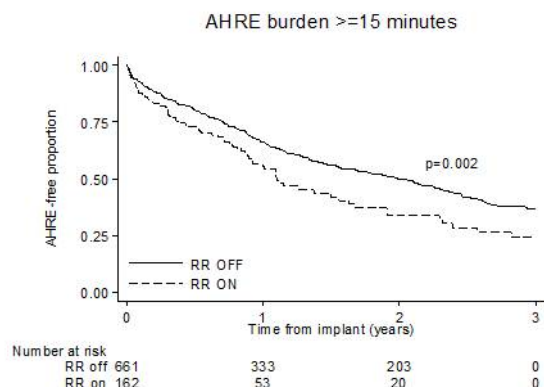
Purpose: We investigated the effect of atrial RR on the incidence of AHREs.

Methods: Daily remote monitoring transmissions from 836 CRT recipients were analyzed. AHREs were classified by duration: ≥ 15 minutes, ≥ 5 hours, and ≥ 24 hours. Variables possibly associated to AHREs were included in time-dependent proportional-hazard models, averaging over 30-day periods and adjusting for main baseline variables.

Results: After a median follow-up of 24.5 (12.2-42.9) months, 507 (60.6%) patients experienced at least one 15-minute AHRE. RR function was programmed in 166 (19.8%) patients and was associated with an increased AHRE occurrence rate with hazard ratio (HR) ranging from 1.45 to 1.78 for the 3 cutoffs of episode duration. The negative effect of RR function was not observed in the subset of patients with low mean heart rate (< 68 bpm). Higher mean heart rates increased AHRE risk (HR:1.02, $p = 0.01$), while CRT amount decreased it (HR:0.98, $p < 0.01$). The extent of atrial pacing did not predict AHRE occurrence.

Conclusions: RR pacing in CRT recipients is associated with increased AHRE occurrence, especially when an average heart rate > 68 bpm is attained. In CRT recipients, VDD mode at low resting rate should be preferred, and RR pacing considered in the event of severe sinus bradycardia with reduced heart rate variability.

Abstract P1151 Figure.



Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1152

Is it possible to predict CRT response by analyzing damaged-DNA in blood taken from coronary sinus?

Sipos SN.¹; Grigore C.²; Capraru C.¹; Dragotoiu N.¹; Mandes L.¹; Bostan I.¹; Ciudin RN.¹

¹Institute of Cardiovascular Diseases Prof. C.C. Iliescu, Cardiac electrophysiology and pacing & ICDs, Bucharest, Romania

²Coltea Clinical Hospital, Internal medicine and cardiology, Bucharest, Romania

Funding Acknowledgements: Research financed by POSDRU 2007-2013: CERO – PROFIL DE CARIERĂ: CERCETĂTOR ROMÂN POS-DRU/159/1.5/S/13576

OnBehalf: -

Introduction: Heart failure (HF) patient selection for Cardiac Resynchronization Therapy (CRT) continues to be a real issue nowadays and still needs improvement. Up to 30% of CRT patients are currently non-responders to therapy. New bio-markers could be helpful in identifying CRT responders, before procedure.

Objectives/Purpose: The aim of our prospective study was to evaluate both damaged- DNA and total antioxidant capacity (TAC) – both being part of the oxidative stress panel - in HF patients. Measurements were done prior to cardiac resynchronization therapy and after implant, in order to assess the magnitude of oxygen related stress and its evolution before and after therapy (both in responders and non-responders).

Methods: We enrolled 28 patients with conventional guideline indication for CRT: NYHA Class (II-III), EF < 35%, LBBB, QRS > 130 ms. Blood samples were taken during CRT intervention (both peripheral and directly from the coronary sinus). We followed-up with them every 3 months and a third sample of peripheral blood was taken 6 to 12 months after intervention. Damaged DNA and TAC were then assessed using ELISA method. Although taking blood from the coronary sinus may seem an invasive approach, almost all patients undergoing CRT implant are referred a priori for coronary angiogram; at this point coronary angiogram could be completed with the catheterization of the coronary sinus.

Results: Out of 28 patients, 15 were responders to CRT – using clinical and echocardiography data. The assessment of damaged DNA from peripheral blood prior and after intervention showed no specific pattern and no obvious evolution, both in responders and non-responders. By contrast, the level of damaged DNA taken from the coronary sinus identified a clear and distinct population – all the responders to therapy seemed to have greater levels of Damaged DNA in contrast with the non-responder population. As expected, TAC was lower in the responders group vs. non-responders. Our theory is that greater levels of damaged DNA should be present in heart failures with high percent of remaining viable myocardium. On the contrary, hearts with extensive fibrosis/scar with no or very little viable myocardium are unable to produce high quantities of damaged DNA due to the lack of active cardiac fibers. These patients are less likely to reverse-remodel and consequently are candidates for non-response to CRT. There was no correlation between oxidative stress observed in peripheral and central cardiac blood. Interesting correlations also occurred between QRS duration and the levels of oxidized DNA.

Conclusion: Damaged- DNA and TAC measured from coronary sinus pre-procedural blood sample could be a new biomarker to identify responders to CRT, but it needs further research. Peripheral oxidative stress markers seem to be of no use.

P1153**Assessing the best programming strategy for cardiac resynchronization therapy using MultiPoint Pacing device**

Ciconte G.¹; Calovic Z.¹; Mc Spadden L.²; Ryu K.²; Mangual J.²; Baldi M.²; Conti M.²; Saviano M.²; Vitale R.²; Cuko A.²; Giordano F.²; Pollina A.²; Santinelli V.²; Vicedomini G.²; Pappone C.²

¹IRCCS, Policlinico San Donato, San Donato Milanese, Italy

²IRCCS Polyclinic San Donato, Milan, Italy

Funding Acknowledgements: Abbott

Aim Cardiac resynchronization therapy (CRT) with multipoint left ventricular (LV) pacing (MultiPoint™ Pacing [MPP]) improves long-term reverse remodeling, though questions persist about how to program pacing vectors and delays. We evaluated if an empirical method of programming MPP vectors and delays between pacing pulses improved CRT response similar to pressure-volume loop (PVL) optimized MPP programming.

Methods and Results Patients undergoing CRT implant received MPP with programmed settings optimized either by PVL measurements at implant (PVL-OPT group) or empirically determined by maximizing the spatial separation between the two cathodes and minimal delays between the three ventricular pacing pulses (MAX-SEP group). CRT response was prospectively defined as a reduction in end-systolic volume (ESV) of $\geq 15\%$ relative to baseline at 6 months as determined by a blinded observer.

Patient characteristics at baseline (NYHA II-III, ejection fraction [EF] $27 \pm 6\%$, QRS 151 ± 17 ms) were not significantly different between the PVL-OPT (n = 27) and MAX-SEP (n = 26) groups. After 6 months, ESV reduction, EF increase, and CRT response rate (RR) were similar for PVL-OPT vs. MAX-SEP (ESV: -20 ± 11 vs. $-22 \pm 11\%$, p = 0.59; EF: $+10 \pm 4$ vs. $+9 \pm 7\%$, p = 0.53; RR: 20/27 [74%] vs. 21/26 [81%], p = 0.74), while fewer patients in the PVL-OPT group experienced NYHA class reduction ≥ 2 (4/27 [15%] vs. 15/26 [58%], p = 0.002).

Conclusions Both evaluated methods of MPP programming resulted in similar CRT outcomes. Empirical MPP programming by maximum spatial separation of LV cathodes may be an effective, simple, and non-invasive alternative to pressure-volume optimization.

P1155

Survival and heart failure hospitalisations in cardiac resynchronisation therapy upgrades with non-pacing induced cardiomyopathy are similar to de novo implantations

Baldeep S.; Porter BP.; Gould JG.; Sieniewicz BS.; Teall TT.; Niederer SN.; Carr-White GCW; Rinaldi AR.

Kings College Hospital, Cardiovascular, London, United Kingdom

Background: Cardiac resynchronisation therapy [CRT] is an important intervention to reduce patient morbidity and mortality.

Purpose: There are conflicting reports in the literature regarding the difference in outcomes between CRT upgrades and de novo implantations. The outcomes of patients undergoing CRT upgrades for non-pacing induced cardiomyopathy (defined as a pacing burden of <40%) has not been reported and represents an important subgroup.

Methods: A prospective database of patients who underwent CRT upgrades and de novo implantations was collected. Patients were classified as CRT responders if they survived to follow-up and had an absolute improvement in left ventricular ejection function [LVEF] of $\geq 5\%$. Hospitalisations for heart failure [HFH] during an extended follow-up were recorded and confirmed by reading through patient discharge summaries.

Results: A total of 168 patients were assessed; 75 CRT upgrades and 93 de novo implantations. Patient's undergoing CRT upgrades were more likely to have non-ischaemic cardiomyopathy [NICM] (60% vs. 42%, $p = 0.029$), suffer from AF (64% vs. 37% $p = 0.001$) and have a broader mean QRS duration (176 vs. 152msec, $p < 0.001$). However, CRT upgrades and de novo implantations were matched for other demographics; age (71 vs. 71 years, $p = 0.687$); chronic kidney disease (21% vs. 23%, $p = 1$), male (77% vs. 68%, $p = 0.719$) and LVEF (30% vs. 28%, $p = 0.238$). After a mean follow-up of 8 months, 63% of CRT upgrades were classified as CRT responders and 57% for de novo implantations ($p = 0.528$). There was no significant difference between the two groups in terms of procedural major (2.7% vs. 2.2%, $p = 1$) or minor (2.7% vs. 0%, $p = 0.198$) complications, lead malfunction/displacement (4% vs. 1.1%, $p = 0.325$) and coronary sinus dissection (1.3% vs. 3.2%, $p = 0.629$). However, a higher proportion of CRT upgrades had evidence of a significant central venous stenosis (20% vs. 0%, $p < 0.001$), although a Terumo Glidewire® was able to successfully pass these lesions with transvenous lead extraction [TLE] required in 13% of cases. We performed a sub-analysis to compare de novo implantations with patients that underwent a CRT upgrade for non-pacing induced cardiomyopathy (by excluding all patients that underwent CRT upgrades for a pacing induced cardiomyopathy, defined as a pacing burden of $\geq 40\%$). The Kaplan-Meier analysis demonstrated that long term survival and HFH were similar between CRT upgrades with a non-pacing induced cardiomyopathy vs. de novo implantations (Figure 1).

Conclusion: Patients undergoing CRT upgrades are more likely to suffer from a NICM, AF and have broader QRS durations than de novo implantations. Despite these favourable factors, response rates are similar. A significant proportion of CRT upgrades have central venous stenosis and 13% require TLE to allow for a successful upgrade. Survival and HFH are similar for patients undergoing CRT upgrades for non-pacing induced cardiomyopathy and de novo implantations.

Abstract P1155 Figure.

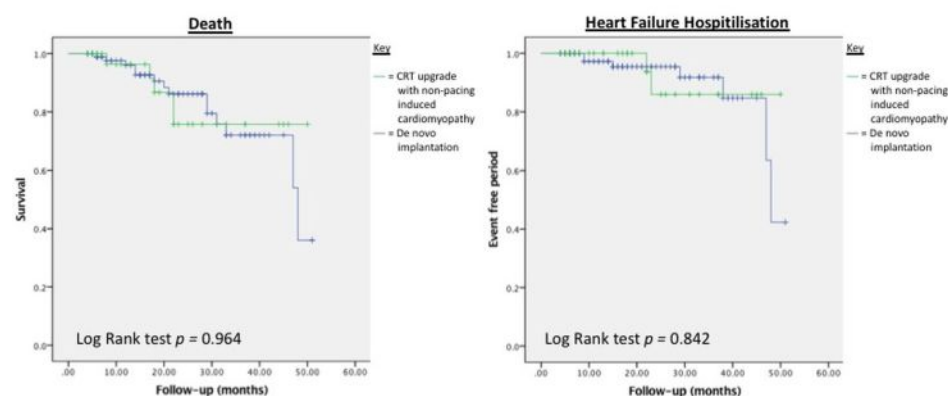


Figure 1. Kaplan-Meier curves showing no significant difference in death or heart failure hospitalisation between patients undergoing CRT upgrades for a non-pacing induced cardiomyopathy (defined as a pacing burden <40%) and de novo implantations. Key: RV= right ventricular

P1156

A high anaerobic threshold on cardio-pulmonary exercise testing predicts response to cardiac resynchronisation therapy

Baldeep S.; Porter BP.; Gould JG.; Sieniewicz BS.; Teall TT.; Niederer SN.; Carr-White GCW; Rinaldi AR.

Kings College Hospital, Cardiovascular, London, United Kingdom

Funding Acknowledgements: Na

Background: Cardiac resynchronisation therapy [CRT] reduces morbidity and mortality in patients with dyssynchronous severe left ventricular systolic impairment. Studies have shown that between 30-40% of patients will fail to respond to CRT and identifying markers that predict a favourable response is increasingly important.

Purpose: A cardio-pulmonary exercise test [CPET] is a useful clinical adjunct to evaluate a patients functional capacity prior to undergoing cardiological intervention. It provides an objective measure of a patients pulmonary, cardiovascular and skeletal muscle response during exercise. The indices which are produced during CPET may help to provide reliable markers of CRT response.

Methods: A prospective registry of patients who underwent CPET prior to CRT was evaluated. All CPET's were performed on a cycle ergometer in an outpatient setting, prior to CRT implantation. Patients were defined as CRT responders if they survived to follow-up and had at least a 5% absolute improvement in left ventricular ejection fraction.

Results: A total of 126 patients were included, with a mean follow-up of 7 ± 3 months. Patient demographics included: age of 69 ± 11 years; 80% were male; 53% had an ischaemic aetiology; 44% had atrial fibrillation; QRS duration 163 ± 26 msec and left ventricular ejection fraction $29\% \pm 8\%$. In total, 58% of patients were classified as CRT responders. Univariate logistic regression showed that a non-ischaemic aetiology and a high anaerobic threshold [AT] measured on CPET were associated with a favourable CRT response (Figure 1). A high AT remained predictive at multivariable logistic regression (Figure 1).

Conclusion: CPET is useful in the evaluation of patients who present with severe left ventricular systolic impairment and dyspnoea. Achieving a high AT is independently associated with a favourable CRT response and further studies are needed to determine whether this may be a useful clinical adjunct when evaluating patients prior to CRT implantation.

Abstract P1156 Figure.

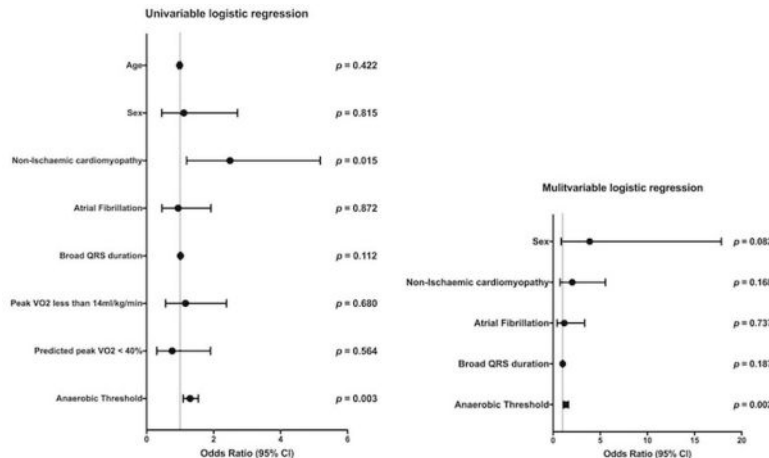


Figure 1: Univariate logistic regression and Multivariable logistic regression showing predictors of CRT response. Achieving a high anaerobic threshold on cardiopulmonary exercise testing remained an independent predictor of CRT response in the multivariable analysis.

P1157

A cardiac resynchronisation therapy pre-assessment clinic appropriately selects patients for implantation and avoids unnecessary interventions

Baldeep S.; Porter BP.; Gould JG.; Sieniewicz BS.; Teall TT.; Niederer SN.; Carr-White GCW; Rinaldi AR.

Kings College Hospital, Cardiovascular, London, United Kingdom

Background: Cardiac resynchronisation therapy [CRT] reduces patient morbidity and mortality. However, nearly 30-40% of patients fail to respond to CRT and selecting appropriate patients is increasingly important. A CRT pre-assessment clinic [CRT PAC] was created to act as a final review for patients prior to deciding whether to proceed with CRT. All patients who were seen in a tertiary centre consultant cardiology clinic and listed for CRT were reviewed in the CRT PAC. Patients were offered a ECG, echocardiogram, cardiac MRI and cardiopulmonary exercise test. They were reviewed by a consultant cardiologist with a specialist interest in heart failure [HF] where a final decision regarding device therapy was made.

Purpose: The purpose of this analysis was to determine whether this clinic was able to carefully select appropriate patients who were likely to respond and was safe.

Methods: A prospective database of all patients seen in the CRT PAC was assessed. Patients were classified as CRT responders if they survived to follow-up and had an improvement in end-systolic volume of at least 15%.

Results: A total of 252 patients were reviewed between 2014-2018. Patient demographics included: age 71 ± 11 , 73% male; 49% had an ischaemic aetiology; 48% had AF; 46% had 2 or more additional co-morbidities; QRS duration 156 ± 28 msec and mean left ventricular ejection fraction [LVEF] $32\% \pm 10\%$. Following CRT PAC, 176 (70%) patients underwent CRT implantation, 60 (24%) patients were turned down for CRT as a result of the clinic and 16 (6%) patients did not have CRT due to other reasons. In those that were implanted, after a mean follow-up of 8 months, 53% of patients were classified as CRT responders. In the patients who were initially turned down for CRT, after a mean follow-up of 15 months, 48 (80%) had no device therapy, 8 (13%) underwent CRT and 4 (7%) had an ICD. Prior to CRT PAC the previous echocardiogram was performed on average 10 months before clinic review, with an average improvement in LVEF of 7%. The commonest reasons for turning a patient down for device therapy following CRT PAC was improvement in LVEF (63%, $n = 38$) and the requirement to up-titrate optimal medical therapy [OMT] (32%, $n = 19$). Following up-titration of OMT only 5 (26%) patients required CRT, with an average improvement in LVEF of 6%. During the follow-up period after CRT PAC (in the 60 patients who were initially turned down for CRT); 6 (10%) patients died; 2 from end-stage HF and 4 from non-cardiac disease. In total, 2 (3%) patients were admitted to hospital with decompensated HF.

Conclusion: A CRT PAC is a novel approach to improve outcomes with CRT. It is able to carefully select patients that are not suitable for CRT, including the requirement to up-titrate OMT. Patients have favourable outcomes using this clinic design and it avoids unnecessary interventions.

Abstract P1157 Figure.

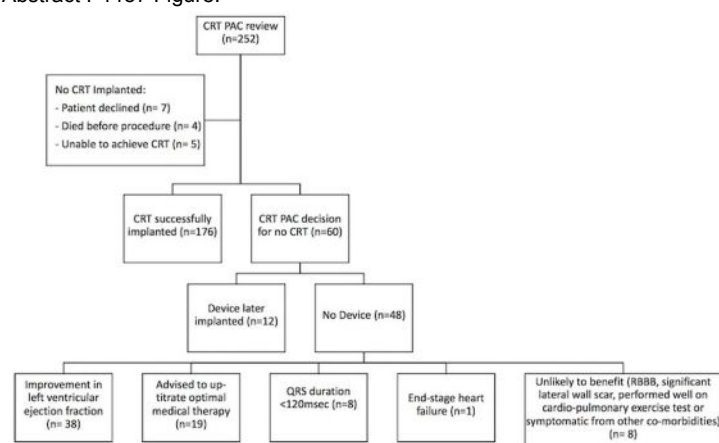


Figure 1. This demonstrates the outcomes of the CRT PAC. The reasons why patients were turned down for CRT are provided and are mainly due to an improvement in left ventricular ejection fraction and the need to up-titrate optimal medical therapy.

P1158

Switching off biventricular pacing reveals cardiac resynchronization therapy recipients at risk of ventricular tachyarrhythmias

Curcio A.¹; Santarpia G.¹; Ripepi O.¹; Albanese M.¹; Bochicchio A.²; Principe E.¹; Cristiano V.¹; Pasceri E.¹; Indolfi C.³

¹Magna Graecia University of Catanzaro, Div of Cardiology, Dept of Medical and Surgical Sciences, Catanzaro, Italy

²San Carlo Hospital, Potenza, Italy

³U.R.T.-C.N.R., Catanzaro, Italy

Background: Increased dispersion of repolarization has been associated with ventricular tachyarrhythmias (VTach) and sudden cardiac death (SCD) in both ischemic (IDCM) and non-ischemic dilated cardiomyopathy (NIDCM).

Purpose: We therefore wanted to determine the frequency of implantable cardioverter defibrillator therapies, including anti-tachycardia pacing (ATP) and shocks, in recipients of cardiac resynchronization therapy (CRT-D) and whether electrocardiographic (ECG) assessment of QT length could predict VTach occurrence.

Materials and Methods: A case-control study was realized enrolling all comers individuals (forty-eight patients, age 76 ± 8 years, 41 males) with left bundle branch block, optimal medical therapy and reduced ejection fraction, who had undergone CRT-D implantation for primary prevention of SCD; patients were included if ≥ 2 and ≤ 12 months were passed from day of implantation. In outpatient clinics, subjects received telemetry interrogation, ECG assessment with and without biventricular pacing (AAI mode at 40 b.p.m.), and blood samples withdrawal to measure noradrenaline concentration upon written informed consent. Exclusion criteria were: use of noncardiac drugs, including anti-arrhythmic agents, associated with QT prolongation; pacemaker-dependent clinical status. According to major arrhythmic events at follow-up, patients were divided in cases (N = 27) and controls (N = 21).

Results: No significant differences in durations of paced QRS segments were observed (116 ± 18 vs. 101 ± 16 ms), nor in QTc (452 ± 35 ms vs. 469 ± 32), whereas percentage of biventricular pacing was 96% in cases vs. 99% in controls ($p < 0.05$). However, Δ QTc from CRT-off ECGs was significantly higher in VTach group compared to controls (five-fold increase, $p < 0.05$), and this finding was reinforced by augmented circulating noradrenaline levels in the cases. The rate of ATP was 15%; the rate of appropriate ICD shock was 11%; overall, the rate of appropriate therapy (ATP + ICD shocks) was 19%. A multivariate Cox model revealed that Δ QTc was an independent predictor of VTach in CRT-D patients ($P = 0.0436$). Finally, we report six fatal outcomes, with the youngest patient deceased at 29 years of age, whose QTc was 488ms during biventricular pacing, and 458ms when unpaced (Δ QTc = 30ms).

Conclusions: We demonstrated for the first time that patients suffering major arrhythmic events present with repolarization abnormalities, and that QT prolongation should be better assessed when CRT is temporarily switched off.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1159

Non-invasive hemodynamic assessment ensures beneficial effect of multipoint pacing CRT: results from the COMPACT-MPP study

Curcio A.¹; Ruocco A.²; Santarpia G.¹; Crispo S.²; Canciello G.³; Ammirati G.³; Colangelo M.¹; Covello C.¹; Capasso D.¹; Rapacciuolo A.³; Mauro C.²; Indolfi C.⁴

¹Magna Graecia University of Catanzaro, Div of Cardiology, Dept of Medical and Surgical Sciences, Catanzaro, Italy

²Cardarelli Hospital, Naples, Italy

³Federico II University of Naples, Naples, Italy

⁴U.R.T.-C.N.R., Catanzaro, Italy

Background: Cardiac resynchronization therapy (CRT) associated with multi-point pacing (MPP) has demonstrated cardiac function improvements through hemodynamic assessment. However, invasive measurement of dP/dtmax is unfeasible in clinical practice and thus cannot be used as a method to optimize the programming of CRT devices. We aimed to compare two different biventricular pacing strategies with non-invasive dP/dtmax and global longitudinal strain (GLS) echocardiographic assessments, in order to identify the best acute results, and to program the CRT device accordingly: 1) standard single-site pacing on the most delayed electrode (CRT opt) and 2) Multi-point pacing with maximum possible electrode spacing and minimum possible delays (MPP opt).

Methods: Thirty patients (age 68.5 ± 10.0 years, 18 males, 33% ischemic dilated cardiomyopathy) implanted with a CRT-D device with MPP technology underwent non-invasive dP/dtmax measurement by means of a finger cuff and an inflatable bladder in combination with an infra-red plethysmograph connected to a laptop with dedicated software. Resting measurements were acquired for a minimum of 20 s and mean dP/dtmax was calculated immediately after each CRT programming to realize either spontaneous intrinsic, CRT opt, or MPP opt rhythms. In 27/30 (90%) patients, GLS was assessed in the same conditions.

Results: Both CRT opt and MPP opt achieved a significant increase in average dP/dtmax versus intrinsic rhythm (971 ± 508 and 999 ± 534 versus 903 ± 483 mmHg/s, $p < 0.03$, and $p < 0.02$, respectively). MPP opt only achieved a significant improvement in GLS versus intrinsic rhythm (11.1 ± 4.2 vs. $10.5 \pm 4.1\%$, $p < 0.05$). MPP opt was associated with the best performances in dP/dtmax (19/30 patients, 63.3%) and in GLS (18/27 patients 66.6%).

Conclusion: dP/dtmax was significantly increased in MPP opt compared to CRT opt, while MPP opt alone achieved a significant improvement in GLS versus intrinsic rhythm. MPP opt obtained the best dP/dtmax and the best GLS in approximately 2/3 of the patients. Based on the acute results, further time points have already been planned to investigate whether the device programming can predict the long-term response to CRT.

P1160

Impact of baseline patient characteristics on optimal programming

Thibault B.¹; Ritter P.²; Pappone C.³; Bode K.⁴; Calo L.⁵; Mangual JO.⁶; Badie N.⁶; Mcspadden LC.⁶; Varma N.⁷¹Montreal Heart Institute, Montreal, Canada²University Hospital of Bordeaux, Bordeaux, France³IRCCS, Policlinico San Donato, San Donato Milanese, Italy⁴University of Leipzig, Leipzig, Germany⁵Polyclinic Casilino of Rome, Rome, Italy⁶Abbott, Sylmar, United States of America⁷Cleveland Clinic, Cleveland, United States of America**Funding Acknowledgements:** Abbott

Introduction: a CRT continually programs atrioventricular delay (AVD) shorter than the intrinsic PR interval by a programmable offset to synchronize intrinsic, LV-paced, and RV-paced activation wavefronts. The greatest degree of synchrony can be achieved by optimizing AVD offsets to each patient, but the impact of baseline patient characteristics on the optimal offset is not known.

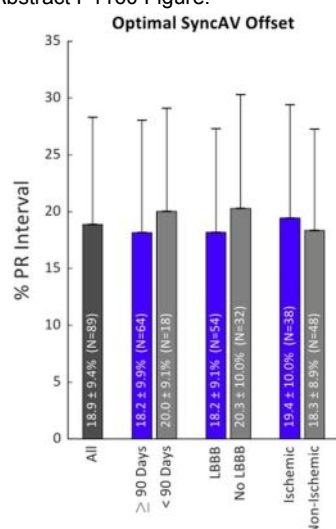
Purpose: Evaluate the relationship between baseline patient characteristics and the device offset that produces the narrowest QRS duration (QRSd).

Methods: Patients with CRT-D or -P implants and quadripolar leads were enrolled prospectively. QRSd was measured by a blinded observer from 12-lead ECG during intrinsic conduction and during biventricular (BiV) pacing programmed to offsets of 10-60 ms. The offset associated with the narrowest QRSd was defined as "optimal." Simultaneous RV + LV pacing was used, and LV pacing was applied using the latest-activating quadripolar electrode as the cathode.

Results: Eighty-nine patients (age 67 ± 10 yr, male, 44% ischemic, 63% LBBB, $32 \pm 9\%$ ejection fraction, NYHA class 2.1 ± 0.6 , PR 195 ± 48 ms [120-320 ms range], QRSd 156 ± 29 ms [80-258 ms range]) were evaluated at 22 ± 27 months post-CRT implant. Relative to intrinsic conduction, the default offset of 50 ms reduced QRSd by $13 \pm 14\%$ to 133 ± 25 ms. Optimal offsets reduced QRSd by $20 \pm 10\%$ to 123 ± 22 ms. Of all baseline characteristics, stepwise linear regression revealed only baseline QRSd as a predictor of the optimal QRSd reduction ($P < 0.0001$). The optimum offset was $18.9 \pm 9.4\%$ of the intrinsic PR interval. The optimal offset did not differ for patients with CRT implants older or newer than 90 days (18.2% vs. 20.0%, $p > 0.63$), with or without LBBB (18.2% vs. 20.3%, $p > 0.63$), with or without ischemia (19.4% vs. 18.3%, $p > 0.86$). These results suggest that the optimal AVD as a percent of the intrinsic AV conduction interval is not influenced by the degree of reverse remodeling already achieved by CRT, the conduction time to the LV, or ischemic etiology.

Conclusion: it improves acute electrical synchrony beyond conventional CRT, particularly with patient-specific optimization. The optimal offset, as a percent of PR interval, was not influenced by the age of the CRT implant, presence of LBBB, or ischemic cardiomyopathy.

Abstract P1160 Figure.



Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1161

Possibilities of gadolinium-enhanced cardiac magnetic resonance in selection of candidates for cardiac resynchronization therapy

Utsumueva M.; Stukalova O.; Kashtanova S.; Mironova N.; Golitsyn S.

National medical research center of cardiology, Moscow, Russian Federation

Background. Cardiac resynchronization therapy (CRT) has been of great benefit to many heart failure (HF) patients with reduced ejection fraction (EF) and widened QRS complexes. Nonetheless, approximately one third of candidates may not derive symptomatic benefit from CRT. Several reasons have been proposed to explain lack of response to CRT in such patients. Underlying myocardial substrate, the total amount of scar and its location appears to be important in determining response and outcome.

Purpose. To determine the impact of the amount and distribution of myocardial structural damage on response to CRT in patients with ischemic (ICM) and non-ischemic cardiomyopathy (NICM).

Methods. 43 patients with HF (age $62,3 \pm 9,1$ yrs (mean $\pm$ SD), 44,2% females and 55,8% males) due to ICM (41,8%) or NICM (58,2%), LV ejection fraction $<35\%$, QRS >130 ms, LBBB, sinus rhythm were enrolled. Late-gadolinium enhancement-cardiovascular magnetic resonance (LGE-CMR) was undertaken to evaluate myocardial scar prior to CRT devices implantation. All CMR analysis was performed on CVI42 software. According to signal intensity fibrosis zone (signal intensities of 5-SD above the mean normal remote myocardium) and «grey zone» (signal intensities of 2-SD above the mean normal remote myocardium) were defined. Scar zone included fibrosis zone and «grey zone». Percentage and mass of fibrosis zone, «grey zone» and scar were assessed. Scar location was assessed using a 16 segment model (AHA). Response was defined as a reduction in LV ESV of $>15\%$ at 6 months follow-up.

Results. In nonresponse group was significantly higher percent and mass of total scar (median 4% [3; 19] vs 24% [7; 44], $p = 0,017$, 6 g [4; 32,5] vs 41 g [8; 86], $p = 0,017$), fibrosis zone (median 0% [0; 3,5] vs 8% [0; 19], $p = 0,01$, 0 g [0; 6] vs 14 g [0; 34], $p = 0,014$) and "grey zone" (4% [3; 15] vs 15% [7; 23], $p = 0,027$, 6 g [4; 27,5] vs 23 g [8; 39], $p = 0,04$). Among patients with NICM and ICM, percentage of response was higher in group of NICM (44,19% vs 11,63%, $p < 0,01$). Response to CRT was less in patients with posterolateral scar (9,3% vs 25,58%, $p < 0,01$), more specifically in segments 5, 10, 11, 16 ($p < 0,05$). CRT response in patients with ICM didn't depend on amount of myocardial structural damage, but depend on scar localization – presence of lateral scar was associated with poor response ($p = 0,294$). In NICM group amount (percentage and mass) of fibrosis zone was less in responder group (median 0% [0; 3] vs 8,5% [0; 11], $p < 0,05$, 0 g [0; 3] vs 14,5 g [0; 22], $p < 0,05$).

Conclusion. Response to CRT is significantly higher in patients with NICM in comparison with ICM. Nonresponse to CRT is associated with posterolateral scar regardless of the etiology of heart failure. In patients with NICM amount of fibrosis zone is higher in the group of patients with ineffective CRT. In case of ICM, amount of LV structural damage does not affect the effectiveness of CRT, but in patients with lateral scar the effect of CRT is worse.

P1162

Device replacement strategy in CRT-D patients: interim results of the BioCONTINUE study

Gras D.¹; Ploux S.²; Babuty D.²; Guyomar Y.³; Bongiorni MG.⁴; Blangy H.⁵

¹Nouvelles Cliniques Nantaises, Department of Cardiology, Nantes, France

²Centre Hospitalier Universitaire Pessac, France, Bordeaux, France

³Centre Hospitalier Saint Philibert, Lomme, France, Lomme, France

⁴Hospital Santa Chiara, Cisanello, Italy, Cisanello, Italy

⁵Hôpital Brabois, Nancy, France, Nancy, France

Funding Acknowledgements: Supported by Biotronik

OnBehalf: Biocontinue Study Group

Device Replacement Strategy in CRT-D Patients: Interim Results of the BioCONTINUE Study

Background: Cardiac resynchronization therapy (CRT) has been shown to reduce hospitalizations and death in patients with left ventricular ejection fraction (LVEF) <35% and wide QRS. CRT response is usually correlated with LV reverse remodelling leading to increase of LVEF. Most of ICD patients implanted for primary prevention indication do not experience ventricular tachyarrhythmia (VTA) during the lifetime of their first device, so the need for defibrillator back-up may be controversial at the time of replacement.

Purpose: The BioCONTINUE study is an observational, multicentre and prospective trial. The objective is to evaluate the clinical relevance of defibrillator back-up after replacement of the first CRT-D device in patients with primary prevention ICD indication.

Methods: Patients were enrolled after CRT-D replacement and followed up > 2 years to evaluate the rate of sustained VTA, as defined by VTA > 30s and/or ICD device-treated VTA either by ATP or shock. This rate was evaluated also according to (1) LVEF at the replacement ($\geq 40\%$ versus <40%) and (2) history of VTA documented by the first CRT-D

Results: A total of 276 patients are enrolled (70 ± 10 years, 77% men). The mean FU duration at the interim analysis is 19.8 ± 8.7 months, including 98 patients (35%) with a 2-year FU. The rate of patients free of sustained VTA, is 91.2%, 88.4% and 85.1% respectively at 1, 2 and 3 years of FU. See Table 1

In patients with persistent ICD indication (LVEF < 40% and/or prior sustained VTA) at enrolment, the risk of sustained VTA after the device replacement is 3.3 times higher (95% CI: 1.4–8.2) than patients with no persistent ICD indication. The risk of sustained VTA remains, however, in patients with no persistent ICD indication, with a rate of 4.9% (95% CI 1.8%-10.4%).

Conclusions: The interim results show a persistent risk of sustained VTA after device replacement, in patients with a primary prevention ICD indication at first implantation of a CRT-D device.

table 1

Total population n = 276	(27)	9.8% (95% CI 6.6-13.9%)
LVEF < 40% at device replacement n = 110	(16)	14.6% (95% CI 8.5-22.5%)
LVEF $\geq 40\%$ at device replacement n = 151	(10)	6.6% (95% CI 3.2-11.8%)
Patients without history of VTA n = 208	(13)	6.3% (95% CI 3.3-10.5%)
Patients with history of VTA n = 65	(14)	21.5% (95% CI 12.3-33.5%)

Number & rate of patients with at least 1 VTA at 2-year FU

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1163

Pacertool - patient specific biofeedback implantation system for pacemakers and CRT

Odland HH.; Kongsgard E.; Pettersen FJ.; Florvaag PM.; Paszkowski L.

Center for Cardiological Innovation, Department of Cardiology, Oslo, Norway

Introduction

Cardiac resynchronization therapy (CRT) is effective in patients With left bundle branch Block and heart failure, but treatment lack efficiency. Mutple reasons have been proposed for the lack of response in selected patients, and empirical data point out certain characteristics that are Associated with lack of response. However, no clinical parameter exist that can confirm the effect of an implanted CRT and tools to provide measurements during implantation are not readily available.

Purpose

To develop a system tha can aid during implantation of pacemakers and CRT and give feedback on the efficacy of the applied therapy.

Methods

We have developed a vendor independent system that allows 1. visualization of segmented CT, MRI or 3D echo scans in fusion with fluoroscopy in multiple views patient. 2. Reconstruction of lead positions and coronary vein anatomy in 3D. 3. Placement of electrodes on the model. 4. Visualization of any measurement on the 3D heart model. 5. Utilize sensors and electrical measures to give feedback on therapy.

Results: We have tested the system in patients for both CRT implantation and parahisian pacing. The system provides a 12-channel ECG together with multiple electrograms and VCGs on demand, sensordata can be included and displayed. Visualization occurs in real time and mapping can be performed, either for locations (as the His potential) or for propagation (as in QLV). Imaging may include MRI LGE to allow for visualization of scars.

Conclusion: We have developed a full scale vendor independent tool to aid implantation of CRT and permanent parahisian pacing. The system has been tested in patients and is now ready for clinical trials.

P1164

The missing link- time to maximal rate of left ventricular pressure rise reflects resynchronisation with biventricular pacing in patients with heart failure and left bundle branch block

Odland HH.¹; Ross S.²; Gammelsrud LO.³; Cornelussen R.³; Kongsgard E.⁴

¹Oslo University Hospital, Department of Pediatric Cardiology, Oslo, Norway

²Center for Cardiological Innovation, Department of Cardiology, Oslo, Norway

³Bakken Research Center, Medtronic, Maastricht, Netherlands

⁴Oslo University Hospital, Department of Cardiology, Oslo, Norway

Introduction: Resynchronization therapy restores effectively myocardial function. No measures exist that specifically quantifies resynchronization. A parameter that quantifies resynchronization should be able to detect effective resynchronization and should not respond to changes in contractility caused by heterometric regulation.

Purpose: We compared the acute differences between BIVP and LVP with regards to the preload dependent maximum rate of the LV pressure rise (dP/dtmax), and the preload independent measurement of time dependent cardiac contractility; time to dP/dtmax (Td). LVP changes the pattern of dyssynchrony without resynchronization, while BIVP promotes resynchronization dependent on the pacing position of the LV electrode.

Methods: Twenty nine patients in heart failure with LBBB underwent CRT implantation with continuous LV pressure registration. The LV lead was first placed in either apical or anterior position followed by a permanent placement in a lateral position. Sequential LVP and BIVP pacing were performed for one minute, at a rate 10% above intrinsic heart rate, before dP/dtmax measurements were encountered. For LVP, BIVP and RVP a similar but patient specific AV delay was used to avoid fusion with intrinsic conduction. Td was defined as the time from pace-maker stimuli to dP/dtmax. Mixed linear models were used for statistics, significance with $p < 0.05$ after Bonferroni correction).

Results: No differences in dP/dtmax were found between LVP and BIVP in any position, while RVP dP/dtmax were significantly lower in all positions except when compared with BIVP in apical position (average for all positions BIVP 877 ± 34 mmHg/s, LVP 899 ± 28 mmHg/s, RVP 789 ± 28 mmHg/s). Td decreased with BIVP compared to both LVP and RVP in all positions except for in the apical position (average for all positions BIVP 164 ± 3 ms, LVP 177 ± 4 ms, RVP 185 ± 3 ms).

Conclusion: DP/dtmax did not reflect resynchronization differences between LVP and BIVP. Td was significantly shorter with BIVP than LVP in anterior and lateral positions despite similar values of dP/dtmax. This suggests that Td reflects resynchronization, and indicates that resynchronization with biventricular pacing translates into a shorter Td and hence improved contractility regardless of the dP/dtmax amplitude. Td measures improved contractility as a result of resynchronization and should be used for optimization of resynchronization therapy.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1165

Effect of multipoint adaptive pacing and ventricular fusion on LV dP/dtmax in CRT

Odland HH.¹; Ross S.²; Gammelsrud LO.³; Cornelussen R.⁴; Kongsgard E.⁵

¹Oslo University Hospital, Department of Pediatric Cardiology, Oslo, Norway

²Center for Cardiological Innovation, Department of Cardiology, Oslo, Norway

³Bakken Research Center, Medtronic, Maastricht, Netherlands

⁴Bakken Research Center, Maastricht, Netherlands

⁵Oslo University Hospital, Department of Cardiology, Oslo, Norway

Funding Acknowledgements: This work has been supported by grants from South-Eastern Norway Regional Health Authority and Medtronic Inc.

Background: Adaptive (LV-only) pacing in cardiac resynchronization therapy carries the potential of conserving pacemaker energy, decrease AF incidence and improve LV performance through reducing RV pacing, thereby allowing intrinsic activation of the right ventricle and promoting fusion with intrinsic activation. We have investigated the effect of adaptive (A) versus non-adaptive (NA, including RV pacing) multipoint pacing (MPP) strategies with different degrees of intraventricular fusion on LV ventricular pressure rise (LV dP/dtmax).

Methods: We studied the acute hemodynamic effect of two different MPP strategies (A vs. NA) in patients with sinus rhythm and LBBB undergoing CRT implantation. We measured pressures with an indwelling LV pressure catheter and calculated dP/dtmax for 10 beats at each stage of pacing. Quadripolar LV pacing leads were used. Pacing modality (sequential DDD) was chosen either as adaptive (Pacing LV only, A) or as non-adaptive (Pacing LV and RV, NA). Intraventricular fusion was differentiated by calculating the AV delay to pace LV either ahead or after the QRS complex (A) or RV pace (NA), and classified by the relative time of LV pace to QRS or RV pace onset in three fusion classes; (Pre) less than -50ms before, (0) between -50ms and onset or (Post) between 0 and 50ms after. Pacing was performed at LV distal [LVdist], proximal electrode [LVprox] and at both [MPP]. Linear mixed models were used for statistics of the pooled data. Results are estimated marginal means $\pm$ SEM. only significant $P < 0.05$ changes are reported.

Results: Baseline dP/dtmax at RVP was 689 ± 46 mmHg/s. Using all intraventricular fusion classes no difference in dP/dtmax between A (780 ± 32 mmHg/s) and NA (783 ± 32 mmHg/s) was observed. DP/dtmax was lower with pacing from [LVprox] for both A (776 ± 33 mmHg/s, $P = 0.001$) and NA (753 ± 33 mmHg/s, $P < 0.001$) compared to NA[MPP] (802 ± 33 mmHg/s). Discriminating on the relative timing of pacing windows: Pacing [Post] (774 ± 32 mmHg/s) was inferior ($P < 0.001$) to pacing [0] (790 ± 32 mmHg/s) and pacing [Pre] (790 ± 32 mmHg/s). When analyzing the interaction between pacing modality and Fusion class compared to the reference NA[MPP](Post); we found that NA[MPP] and NA[LVdist] at (Pre, 0 and Post) and A[MPP] and A[LVdist] at (Pre and 0) and A[LVprox](Pre) performed equally well and better than all others.

Conclusion: We found no significant difference in acute hemodynamic response between adaptive and non-adaptive pacing modes. In addition, in both these settings the distal quadripolar electrode seems to outperform the proximal electrode. Timing of the LV stimulation needs to occur before or at the same time as QRS-onset or RV pacing onset and not later in both adaptive and non-adaptive pacing modes to achieve higher dP/dtmax.

P1166

Morbidity and mortality in diabetic patients receiving cardiac resynchronisation therapy via a multipolar left ventricular lead

Tang PT.; Monteiro C.; Green P.; Wijesurendra R.; Ormerod J.; Gamble J.; Ginks M.; Rajappan K.; Bashir Y.; Betts T.; Herring N.

Department of Cardiology, John Radcliffe Hospital, Oxford University Hospitals NHS Trust, Oxford, United Kingdom

Introduction: Cardiac resynchronisation therapy (CRT) is an established treatment modality for patients with symptomatic heart failure associated with a prolonged QRS duration on the electrocardiogram. Despite advances in hardware and programming, up to 30% of patients still do not derive symptomatic benefit. Multipolar left ventricular (LV) leads provide multiple pacing vectors and allow more optimal CRT delivery. They have recently been shown to reduce the need for reintervention for lead displacement or phrenic nerve stimulation, and also reduce heart failure hospitalisation and mortality, compared to CRT delivered by a bipolar LV lead. However, whether all patients derive the same benefit from multipolar LV leads is not known. Patients with diabetes mellitus (DM) represent a subset of heart failure patients who suffer from poorer outcomes. Although these patients still derive benefit from bipolar CRT, they remain at greater risk of device complications, heart failure hospitalisation, and all-cause mortality.

Purpose: We investigated whether heart failure patients with DM undergoing multipolar LV lead CRT implantation derive the same benefit as patients without DM.

Methods: We collected data on device-related complications and outcomes (heart failure events, all-cause mortality) in 298 consecutive patients receiving CRT via multipolar LV leads between 2010 and 2015. A heart failure event was defined as a decompensation requiring either hospitalisation, or outpatient step-up in therapy to intravenous diuretics. Patients were followed up for 38.4 ± 18.4 months (mean $\pm$ standard deviation).

Results: Baseline characteristics were similar between patients with DM ($n = 93$) and without DM ($n = 205$) in terms of age, gender, QRS duration, ejection fraction, New York Heart Association functional class, and rhythm at implant. A significantly higher proportion of the DM group had ischaemic heart disease (IHD; 65.6 v 47.3% , $p = 0.004$). Rates of procedural success and periprocedural complications were similar across the two groups. LV lead displacement rates were similar and all cases of phrenic nerve stimulation were programmed around. There was a trend towards more device infections requiring system explant in the DM group (4.3 v 1.0% , $p = 0.08$). We observed a significantly higher incidence of heart failure events in the DM group (18.5 v 7.0% , $p = 0.007$), independent of IHD in a multivariate analysis. All-cause mortality was similar between the two groups over the follow-up period (21.7 v 22.1%).

Conclusion: In this real-world analysis of outcomes in patients receiving contemporary multipolar CRT, those with DM still performed worse in terms of heart failure events compared to those without DM. However, procedural complications and overall mortality between patients with and without DM were similar.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1167

Left ventricular reverse remodeling and brain natriuretic peptide level at one year after cardiac resynchronization therapy predict long-term clinical outcome

Roubicek T.¹; Stros J.¹; Wichterle D.²; Polasek R.¹

¹Regional Hospital Liberec, Cardiology, Liberec, Czech Republic

²Institute for Clinical and Experimental Medicine (IKEM), Department of Cardiology, Prague, Czech Republic

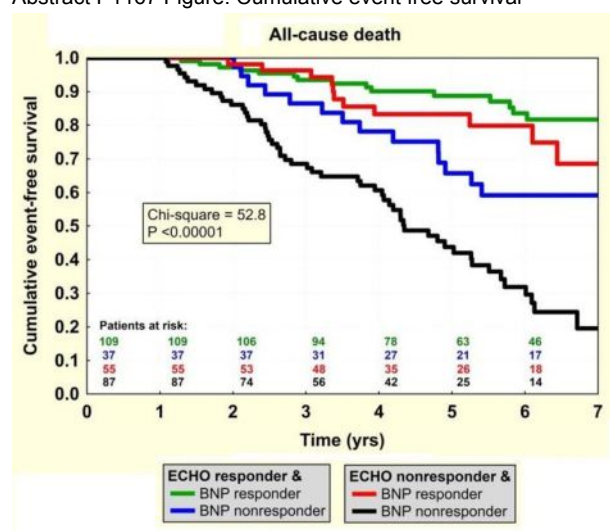
Introduction: Approximately 30% of patients fail to respond to cardiac resynchronization therapy (CRT). Our study investigated the long-term prognostic value of short-term CRT response.

Methods: Single-center prospective database of CRT patients implanted between 2005 and 2013 was analyzed. Left ventricle (LV) diameters and ejection fraction, New York Heart Association (NYHA) class, and level of N-terminal fragment of pro-brain natriuretic peptide (NT-proBNP) were assessed at baseline and 12 months after CRT implantation. Their predictive power for long-term heart failure (HF) hospitalization and all-cause mortality was investigated.

Results: Total 328 patients with left bundle branch block or intraventricular conduction delay were included. During the follow-up period of 4.8 ± 2.1 years after the 12-month visit, 35% patients died and 26% were hospitalized for HF. Post-CRT LV ejection fraction and LV endsystolic diameter (either 12-month value or post-CRT change) were equally predictive for clinical events. For NT-proBNP, however, 12-month level was stronger predictor than its post-CRT change. Both reverse LV remodeling and 12-month level of NT-proBNP were independent and comparable predictors of CRT-related clinical outcome.

Conclusion: Level of NT-proBNP and reverse LV remodeling at one year after CRT are independent, comparable and replaceable predictors of future clinical events. Their combination may help to improve the risk stratification of CRT patients.

Abstract P1167 Figure. Cumulative event free survival



Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1168

AV delay optimisation in patients with congenitally corrected transposition of the great arteries

Griffiths S.; Lascelles K.; Li W.; Babu-Narayan S.

Royal Brompton Hospital, London, United Kingdom

Background: Adults with congenitally corrected transposition of the great arteries (ccTGA) are at risk of systemic right ventricular (RV) failure and cardiac arrhythmias requiring the implantation of pacemakers, ICDs and CRT devices. The importance of atrioventricular delay optimisation in patients with ccTGA has not been investigated. This study assessed the acute response to AV delay optimisation and difference between the empirically programmed AV delay and optimal AV delay in patients with ccTGA.

Methods: Records of eight patients with ccTGA and a dual chamber ICD or CRT device who had undergone echocardiographic AV delay optimisation were reviewed (86% men, mean age 49 ± 8 years, mean systemic right ventricular fractional area change $28 \pm 3\%$, 100% ventricular or biventricular pacing). The optimal AV delay was compared to that programmed empirically prior to optimisation. Diastolic filling time and tricuspid valve regurgitation time data were reviewed at every tested AV delay. For comparison between subjects the optimal AV delay during sequential atrial and ventricular pacing was included in the analysis as 6 out of 8 patients were atrial pacing during optimisation.

Results: The median optimal paced AV delay assessed by echocardiography was 95ms (min AV delay 60ms, max AV delay 140ms). This was significantly shorter than the empirically programmed AV delay (median empirical AV delay 176ms: min 150ms, max 220ms) in all patients (mean difference: -80 ± 41 ms; $P < 0.03$). A ≥ 40 ms increase from the optimal AV delay decreased diastolic systemic right ventricle filling time by 40 ± 16 ms ($p < 0.05$) and increased diastolic tricuspid valve regurgitation time by 38 ± 25 ms ($p < 0.05$).

Conclusions: Atrioventricular dyssynchrony may be present in the paced ccTGA population and optimisation of the AV delay may be necessary to correct suboptimal empirical settings. The optimal AV delay in patients with ccTGA may be shorter than in patients with structurally normal hearts. The mechanisms underpinning a short optimal AV delay in patients with ccTGA could be related to the abnormal electromechanical properties of the systemic right ventricle. Future studies should assess whether AV delay optimisation has a benefit on clinical outcomes in patients with ccTGA.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1169

Cardiac resynchronization therapy programming to improve electrical synchrony: adjusting the atrioventricular conduction delay

Essebag V.; Lima PY.; Alturki A.; Bernier M.; Hadjis T.; Joza J.

McGill University Health Centre, Cardiology, Montreal, Canada

Background: Optimal programming of cardiac resynchronization therapy has not yet been fully elucidated. In particular, a significant proportion of patients who receive CRT do not improve and are deemed non-responders. A decrease in QRS duration (QRSd) after CRT is a predictor of clinical response. A novel algorithm (SyncAV) has been developed to improve electrical synchrony by fusion of the triple wavefronts: intrinsic, RV-paced, and LV-paced.

Purpose: To assess the difference in QRSd in patients with a previously implanted CRT who subsequently receive SyncAV pacing compared to existing CRT pacing.

Methods: Consecutive patients at a single tertiary care center with a previously implanted CRT device with SyncAV algorithm (programmable negative AV hysteresis) were evaluated. Only patients able to be programmed to the SyncAV algorithm (i.e. in sinus rhythm with intrinsic AV conduction) were included in this analysis. QRSd was measured during 1) intrinsic conduction, 2) existing CRT pacing as chronically programmed by treating physician prior to SyncAV optimization, 3) using the device-based QuickOpt™ algorithm for optimization of AV and VV delays and 4) manual ECG-based optimized SyncAV programming. Change in QRSd was assessed and compared to intrinsic conduction and between the different modes of programming.

Results: Of 62 consecutive potentially eligible patients who underwent assessment, 34 patients who were able to undergo SyncAV programming were included. The mean age was 74 ± 9 years, 41% were female and 59% had ischemic cardiomyopathy. The mean intrinsic conduction QRSd was 163 ± 24 ms and the mean existing CRT pacing QRSd was 152 ± 25 ms. Using the QuickOpt™ algorithm the mean QRSd was 160 ± 25 ms and using manual ECG-based optimized SyncAV programming the mean QRSd was 138 ± 23 .

In comparison to intrinsic conduction the change in QRS was -11 ± 19 , -4 ± 25 and -24 ± 17 using existing CRT pacing, QuickOpt™ algorithm and manual ECG-based optimized SyncAV programming. Using SyncAV optimization resulted in significant reduction in QRSd compared to existing CRT pacing ($P = 0.02$) and the QuickOpt™ algorithm ($P < 0.001$). There was no difference between the latter two.

Conclusions: Manual ECG-based atrioventricular delay optimization using SyncAV significantly improved electrical synchrony in patients with a previously implanted CRT. Further studies are required to delineate the clinical and hemodynamic effects of using SyncAV in patients with chronically implanted CRT devices.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1170

Efficacy of cardiac resynchronization therapy using automated dynamic optimization and synchronized left ventricular pacing

Gwag HB.; Park YJ.; Lee SS.; Kim JS.; On YK.; Park KM.; Park SJ.

Samsung Medical Center, Cardiology, Seoul, Korea Republic of

Funding Acknowledgements: None.

Purpose: Although device-based optimization has been developed to overcome the limitation of conventional method cardiac resynchronization therapy (CRT), there are few real-world data. We aimed to investigate whether the adaptive CRT (aCRT) algorithm is comparable to biventricular (BiV) pacing with conventional optimization.

Methods: We analyzed 155 CRT patients with advanced heart failure. Patients were categorized into 3 groups according to the optimization method: non-adaptive BiV (n = 129), adaptive BiV (n = 11), and adaptive LV groups (LV pacing $\geq 50\%$, n = 15). Patients in the non-adaptive BiV group were matched according to baseline PR interval and QRS morphology. The primary outcome was a composite clinical outcome. Secondary outcome included electromechanical reverse remodeling and responder rates at 6 months after CRT implantation.

Results: During a median 27.5 months, there was no difference in primary outcome, while the adaptive LV group showed the highest increase in left ventricular ejection fraction 6 months after CRT. After matching, the adaptive LV group still showed similar efficacy compared to the matched non-adaptive BiV group (n = 59).

Conclusions: In our first Asia-Pacific real-world data, CRT with aCRT optimization showed non-inferior outcomes in clinical events and electromechanical remodeling compared to conventional CRT.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1171

Cardiac resynchronization therapy in non-ambulatory nyha class four heart failure patients

Park YJ.; Lee SS.; Gwag HB.; Park KM.; On YK.; Kim JS.; Park SJ.

Samsung Medical Center, Seoul, Korea Republic of

Background/Introduction : Cardiac resynchronization therapy (CRT) is a validated treatment to decrease rates of mortality and hospitalization among symptomatic heart failure patients. However, evidence is significantly inadequate for non-ambulatory NYHA class-four heart failure patients.

Purpose: This study evaluated effect of CRT for non-ambulatory NYHA class-four heart failure patients.

METHODS: From October 2005 to December 2017, a total of 159 patients had undergone CRT implantation in Samsung Medical Center (Seoul, South Korea). Of these, seventeen were classified as non-ambulatory NYHA class-four patients necessitating continuous infusion of inotropes, diuretics, or vasodilators or mechanical support such as continuous renal replacement therapy (CRRT) or extracorporeal membrane oxygenation (ECMO). Survival, symptom improvement, rehospitalization and echocardiographic parameters were assessed at twelve months after the CRT implantation. Clinical response was defined as the continued improvement of symptoms with no or reduced rate of rehospitalization due to heart failure at twelve months as compared to the rate of hospitalization one year prior to the CRT. Clinical super response was defined when symptom at twelve months was improved by more than two levels of NYHA class.

RESULTS: Survival was positive for thirteen of seventeen non-ambulatory NYHA class-four patients (76.5%) at twelve months. Of these, twelve patients (70.6%) were clinical responders. Among the twelve clinical responders, post-CRT implantation LVEF at twelve months based on echocardiography showed significant increase as compared to the baseline (18.0 [15.4; 23.1] vs 23.2 [18.4; 39.5], $p = 0.01207$). Although the decrease was not statistically significant, the LV volume post-CRT exhibited a decreasing tendency (LVEDV 284.1 [227.7; 328.2] vs 263.3 [154.2; 319.6] $p = 0.1174$ 95% CI of delta -68.4~8.9, LVESV 230.4 [186.9; 258.1] vs 207.5 [103.3; 256.2] $p = 0.08257$ 95% CI of delta -71.3~5.1). There were nine clinical super responders. Baseline QRS duration was significantly longer (176.0 [162.0; 202.0] vs 148.0 [141.5; 165.0] $p = 0.036$) and immediate post-CRT QRS duration reduction was markedly prominent for the clinical super responders (-23.0 [-36.0; -19.0] vs -3.0 [-20.0; 6.0] $p = 0.027$).

CONCLUSION: With adequate patient screening, CRT implantation is a feasible treatment that can offer clinical benefits for non-ambulatory NYHA class-four patients. The possibility of improvement due to CRT may be more apparent, especially in cases where the baseline feature shows more delayed electrical activation.

P1172**Long-term outcomes in patients with and without left bundle branch block undergoing electroanatomic mapping system-guided cardiac resynchronization therapy device implantation**

Del Greco M.¹; Maines M.¹; Angheben C.¹; Di Matteo I.¹; Cima A.¹; Catanzariti D.¹; Zorzi A.²; Peruzza F.¹

¹Santa Maria Del Carmine Hospital, Rovereto, Italy

²University Hospital of Padova, Department of cardiac, thoracic and vascular sciences, University of Padova, Padua, Italy

Background: Implantation of left ventricular (LV) lead in segments with delayed electrical activation may improve response to cardiac resynchronization therapy (CRT). Electroanatomic mapping system (EAMS)-guided CRT implantation has proved to be safe, reliable and effective technique.

Objective: The aim of this study was to assess long term outcomes in patients undergoing electroanatomic mapping system-guided cardiac resynchronization therapy device implantation.

Methods: we enrolled consecutive patients who successfully underwent to electroanatomic mapping system-guided cardiac resynchronization therapy device implantation. The activation mapping of the coronary sinus (CS) and relative branches were performed using an insulated guide wire. LV electrical delay (LVED) was defined as the interval between the beginning of the QRS complex on the surface electrocardiogram (ECG) and the local electrogram and expressed in milliseconds (ms). After discharge we scheduled a patients evaluation at our heart failure unit once year.

Results: 54 patients were included in this study (44 males, mean age 75 ± 7.2 years). 38 patients showed a left bundle branch block (LBBB) (70,4%, 20/38 a true-LBBB), and 13 a no-LBBB ECG pattern.

Overall, after a median follow-up of 36,6 months (12-60), left ventricular ejection fraction (LV-EF) significantly improved (29,3% vs 40,3%, $P < 0,0001$; LBBB 28,8% vs 40,2%, $P < 0,0001$) and left ventricular end systolic volume (LV-ESV) declined (130,6 ml vs 104,6 ml, $P = 0,02$; for LBBB 136 ml vs 104,6, $P = 0,04$).

Moreover we found an enhancement of performance status, with an improving of New York Heart Association (NYHA) functional class (2,5 vs 1,7; $P < 0,001$; for LBBB 2,5 vs 1,7, $P = 0,006$). 41/54 (78%) patients were classified as responders (improving NYHA class or reduction in LV-ESV at least 15%).

When focusing on the subgroup with no-LBBB, we found a significant improving of NYHA class (2,5 vs 1,8; $P = 0,006$) and 9/13 (82%) patients were classified as responders.

Conclusions: Electroanatomic mapping system (EAMS)-guided CRT implantation resulted in a positive LV structural remodeling and improving of NYHA functional class. The rate of CRT responder was high both in patients with LBBB and no-LBBB. Future studies should contain larger number of patient in order to provide more accurate data.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1173

Prediction of reverse remodeling in cardiac resynchronization therapy by acute changes in three-dimensional trajectory of pacing cathode pole in coronary sinus: preliminary results

Tomasi C.¹; Severi S.²; Zanon F.³; Molon G.⁴; Corzani A.⁵; Rossillo A.⁶; Biffi M.⁷; Zanolto G.⁸; Marcantoni L.³; Costa A.⁴; Dal Monte A.¹; Lanzoni L.⁴; Piovaccari G.¹; Corsi C.²

¹Santa Maria delle Croci Hospital, Department of Cardiovascular, Ravenna, Italy

²University of Bologna, Department DEIS, Cesena, Italy

³General Hospital of Rovigo, Rovigo, Italy

⁴Sacred Heart Hospital of Negrar, Negrar-Verona, Italy

⁵Ospedale M. Bufalini, Cesena, Italy

⁶San Bortolo Hospital, Vicenza, Italy

⁷University Hospital Policlinic S. Orsola-Malpighi, Bologna, Italy

⁸Legnago Hospital, Legnago, Italy

Background: In cardiac resynchronization therapy (CRT) patients, the coronary sinus (CS) lead pacing cathode movements have been proposed as a source of information about left ventricular (LV) mechanic response to CRT. An automated method for 3D reconstruction of CS lead's pacing cathode trajectory (3DTJ) was described by our group, and in a small exploratory study we found that trajectory's geometry at biventricular pacing (BIV) start suddenly changed in CRT responders (R), becoming less eccentric and more multi-directional, as described by the ratio between its two major axes (S1/S2).

Purpose: The TRAJECTORIES study (Trajectory Changes Of Coronary Sinus Lead Tip And Cardiac Resynchronization Therapy Outcome, NCT02340546) is an observational study by seven Italian centers about the prediction of CRT-induced LV reverse remodeling by means of the acute 3DTJ changes at CRT implant. Preliminary description and results are reported.

Methods: In CRT implants with standard indications, stable CHF and regular ventricular rhythm, a fluoroscopic sequence in two standard X-rays views of a few seconds was acquired immediately before (T-1) and after the start of BIV (T0). 3DTJ at T-1 and T0 were reconstructed using a procedure to track the CS lead cathode pole throughout the cardiac cycle and applying stereo-photogrammetric rules, and the mean 3DTJ over a cardiac cycle was computed. Geometric features and shape of mean 3DTJ were then analyzed. Changes of S1/S2 ($\Delta S1/S2$) between T-1 and T0 were compared with the volumetric response at six-month f.u.: the percent negative variation of S1/S2 ($\Delta S1/S2 < 0$), marking a more multi-directional shape of 3DTJ, was assumed to predict the response to CRT. Volumetric response was adjudicated by a core-lab using a cut-off reduction $\geq 15\%$ in echocardiographic LV end-systolic volume at f.u..

Results: Out of 119 patients enrolled in 42 months, 39 pts ended f.u. (28 m; age 69 ± 10) and 10 dropped-out. Fluoroscopies were acquired easily and 3DTJ were fully reconstructed. Patients baseline features were: ischemic heart disease (IHD) 24/39 pts; sinus rhythm 35/39 pts; upgrade from PM/ICD 9/39 pts; QRS morphology with LBBB 30/39, intraventricular aspecific delay 3 and RV pace 6 pts; LV ejection fraction (EF) $32 \pm 10\%$; QRS duration 162 ± 26 ms. At f.u., volumetric R were 26/39 (66%). Concordance between $\Delta S1/S2$ (as either $\Delta S1/S2 < 0$ or $\Delta S1/S2 > 0$) and volumetric response was 79% overall (31/39), 92% in R (24/26), 61% in non-R (8/13). Non-concordant patients were older (73 ± 8), predominantly with IHD (6/8) and mostly non-R (5/8), but no differences in QRS and EF were found. The proposed 3DTJ metric showed sensitivity = 82%, specificity = 72%; positive predictive value = 88%, negative predictive value = 61%.

Conclusions: Metrics of 3DTJ seem promising to acutely predict CS pacing site-specific response to CRT in long-term, above all in R. 3DTJ might depict aspects of CRT delivery effects on LV mechanics.

P1174**Optimizing cardiac resynchronization therapy: when the left ventricular lead is not the answer**

Nunes Ferreira AM.; Goncalves I.; Ricardo I.; Rigueira J.; Santos R.; Rodrigues T.; Cunha N.; Bernardes A.; Pinto F.; Sousa J.; Marques P.
Cardiology Department, Santa Maria Hospital, CHLN, CCUL, Lisbon University, Lisbon, Portugal

Introduction: The most recent studies in cardiac resynchronization therapy (CRT) have been focused on attempts to improve response rate, such as the determination of the optimal placement of the left ventricular (LV) lead. The position of the LV lead guided by the site of latest electrical delay (ED), seems to be a promising strategy. The same strategy may be useful in assessing the ideal positioning of right ventricular (RV) lead in CRT.

Purpose: To determine the most favorable position of the RV lead (septal versus apical) in CRT, by measuring the ED of the LV poles during septal or apical RV pacing in patients with triple-site CRT (TRIV).

Methods: A single-center prospective study of consecutive patients (Oct. 2014 to Oct. 2017) submitted to CRT device implantation (Quadra Allure MPTM, which allows post-implantation ED measurement) in TRIV mode - with a quadripolar lead in the LV, a RV lead positioned at the septum and a RV lead at the apex. In the follow-up, the lead position was confirmed and determined by fluoroscopic evaluation (anterior, lateral and postero-lateral in the short axis and basal, mid and apical on the long axis). The ED was measured at the 4-pole LV lead, during apical and septal RV pacing and the relation between the ED and lead position was evaluated.

Results: Twenty two patients were included: 82% male, median age 78 years; 50% implanted CRT with defibrillator; 27% had ischemic heart disease and 73% non-ischemic etiology; all patients had permanent atrial fibrillation and the QRS duration was of 176 ± 29 ms.

The position of the LV lead poles was classified as lateral in 44% and postero-lateral in 56%, basal in 28%, medial in 39% and apical in 34%. We evaluated 160 ED. The mean ED between the apical RV lead and the LV poles was significantly higher than the delay between septal RV lead and the LV poles [161 ± 33 ms vs 75 ± 45 ms ($p < 0.001$)] . This difference remained significant in LV poles located in a lateral position (76 ± 62 vs. 166 ± 36 ms; $p < 0.001$) or in a postero-lateral position (74 ± 30 vs. 157 ± 31 ms; $p < 0.001$); the same occurred for LV poles in a basal (99 ± 62 vs. 179 ± 24 ms, $p < 0.001$), mid (72 ± 38 vs. 167 ± 31 ms, $p < 0.001$) and apical location (57 ± 24 vs. 140 ± 32 ms, $p < 0.001$).

Conclusion: The LV lead position is an important determinant of the success of CRT, but is conditioned by anatomical and technical characteristics. The optimization of CRT may then depend on the positioning of RV lead. This study demonstrated that the apical (vs. septal) RV lead positioning presents higher ED in relation to LV lead, regardless of the latter position.

Subject: Poster session 2 -- Implantable Cardioverter / Defibrillator

P1175

The predictive role of mitral regurgitation in heart failure patients of different etiology, undergoing cardiac resynchronization therapy

Perge P.; Liptai C.; Nagy KV.; Boros AM.; Apor A.; Geller L.; Szeplaki G.; Merkely B.

Semmelweis University, Heart and Vascular Center, Budapest, Hungary

Funding Acknowledgements: OTKA K 105555

PURPOSE: Cardiac resynchronization therapy (CRT) reduces mortality and morbidity in selected groups of heart failure (HF) patients, although the predictors of non-response are not fully recognized. Ischemic cardiomyopathy is associated with worse clinical response to CRT, furthermore coronary artery disease (CAD) patients with significant mitral regurgitation (MR) have higher mortality risk regardless the presence of HF. The purpose of our study was to assess the impact of MR on clinical outcomes in ischemic (ICM) and non-ischemic HF (DCM) patients undergoing CRT.

METHODS: We enrolled 117 consecutive patients undergoing CRT, the follow-up period lasted for 5 years. The primary end-point was 5-year all-cause mortality, the composite endpoint of 2-year HF hospitalization and mortality was considered as secondary end-point. Echocardiographic measurements were taken off-line, MR were quantified using the PISA method, according to recent EACVI guidelines. We created to groups based on the baseline MR, moderate or more severe MR was considered as „significant MR”.

RESULTS: The mean age of patients were 70.2 ± 10.3 years, 55% suffered from HF of ischemic origin, 78 % were male. Among patients with ICM the ratio of males ($p = 0.04$) and use of diuretics ($p = 0.04$) were significantly higher. During follow-up 42 patients reached the primary, while 12 the secondary end-point. Ischemic etiology ($p = 0.816$) and the severity of baseline MR ($p = 0.28$) did not predicted 5-year mortality, the two-year combined end-point was not significantly associated with baseline MR ($p = 0.22$). Significant MR at six months after implantation predicted the risk of secondary end-point, in case of long term mortality we found a strong trend ($p = 0.058$). We analyzed the clinical response in groups formed according to severity of MR and etiology of HF. 5-year mortality significantly differed among groups ($p = 0.017$), patients with mild MR and DCM showed the best response, while the significant MR-ICM group had the worst outcome. **CONCLUSION:** Baseline MR was not associated with clinical outcomes after CRT. On the other hand persisting significant MR predicted increased risk of mortality and morbidity regardless of HF etiology. Based on our results in ICM patients with persisting significant MR poor prognosis can be anticipated after CRT implantation.

Subject: Poster session 2 -- Home and Remote Patient Monitoring

P1176

Remote monitoring decreases unnecessary electrotherapy rate and improves patient survival

Lebedeva V.; Lubimceva T.; Lebedev D.

Almazov National Medical Research Centre, Saint Petersburg, Russian Federation

Background: Remote monitoring (RM) is a modern option for cardiovascular implantable electronic devices (CIED). Timely evaluation of the device parameters helps to avoid complications associated with the technical CIED features, to identify life-threatening arrhythmias, shocks and possible decompensation of the heart failure (HF).

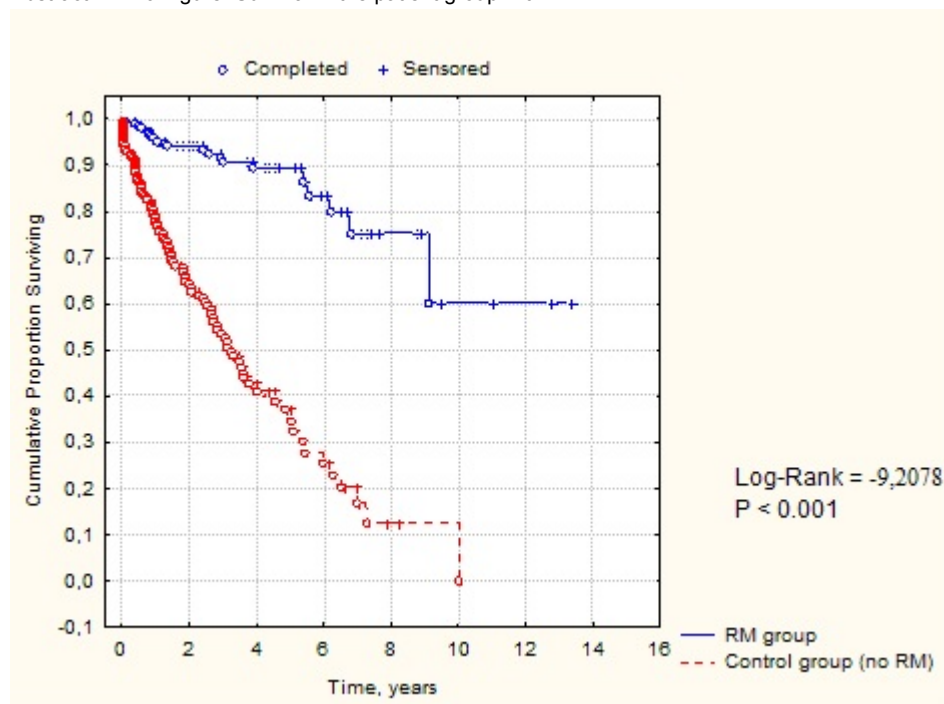
Objective: To compare the level of appropriate and inappropriate CIED electrotherapy, the survival rate of patients with and without RM during a five-year follow-up period.

Materials and methods: We analyzed data from 517 patients with CIED, 278 of them had RM system. CIED types were 229 CRT-D, 144 ICD for primary prevention of sudden cardiac death (SCD), 150 ICD for secondary SCD prevention. Mean age was 62.1 ± 12.4 years, 294 patients were male, the proportion of ischemic patients was 56.3% ($n = 291$). No differences were found in baseline patient characteristics with and without remote monitoring. The following parameters were evaluated: the number and type of ventricular arrhythmias, the use of ICD electrotherapy, analysis of the unnecessary ventricular tachycardia (VT) detection, time to decision making, patient survival. A corresponding detailed statistical analysis of the primary data was carried out.

Results: VT was detected in 165 out of 517 patients (32.2%). The greatest number of VTs was found in patients with secondary SCD prevention. According to the saved electrograms, 8.2% episodes with false VT/VF detection were detected. These events related to supraventricular tachycardias (atrial fibrillation, atrial flutter with fast ventricular rate), ventricular lead dysfunction, T-wave oversensing. Ineffective maximum energy shock therapy was registered in 45 cases (18.8%). These episodes were related to false VT detection due to atrial fibrillation or lead damage. Data on any types of electrotherapy, as well as electrogram analysis were carried out significantly earlier in patients with RM. Success of antitachycardia pacing (ATP) did not depend on the type of CIED and VT rate. Survival rate was significantly higher in the patient group with RM (Log-Rank test = -9,21; $p < 0,001$).

Conclusions: The RM systems have the objective information and help to assess the clinical situation in each case in a timely manner with quick decision making for the better assistance in the treatment of patients and improving their survival.

Abstract P1176 Figure. Survival in the patient group with RM



Subject: Poster session 2 -- Home and Remote Patient Monitoring

P1177

Benefits of the remote monitoring of cardiac implanted electronic devices in the clinical practice of a high-volume hospital center

Mendez Zurita F.; Rodriguez Font E.; Alonso Martin C.; Guerra Ramos J.; Campos Garcia B.; Alcalde Rodriguez O.; Espinosa Viamonte H.; El Amrani Rani A.; Maldonado Chavez J.; Vinolas Prat X.

Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

INTRODUCTION: Remote monitoring (RM) of cardiac implanted electronic devices (CIED) is a technology established in the clinical practice, and should be offered as part of the usual care of patients. The RM accessibility, benefits and safety have been demonstrated in randomized clinical trials. However, data in daily clinical practice with unselected patients and including all manufacturers is limited.

The purpose of this study was to assess the impact of RM in the clinical practice. A detailed review of RM experience was performed in a tertiary referral hospital.

METHODS: All patients with an CIED and RM followed-up in our center in 2017 were included. All manufacturers were included. Clinical and demographic characteristics were analyzed. The digital device data obtained in remote and in hospital follow-up visits were transferred in a system software package. Patients with ICD were seen annually with in clinic device interrogation, patients with CRT were seen every six months. All patients were scheduled for a RM transmission every four months. The total number of scheduled and unscheduled in hospital visits was analyzed. The amount of remote visits that represented clinically significant conditions was evaluated. A protocol of classification by colors is used in our center: green (non clinical relevance), yellow (mild clinical - electrical instability), red (critical clinical - electrical instability, ERI).

RESULTS: A total of 860 patients are in RM (64% ICD, 30% CRT-D, 6% CRT-P, 78.2% males, 65 ± 12.93 years, 65.96% primary prevention). The number of in hospital follow-up was 1.69 visits /patient /year. A total of 2968 transmissions were received and analyzed during the study period (3.45 transmissions /patient / year). Of this total 273 (9.2%) transmissions were unscheduled (alert, event, duplicate or unintentional). A 21.44% of RM transmissions were classified as yellow or red, according our local protocol. A 4.94% of the transmissions induced an unscheduled in hospital visit to reprogramming or initiation / uptritaion medication, of which 10 cases were due to asymptomatic new on-set atrial fibrillation.

CONCLUSION: RM allows a reduction in hospital follow-up visits, generates a very low proportion of unscheduled visits, and allows early detection of asymptomatic events.

Subject: Poster session 2 -- Home and Remote Patient Monitoring

P1178

Transmission rate of remote monitoring and mortality in patients with a pacemaker

Goto T.; Mori K.; Nakasuka K.; Kato M.; Nakayama T.; Wakami K.; Fukuta H.; Ohte N.

Nagoya City University Graduate School of Medical Sciences, Nagoya, Japan

Background: Remote monitoring of cardiac implantable electronic devices improve clinical outcome. There was few data, however, about the association between transmission rate of remote monitoring [TR (%); days of transmission / days of follow-up ratio after remote monitoring introduction] and mortality in patients with pacemakers.

Purpose: To investigate whether the TR can predict all-cause mortality in patients with a pacemaker.

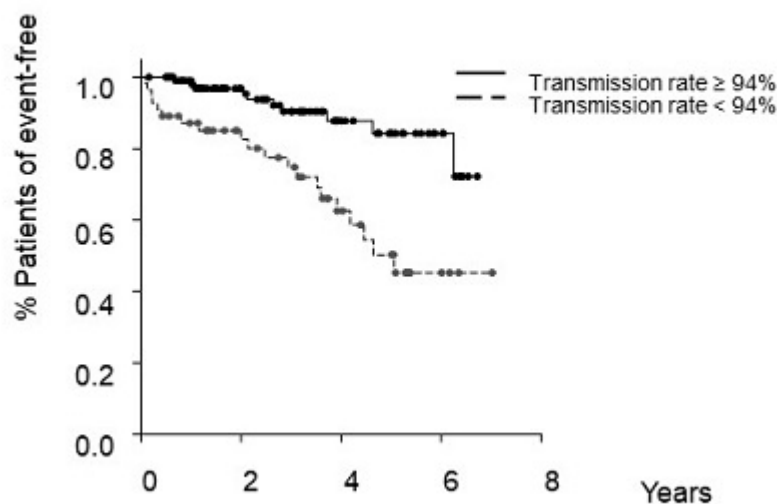
Methods: Patients with a newly implanted a pacemaker between August 2011 and February 2018 were enrolled if they were managed using a specific remote monitoring system with daily transmissions (Biotronik, Home Monitoring). A total of 164 patients was eligible for this study (79.7 ± 8.8 years, 50% men). We evaluated the relationship between TR and all-cause mortality.

Results: During the follow-up period (median 2.8 years), 30 all-cause deaths were observed. There were no significant differences in sex, height, weight, or left ventricular ejection fraction between the patients with all-cause mortality and patients without events. TR was significantly lower in patients who died during the follow-up period than in those who survived (78.5 ± 27.1 vs. $93.8 \pm 9.4\%$, $p = 0.005$). Compared with patients who survived, the patients who died were significantly older (83.9 ± 7.5 vs. 78.7 ± 8.8 years, $p = 0.003$), and had significantly higher plasma B-type natriuretic peptide (BNP) levels (211.0 [IQR, 123.0–424.4] vs. 85.9 [IQR, 45.0–216.6] pg/mL, $p = 0.02$). The patients who died had significantly lower estimated glomerular filtration rate (eGFR) than those survived (40.8 ± 22.8 vs 57.4 ± 21.3 mL/min/1.73 m², $p < 0.001$). The proportion of physiological pacing was significantly higher in patients who survived than in those who died (94.8 vs. 73.3 %, $p < 0.001$). The area under the receiver-operating characteristic curve for the TR to predict all-cause death was 0.73 (95% confidence interval [CI]: 0.62-0.83, $p < 0.001$). A TR value of 94% had a sensitivity of 67% and a specificity of 74% for predicting all-cause mortality. In multivariate Cox regression analysis, TR $\geq 94\%$ was selected as a predictor of all-cause death (hazard ratio: 0.62; 95% CI: 0.41-0.93; $p = 0.02$). However, the other valuables entered into the model, age ≥ 80 years, BNP ≥ 100 pg/mL, eGFR < 60 mL/min/1.73 m², ventricular pacing, were not selected.

Conclusions: Low TR is a predictor of all-cause mortality in patients with a pacemaker. Patients with TR $\geq 94\%$ may experience lower incidences of mortality, and they should have a good prognosis.

Abstract P1178 Figure. Kaplan-Meier curves for mortality

Kaplan-Meier curves for all-cause mortality in patients with transmission rate $\geq 94\%$ or $< 94\%$



Subject: Poster session 2 -- Home and Remote Patient Monitoring

P1180

ICD-measured heart sounds and their correlation with echocardiographic indexes of systolic and diastolic function

Calo L.¹; D'Onofrio A.²; Cipolletta L.³; Santini L.⁴; Favale S.⁵; Pecora D.⁶; Petracci B.⁷; Costa A.⁸; De Ruvo E.¹; Tavoletta V.²; Mahfouz K.⁴; Guaricci A.⁵; La Greca C.⁶; Valsecchi S.⁹; Capucci A.³

¹Policlinico casilino, Rome, Italy

²AO dei Colli-Monaldi Hospital, Naples, Italy

³University Hospital Riuniti of Ancona, Ancona, Italy

⁴Giovan Battista Grassi Hospital, Ostia lido, Rome, Italy

⁵Azienda Ospedaliero Universitaria, Policlinico di Bari, Bari, Italy

⁶Poliambulanza Foundation Hospital Institute of Brescia, Brescia, Italy

⁷Policlinic Foundation San Matteo IRCCS, Pavia, Italy

⁸Ospedale Sacro Cuore Don Calabria, Negrar, Verona, Italy

⁹Boston Scientific Italia, Milan, Italy

Background Novel ICDs allow the estimation of first (S1) and third (S3) heart sounds (HS) using the embedded accelerometer. ICD-measured S1 and S3 were previously shown to significantly correlate with hemodynamic changes in acute animal models. The HeartLogic algorithm (Boston Scientific) measures and combines multiple parameters, including S3 and S3/S1, in a single index to predict impending HF decompensation.

Purpose To evaluate the echocardiographic correlates of ICD-measured S3 and S3/S1 in patients with ICD and cardiac resynchronization therapy ICD.

Methods The HeartLogic feature was activated in 75 patients (57 male, 71 ± 10 years, left ventricular ejection fraction (LVEF) $36 \pm 9\%$). At in-office visit, patients underwent echocardiographic evaluation and parameters of systolic and diastolic function were correlated with S3 amplitude and S1/S3 ratio measured on the same day of the visit.

Results S3 amplitude significantly correlated with the deceleration time of E wave (DT) ($r = -0.38$, $p = 0.005$). Patients with S3 > 0.79 mG (median value) showed significantly lower values of DT than patients with lower S3 (208 ± 77 ms vs. 250 ± 75 ms, $p = 0.046$). Interestingly, S3 was detected at auscultation only in 6 patients who did not show lower DT values at echocardiography (209 ± 83 ms vs. 229 ± 77 ms, $p = 0.566$). S3/S1 ratio significantly correlated with the LVEF ($r = -0.38$, $p = 0.001$). Patients with S3/S1 > 0.35 (median value) showed significantly lower values of LVEF than patients with lower S3/S1 ($32 \pm 8\%$ vs. $39 \pm 8\%$, $p = 0.002$).

Conclusions The ICD-measured HS parameters are significantly correlated with echocardiographic indexes of systolic and diastolic function. This confirms their utility for remote HF patient monitoring when considered as single sensors, and their potential relevance when considered in combination with other physiological ICD sensors that evaluate different aspects of HF physiology.

Subject: Poster session 2 -- Home and Remote Patient Monitoring

P1181

Preliminary experience with the multisensor HeartLogic algorithm for heart failure monitoring: a case series report

Capucci A.¹; Ammirati F.²; Favale S.³; Pecora D.⁴; Petracci B.⁵; Calo L.⁶; Molon G.⁷; Cipolletta L.¹; Bianchi V.⁸; Schirripa V.²; Santobuono V.E.³; La Greca C.⁴; Guardiani S.⁹; D'Onofrio A.⁸

¹University Hospital Riuniti of Ancona, Cardiology and Arrhythmology Dept, Ancona, Italy

²Cardiology Division, "Giovanni Battista Grassi" Hospital, Ostia lido, Rome, Italy

³University of Bari, Bari, Italy

⁴Poliambulanza Foundation Hospital Institute of Brescia, Brescia, Italy

⁵Polyclinic Foundation San Matteo IRCCS, Pavia, Italy

⁶Polyclinic Casilino of Rome, Rome, Italy

⁷Sacred Heart Hospital of Negrar, Negrar-Verona, Italy

⁸AO dei Colli-Monaldi Hospital, Naples, Italy

⁹Boston Scientific, Milan, Italy

Funding Acknowledgements: No external funding was obtained for this project

Background: In the MultiSENSE study, a novel algorithm for heart failure (HF) monitoring was implemented. The HeartLogic index combines data from multiple implantable cardioverter-defibrillator (ICD)-based sensors and has proved to be a sensitive and timely predictor of impending HF decompensation. The remote monitoring of HF patients by means of HeartLogic has never been described in clinical practice.

Purpose: We report post-implantation data collected from sensors, the combined index, and their association with clinical events during follow-up in a group of patients who received a HeartLogic-enabled device in clinical practice.

Methods: Patients with ICD and cardiac resynchronization therapy ICD were remotely monitored. In December 2017, the HeartLogic feature was activated on the remote monitoring platform, and multiple ICD-based sensor data collected since device implantation were made available: HeartLogic index, heart rate, heart sounds, thoracic impedance, respiration, and activity. Their association with clinical events was retrospectively analyzed.

Results: Data from 58 patients were analyzed. During a mean follow-up of 5 ± 3 months, the HeartLogic index crossed the threshold value (set by default to 16) 24 times (over 24 person-years, 0.99 alerts/pt-year) in 16 patients. HeartLogic alerts preceded 5 HF hospitalizations and 5 unplanned in-office visits for HF. Symptoms or signs of HF were also reported at the time of 5 scheduled visits. The median early-warning time and the time spent in alert were longer in the case of hospitalizations than of minor events of clinical deterioration of HF. HeartLogic contributing sensors detected changes in heart sound amplitude (increased third sound and decreased first sound) in all cases of alerts. Patients with HeartLogic alerts during the observation period had higher NYHA class ($p = 0.025$) and lower ejection fraction ($p = 0.016$) at the time of activation.

Conclusions: Our analysis confirmed the ability of the HeartLogic algorithm to detect gradual worsening of HF and to stratify risk of HF decompensation.

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1182

Real-world evidence of pacemaker and ICD implantation in patients taking apixaban: the French AMPER-AF implantation study

Amara W.¹; Mlayeh D.¹; Garcia R.²; Mansourati J.³; Taieb J.⁴; Gandjbackh E.⁵; Dompnier A.⁶; Gorka H.⁷; Da Costa A.⁸; Sacher F.⁹; Jourda F.¹⁰; Fromentin S.¹¹; Cheggour S.¹²; Georger F.¹³; Milhem A.¹⁴

¹Centre Hospitalier Intercommunal Le Raincy-Montfermeil, Service de cardiologie, Le Raincy-Montfermeil, France

²University Hospital of Poitiers, Poitiers, France

³University Hospital of Brest, Brest, France

⁴General Hospital of Aix en Provence, Aix en Provence, France

⁵Hospital Pitie-Salpetriere, Paris, France

⁶Hospital of Annecy, Annecy, France

⁷Hospital Louis Pasteur of Chartres, Chartres, France

⁸CHU Saint Etienne Hopital Nord, Saint Etienne, France

⁹Hospital Haut Leveque, Bordeaux-Pessac, France

¹⁰Hospital center of Auxerre, Auxerre, France

¹¹Hospital Belfort-Montbeliard, Montbeliard, France

¹²Hospital Center of Avignon, Avignon, France

¹³Hospital center of Beziers, Beziers, France

¹⁴University Hospital of La Rochelle, La Rochelle, France

Funding Acknowledgements: BMS

OnBehalf: CNCH

Purpose: To evaluate bleeding complications in patients taking apixaban and undergoing a pacemaker or ICD implantation in everyday clinical practice.

Methods: It is a multicentre, observational, prospective study of patients with non-valvular atrial fibrillation (AF) undergoing a pacemaker or implantable cardioverter defibrillator (ICD). Eligible patients had been taking apixaban (2.5 or 5 mg twice daily) for ≥ 3 weeks before the procedure, and were followed for 30 days afterwards.

Results: A total of 115 patients (80 [72, 85] years, 63% male, mean CHA2DS2-VASc score 3, mean HAS BLED score 3) were enrolled at 25 academic/non-academic centres in France; 68 patients (59%) were receiving apixaban 10 mg/day and 47 (41%) 5 mg/day. The most prevalent concomitant disorders were hypertension (55% of patients), diabetes (15%), vascular disease (10%) and a history of stroke (6%). Mean creatinine value was 93 ± 25 $\mu\text{mol/L}$, median weight was 83 ± 18 kg and mean creatinine clearance (Cockcroft-Gault) was 82 ± 34 mL/min. The implantation was a planned procedure in 102 (89%) of cases. The mean duration of procedure was 51 min. The management of apixaban in the periprocedural period was let to the investigators preference. Median withdrawal time was 25 h. Bleeding events were detected in 4 (3.5 %) cases. One of them was a pocket hematoma with infection treated by the extraction of the device. Three patients presented minor bleedings according to International Society on Thrombosis and Haemostasis bleeding (ISTH) classification without prolongation of hospitalization.

Conclusion: These observational data of patients on apixaban undergoing pacemaker/ICD implantation in everyday practice show a management of apixaban according to guidelines with a low rate of bleeding events.

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1183

Long-term follow-up of the patients with pacemaker leads implanted through persistent left superior vena cava

Brankovic N.; Kircanski B.; Vujadinovic N.; Radovanovic N.; Jovanovic V.; Milasinovic A.; Nikcevic G.; Zivkovic M.; Savic D.; Pavlovic SU.; Milasinovic G.

Clinical center of Serbia, Pacemaker Center, Belgrade, Serbia

BACKGROUND: Persistent left superior vena cava (PLSVC) is the commonest congenital malformation of the thoracic venous system and it affects 0.2-0.5% of the general population. In spite of the many case reports and several case studies with patients with cardiac implantable electronic devices (CIED) leads implanted through PLSVC reported, the overall number of these patients reported in the papers is not big. To our best knowledge, our series of the patients with CIED lead(s) implanted through PLSVC that is presented here is the second largest reported.

PURPOSE: The purpose of this study was to show that CIED lead implantation through PLSVC is feasible and safe during long-term follow-up.

METHODS: This is the retrospective observational study performed in a tertiary center from January 2006 to September 2018. In 27 of 9530 (0.3%) patients that underwent left-sided endovenous CIED implantation, the presence of the PLSVC was detected during implantation and proved by contrast venography. Excluding venography, the rest of the procedure was performed in a usual manner. Data from implantation as well as CIED follow-ups were collected from medical records. The study was approved by the local Ethical Committee.

RESULTS: CIEDs were successfully implanted on the left side, as intended, in 26 of 27 (96.3%) patients with PLSVC. In one patient, lead positioning through PLSVC was not possible so left-side approach was abandoned and VVIR pacemaker was implanted on the opposite (right) side without complications. This patient was excluded from the further analysis. There were 12 single and 6 dual chamber pacemakers, one single and one dual chamber ICD, and 6 CRTs implanted without complications. In all CRT patients, leads for the left ventricle were implanted subsequently, epicardially, using mini-thoracotomy approach. The reason for that was the absence of appropriate vein for CRT. The average implantation time was 67, 63 and 90 minutes for single chamber, dual chamber and CRT devices, respectively. The average fluoroscopy time was 14.7, 10.8, 53.2 minutes for single chamber, dual chamber and CRT devices, respectively. The average follow-up period was 42 months (1-110 months). During follow-up period, no CIED complications were noted. Pacing parameters including impedance, sensing (of P and R waves) and threshold capture (for atrial and ventricular leads) did not changed significantly during the entire follow-up periods (all $p > 0.05$).

CONCLUSIONS: The results of our study show that the presence of PLSVC is not an obstacle for CIED implantation and that CIED implantation in the presence of PLSVC is feasible and safe which is proven during long-term follow-up. Longer implantation and fluoroscopy time were expected and acceptable feature of these procedures. Implantation of the endocardial left ventricle lead for CRT in the presence of the PLSVC could be very challenging.

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1184**The role of cardiac surgery in transvenous lead extraction. The experience of a high volume center and 2841 procedures**Czajkowski M.¹; Targonska S.¹; Tulecki L.²; Tomkow K.²; Polewczyk M.³; Nowosielecka D.⁴; Stazka J.¹; Kutarski A.⁵¹Medical University of Lublin, Department of Cardiac Surgery, Lublin, Poland²The Pope John Paul II Province Hospital, Department of Cardiac Surgery, Zamosc, Poland³The Jan Kochanowski University, Institute of Medical Sciences, Kielce, Poland⁴The Pope John Paul II Province Hospital, Department of Cardiology, Zamosc, Poland⁵Medical University of Lublin, Department of Cardiology, Lublin, Poland

The guidelines suggest close co-operation between TLE operating team and cardiac surgery underlining the key role of the surgery in the management of life-threatening cardiovascular TLE complications. Objective: An analysis of a role of cardiac surgery in patients undergoing TLE procedures. Methods: Using standard non-powered mechanical systems we have extracted leads from 2841 patients. An average dwelling time of all leads was 91,5 months. Results: Procedural success was achieved in 95,6% patients, clinical success in 98,0%, procedure-related death was 0,2%. Major complications appeared in 1,8% patients. Conclusions: Rescue cardiac surgery for management of severe TLE complications is still the most frequent reason of surgical intervention (1,1%), however relatively often cardiac surgery was a complementary intervention due to different causes. Large single TLE centre experience indicates the necessity of close cooperation with cardiac surgery, which role seems to be more comprehensive than a surgical standby.

The role of cardiac surgery in patients undergoing 2841 TLE in high volume center. 113 interventions among 2841 TLE procedures (3,98%) in 82 pts (2,9%)		No	% of 2841 TLE procedures	% among 82 pts in which cardiac surgery was necessary. In 21 pts - 2 or more procedures
No Cardiac Surgery		2 759	96,37%	
Rescue (acute) cardiac surgery (major TLE complication) 52/2841 (1,8%)	TLE complication - Atrial Suture	22	0,77%	26,83%
	TLE complication - Ventricle Suture	4	0,14%	4,88%
	Complication Vena Cava Suture	4	0,14%	4,88%
	TLE complication - Coronary Sinus Suture	1	0,03%	1,14%
	Pulmonary Embolus Surgery	1	0,03%	1,14%
	TLE complication Pleural Drainage	3	0,10%	3,66%
	Floating Stent Removal	1	0,03%	1,14%
Supplementary cardiac surgery after (incomplete) TLE 22/2841 (0,77%)	Large Vege removal (hybrid procedure: lead liberation and cardiac surg)	4	0,14%	4,88%
	Left Heart Endocarditis surgery (hybrid management TLE & cardiac surg)	1	0,03%	1,14%
	Vegetation symptomatic remnant removal	8	0,28%	9,76%
	Infected non-extractable lead fragment removal	7	0,24%	8,54%
	Dangerous for TLE surgical lead removal (risk of TV damage)	2	0,07%	2,44%

Late surgical intervention (TLE related TVD) 6/2841 (0,21%)	TLE-related TV damage - tricuspid v. plastic	2	0,07%	2,44%
	TLE-related TV damage - tricuspid v. replacement	2	0,07%	2,44%
	TLE related TVD Observation. No Surgery yet	9	0,31%	10,97%
	Lead dependent TV dysfunction in spite of lead extraction	2	0,07%	2,44%
Epicardial permanent pacing system implantation during sternotomy		17	0,60%	21%
Delayed intervention after TLE - epicardial LA/LV lead implantation		23	0,81%	28%

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1185**Lead related venous narrowing and occlusion. Lessons from 2105 preoperative venographies. Are the veins free of leads also affected?**Czajkowski M.¹; Tulecki L.²; Tomkow K.²; Polewczyk A.³; Jachec W.⁴; Polewczyk M.³; Kutarski A.⁵¹Medical University of Lublin, Department of Cardiac Surgery, Lublin, Poland²The Pope John Paul II Province Hospital, Department of Cardiac Surgery, Zamosc, Poland³The Jan Kochanowski University, Institute of Medical Sciences, Kielce, Poland⁴Silesian Medical University, 2nd Department of Cardiology, Zabrze, Poland⁵Medical University of Lublin, Department of Cardiology, Lublin, Poland

The phenomenon of lead-related venous problems is generally known, but its scale (frequency, degree and extensiveness) was not analysed in large patients group. Objective: A retrospective analysis of our preoperative venography in the aspects of appearance of venous narrowing/occlusion. Methods: In 2140 patients (60,7% males), average 64,8-year-old referred for transvenous lead extraction (TLE) a routine venography was performed and analyzed. An average dwelling time of all leads was 91,5 months. The lead entry side was left in 96%, right in 3% and both – 1%. Observations: The narrowing (significant-occlusion) appeared in 46% of cardiac implantable electronic device (CIED) carriers. Stenosis seems to be less frequent if the right approach was used. Main narrowing affects subclavian vein (SV) but brachiocephalic vein (BCV) might also be affected relatively frequently. A long term pacing history and a previous temporary catheterisation causes that the opposite chest side veins might be affected too in several percent of patients. Conclusions: 1. Lead related venous occlusion appears in 81% CIED carriers but significant is noted in 46% of patients. 2. Lack of leads on the opposite chest side does not exclude venous narrowing. In a patient with CIED system, the veins of free of leads chest side might be affected by narrowing or even occlusion.

Condition of the venous system	Leads left side of the chest				Chest side free of leads			
	LSV		LBCV		RSV		RBCV	
	pts.	%	pts.	%	pts.	%	pts.	%
Lack of stenosis	395	19,0%	1247	59,7%	624	93,6%	1324	97,1%
Mild narrowing	447	21,5%	255	12,2%	12	1,8%	14	1,0%
Moderate narrowing	467	22,5%	143	6,8%	8	1,2%	6	0,4%
Severe stenosis	402	19,4%	142	6,8%	10	1,5%	11	0,8%
Compl. occlusion	365	17,6%	301	14,4%	13	1,9%	9	0,7%
Condition of the venous system	Leads right side of the chest				Chest side free of leads			
	RSV		RBCV		LSV		LBCV	
	pts.	%	pts.	%	pts.	%	pts.	%
Lack of stenosis	22	44,0%	32	61,5%	25	67,6%	30	71,4%
Mild narrowing	11	22,0%	7	13,5%	2	5,4%	6	14,3%
Moderate narrowing	5	10,0%	6	11,5%	3	8,1%	2	4,8%
Severe stenosis	8	16,0%	6	11,5%	3	8,1%	0	0,0%
Compl. occlusion	4	8,0%	1	1,9%	4	10,8%	4	9,5%

P1186**Is there a chance of a safe and effective use of jugular venous approach for intensive therapy or anesthesia in a CIED carrier? The analysis of 2228 venographies**Czajkowski M.¹; Tulecki L.²; Tomkow K.²; Polewczyk A.³; Jachec W.⁴; Polewczyk M.³; Kutarski A.⁵¹Medical University of Lublin, Department of Cardiac Surgery, Lublin, Poland²The Pope John Paul II Province Hospital, Department of Cardiac Surgery, Zamosc, Poland³The Jan Kochanowski University, Institute of Medical Sciences, Kielce, Poland⁴Silesian Medical University, 2nd Department of Cardiology, Zabrze, Poland⁵Medical University of Lublin, Department of Cardiology, Lublin, Poland

The phenomenon of lead-dependent venous stenosis is generally known, but mainly for cardiologists and cardiac surgeons. The awareness of essential limitations of jugular approach use is less known for specialists of intensive therapy and anaesthesiologists. Objective: A retrospective analysis of preoperative venography in the aspects of appearance and extension of venous stenosis/occlusion. Methods: In 2228 patients (60,7% males), average 64,8-year-old referred for transvenous lead extraction (TLE) a routine venography was performed and analyzed. In this study a condition of jugular and brachiocephalic veins was considered. Non-infectious TLE indications were present in 64,8% of patients. 46% of patients had dual-chamber pacemaker system, 15% single-chamber, 21% ICD, 9% CRT, 16% other systems. In 12% of patients abandoned leads were found. 8% of patients had one lead, 54% - two, 15% - three and 4 % 4-6 leads in the heart. An average dwelling time of all leads was 91,5 months. The lead entry side was left in 96%, right in 3% and both – 1%. Observations: The venous stenosis (significant-occlusion) was found in 47% of CIED carriers which may severely complicate the insertion of a catheter using jugular approach. The axillary and subclavian veins patency has no influence in this case. However, the permeability of brachiocephalic trunk plays a key role - its narrowing/occlusion may be the trap and provide severe complications. Conclusions: 1. Due to frequent appearance of lead related venous occlusion (47% of CIED carriers) ipsilateral to the system even jugular approach should be avoided. 2. If necessary – the procedure of catheter insertion should be under X-ray fluoroscopy. 3. Preceding venography and X-ray fluoroscopy support seems to be mandatory if a relatively contraindicated approach have to be utilized due to important indications.

Condition of the venous system at the lead venous entry chest side			Chance of safe jugular insertion and appropriate functioning of central venous catheter	Ipsilaterally to PM/ICD/CRT leads		Contralaterally to PM/ICD/CRT leads	
Lack or mild narrowing	768	35%	Possible, relatively easy	1613	72,4%	2179	97,8%
Moderate narrowing	458	20%	Difficult - special tools necessary	199	8,9%	22	1,0%
Severe stenosis	459	21%	Doubtful - in spite of special scenario	412	18,5%	27	1,2%
Complete occlusion	543	24%	Impossible (compl occlusion)	4	0,2%	0	0,0%
	2228	100%	All patients	2228	100,0%	2228	100,0%

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1187**The effect of different peri-procedural anticoagulation regimens on in-hospital outcomes after lead extraction in CRT patients- a substudy of the ELECTRa Registry**Regoli F.¹; Auricchio A.¹; Di Cori A.²; Segreti L.²; Blomstroem Lunqvist C.³; Butter C.⁴; Deharo JC.⁵; Kennergren C.⁶; Kutarski A.⁷; Maggioni A.⁸; Rinaldi A.⁹; Bongiorni MG.²¹Foundation "Cardiocentro Ticino", Lugano, Switzerland²Azienda Ospedaliero-Universitaria Pisana, Department of Cardiology, Pisa, Italy³Uppsala University, Department of Cardiology and Medical Science, Uppsala, Sweden⁴Brandenburg Heart Center, Department of Cardiology, Bernau bei Berlin, Germany⁵Hospital La Timone of Marseille, Service de Cardiologie-Rythmologie, Marseille, France⁶Sahlgrenska Academy, Department of Cardiothoracic Surgery, Gothenburg, Sweden⁷Medical University of Lublin, Department of Cardiology, Lublin, Poland⁸Associazione Nazionale Medici Cardiologi Ospedalieri Research Center, Florence, Italy⁹Guy's Hospital, Department of Cardiology, London, United Kingdom**OnBehalf:** ELECTRa Registry**Purpose:** The effect of different peri-procedural AC regimens on post-procedural outcomes of CRT pts undergoing transvenous lead extraction (TLE) is unknown and was investigated.**Methods:** CRT pts undergoing TLE enrolled in the ELECTRa registry were considered. Major and minor complications were compared between the different AC regimen groups, which included interruption of AC without bridging (G1), interruption with "bridging" (G2), or uninterrupted AC (G3).**Results:** A total of 734 CRT pts were enrolled; 328 (44.7%) were under AC, treated with vitamin K antagonists (VKA)(n = 230, 70%), non-VKA antagonist (n = 54, 16%) or heparins (n = 44, 13%). AC was interrupted in 169 (G1, 52%), interrupted with "bridging" in 135 (G2, 41%), or uninterrupted in 24 pts (G3, 7%). Demographic, clinical, and anti-platelet treatments were similar between groups. In a context of a very low rate of events, no differences were found in the rates of major complications between the groups. However, G2 presented a significantly higher rate of minor complications compared to the other groups (Table).**Conclusions:** In more than half of CRT pts treated with AC, preferred AC regimen was interruption without bridging. "Bridging" was associated with a significantly higher rate of minor complications in the post-procedural phase compared to other strategies.

Minor complications after TLE

	Groups 1/3 (AC interrupted & continued, N = 193)	Group 2 (AC «Bridging», N = 135)	p-value
MINOR- Total (%)	9 (4.7)	16 (11.9)	0.020
Intraprocedural (%)	3 (1.6)	0	0.2712
Arrhythmia	1	0	ns
Blood transfusion	2	0	ns
Post-procedural (%)	6 (3.1)	16 (11.9)	0.005
Pericardial effusion w/o drainage	0	1	ns
Hematoma needing intervention	3	5	ns
Hemotorax without chest tube	1	0	ns
Vein thrombosis	0	4	0.028
Blood transfusion	1	5	0.087
Pneumothorax req. chest tube	0	0	ns
Minor pulmonary embolism	0	1	ns
Other	1	0	ns
Total minor bleeding (%)	7 (3.6)	11 (8.1)	0.088

Total minor thromboembolism (%)	0	5 (3.7)	0.011
---------------------------------	---	---------	-------

Values are expressed as absolute with percentages between parenthesis.

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1188

Under direct vision: minimally invasive thoracoscopy during lead extraction

Elitzur Y.; Wald O.; Korach A.; Yizhar U.; Shauer A.; Rudis E.; Shapira O.; Afifi M.; Biton Y.; Orenstein D.; Hadieh A.; Luria D.

Hadassah University Medical Center, Cardiology, Jerusalem, Israel

Introduction

The increasing use of cardiac implantable electronic devices has made lead extraction due to failure or infection a relatively common and safe procedure. However, in complex cases, vascular tear at the innominate-SVC junction remains a key concern[1],[2]. In particular, timely diagnosis of this complication remains challenging since massive blood loss to the pleural space is invisible to TEE, and since transient hypotension is not uncommon in this procedure.

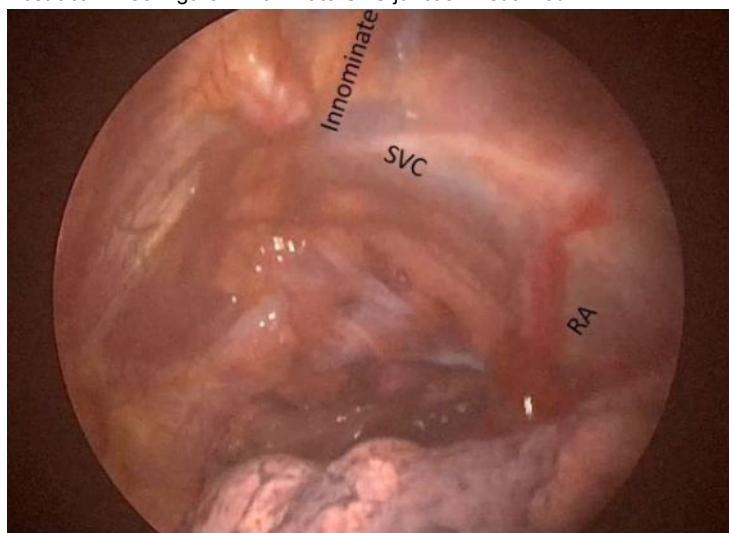
Purpose: We report our recent experience using thoracoscopic surveillance during high-risk extraction procedures.

Methods: The patient is positioned in supine position, selective lung intubation is performed and a TEE probe is introduced. The neck down to the groins is sterilely covered and femoral venous access is established for possible balloon occlusion of the SVC. Next, a right mini thoracotomy is performed while the pocket and leads are dissected. Extraction sheaths are only introduced once the innominate-SVC junction is visualized [3].

Results: A total of 10 leads were extracted in five uneventful procedures (patients aged 31 to 77). 3 procedures were performed for infection and 2 for lead malfunction. Median lead age was 10 years (range 8 to 15). In all cases the addition of thoracoscopy was well tolerated, associated with no complication and did not prolong neither the operative time nor the duration of hospitalization. In one case asystole and hypotension were visually confirmed to be associated with inflow occlusion due to traction on the right atrium rather than bleeding - emergent mid-sternotomy was avoided. In long term follow up 4/5 patients are alive and doing well. One patient succumbed to rapid VT 3 weeks after discharge.

Conclusions: Thoracoscopic monitoring during complex lead extraction may eliminate bleeding as the cause of major hemodynamic shifts and may also allow for rapid intervention if necessary. It enhances both patient safety and confidence of the operating cardiologist, thereby improving the chances of performing a successful and uneventful extraction. Further large scale studies are warranted.

Abstract P1188 Figure. Innominate-SVC junction visualized



Subject: Poster session 2 -- Device Complications and Lead Extraction

P1189

10-year performance of Durata versus Riata implantable cardioverter defibrillator leads in clinical practice

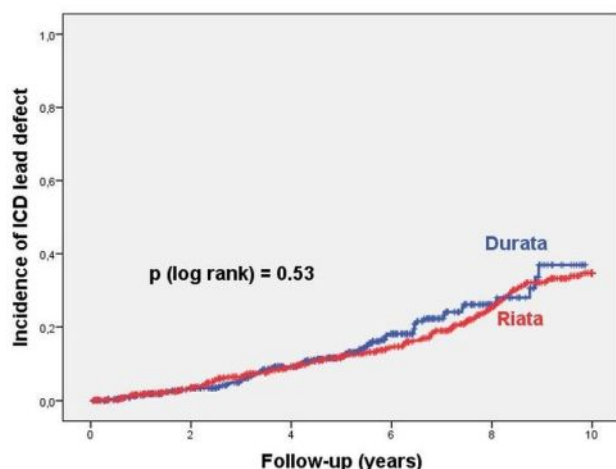
Kleemann T.; Nonnenmacher F.; Strauss M.; Kouraki K.; Werner N.; Zahn R.

Medizinische Klinik B, Klinikum Ludwigshafen, Ludwigshafen, Germany

Background: Data on long-term durability of Durata implantable cardioverter defibrillator (ICD) leads compared to Riata leads in clinical practice are missing. **Objectives:** Aim of the study was to analyze the long-term performance of the Durata ICD leads compared to the Riata ICD leads in clinical practice. **Methods:** A total of 1088 consecutive patients of a prospective single-centre ICD-registry were analyzed who underwent ICD implantation with a Durata (n = 506) or Riata (n = 582) ICD lead between 2002 and 2012. Only suspected or visible structural lead failure was considered as lead failure. **Results:** The estimated lead defect rates after 5 and 10 years were not different between the Durata and Riata leads (12% and 37% respectively 12% and 35%, p = n.s.). Riata leads more often had an insulation failure (79% versus 57%, p = 0.001), whereas lead fracture was more often present in Durata leads (43% versus 21%, p = 0.001). One third of patients in both groups had a radiological compression of the lead in the clavicular region whereas lead defect due to externalization was a rare cause of lead defect in Riata leads (2%). Durata leads with a DF-4 connector had a lower incidence of lead defects than Durata leads with a DF-1 connector (p = 0.007).

Conclusion: The lead defect rate of Durata leads after 10 years was similar to that of Riata leads. Externalization is a rare cause of lead failure whereas compression of the lead in the clavicular region and type of lead connector play an important role in the mechanism of lead failure.

Abstract P1189 Figure 1



Subject: Poster session 2 -- Device Complications and Lead Extraction

P1190

Lead-related complications in patients undergoing ICD/CRT-D upgrade in real life practice: the DECODE registry experience

Biffi M.¹; Ammendola E.²; Menardi E.³; De Filippo P.⁴; Manzo M.⁵; Stabile G.⁶; Potenza D.⁷; Iori M.⁸; Ziacchi M.¹; Sabbatani P.⁹; Zaca" V.¹⁰; Boggian G.¹¹; Viviani E.¹²; Malacrida M.¹²; Zanon F.¹³

¹University Hospital Policlinic S. Orsola-Malpighi, Bologna, Italy

²Second University of Naples, Naples, Italy

³Santa Croce E Carle Hospital, Cuneo, Italy

⁴Ospedale Papa Giovanni XXIII, Bergamo, Italy

⁵AOU S. Giovanni e Ruggi, Salerno, Italy

⁶Clinica Mediterranea, Naples, Italy

⁷Casa Sollievo della Sofferenza, San Giovanni Rotondo (FG), Italy

⁸Santa Maria Nuova Hospital, Reggio Emilia, Italy

⁹Ospedale M. Bufalini, Cesena, Italy

¹⁰Polyclinic Santa Maria alle Scotte, Siena, Italy

¹¹Hospital of Bentivoglio, Bologna, Italy

¹²Boston Scientific, Milan, Italy

¹³Ospedale S.Maria Della Misericordia, Rovigo, Italy

Funding Acknowledgements: No external funding was obtained for this project

Background: Complications threaten lead addition while upgrading ICD/CRT-Ds, as learnt by the REPLACE registry experience.

Purpose: We aimed at understanding the extent and the mechanism of lead-related adverse events (AEs) in a contemporary cohort of ICD/CRT-D upgrade recipients in a large real-world population.

Methods: Detect long-term complications after ICD replacement (DECODE) was a prospective, single-arm, multicenter cohort study aimed at estimating medium-to long-term complications in 983 consecutive patients who underwent ICD/CRT-D replacement/upgrade from 2013 to 2015. We prospectively analyzed all clinical and device-related data of these patients at 12-month follow-up. In this work we analyzed the reason for ICD/CRT-D upgrade, the occurrence and mechanism of lead related AEs at 12 months follow-up.

Results: We analyzed 179 consecutive patients who underwent device upgrade (median age 70 years, 78% male, 57% ischemic, 25% CRT-D): 84(47%) due to lead failure, 85 (47.5%) for clinical reasons, and 10 (5.5%) for clinical reasons plus lead failure. Lead failure was more common in CRT-D recipients (44/460, 9.5%) than in ICD recipients (40/523, 7.6%). In 40 ICD recipients, RV coil failure was the most common cause of lead addition (38/40 patients, 95%), atrial lead failure occurring in 2 (5%). In 44 CRT-D recipients, lead failure was reported for the RV lead in 25/44 (56.8%), LV lead in 20/44 (45%), and atrial lead in 1/44 (2.2%). Loss of RV sensing occurred in 100% of RV lead failures, while loss of LV capture occurred in 90% of LV lead failures. Sensing issues for RA lead were present in 3 cases. The lead addition procedure was burdened by AEs in 22/179 patients (12.2%), specifically 9/44 (20%) CRTD and 13/135 (9.6%) ICD. AEs occurred in 12/70 (17%) patients with RV lead failure (12 required repeated surgery), in 13/103 (12.6%) patients with LV lead procedures (8 required repeated surgery), and in none of the 12 patients with atrial lead procedures.

Conclusions: RV lead loss of function is the leading cause of ICD/CRT-D upgrade due to lead failure. RV lead addition is associated to repeated surgery after upgrading more commonly than LV addition. Technologic development in ICD/CRT-D should focus on electronic recovery of sensing and detection to minimize repeated surgery, that is associated to infection.

P1192

Ultrasound guided axillary vein puncture for cardiac devices implantation, time to re-think the vascular access technique

Slater C.; Camanho LE.; Oliveira Inacio Jr LA.; Carvalho Dias L.; Saad EB.

Hospital Pro Cardiaco, Rio de Janeiro, Brazil

Fundamental: axillary vein puncture is the technique of choice for cardiac lead implantation, because of ease in obtaining vascular access with low need of surgical skills. Regardless of the evolution of cardiac devices technology, vascular access techniques still rely on traditional tools like contrast venography, poor anatomical references and blind puncture. Complications related to vascular access for lead implantation still represent a clinical problem, adding risk to the patient, increasing hospital costs and requiring longer hospitalization.

Ultrasound guided techniques for vascular access are growing among intensive care providers all over the world in order to offer safety to vascular puncture with less complications.

Objective: to demonstrate the safety profile and results after 13 months of a implemented institutional protocol for performing 100% ultrasound-guided vascular puncture in cardiac devices implantations.

Methods: over a period of 13 months, 155 patients (mean 78 ± 14 years, 63% male) were submitted to cardiac devices implantations (106 dual-chamber pacemakers, 6 single-chamber pacemakers, 5 CRT-P's, 1 dual-chamber pacemaker for His bundle pacing, 12 CRT-D's, 13 dual-chamber ICD, 1 single-chamber ICD, 1 lead reimplantation and 10 upgrades for CRT-P). A total of 308 (100%) ultrasound-guided vascular punctures were performed. Techniques used for ultrasound-guided puncture were the transverse "out-of-plane" or the longitudinal "in-plane" approach, at the discretion of the physician experience. All providers used a point of care ultrasound device with a 12MHz linear transducer protected by a sterile cover Kit. All punctures were performed through the skin, before opening the wound, in order to increase image quality at the moment of the puncture.

Results: successful punctures were performed in 304 attempts (98.7% - 153 patients). In two patients (4 puncture attempts) there was no progression of guidewire due to complete obstruction at the level of left brachiocephalic vein. In these cases, right axillary vein implantation under ultrasound guidance was performed uneventfully. There were no pulmonary complications (pneumothorax or hemothorax) in this sample. There was one axillary artery accidental puncture (0.32%), during the learning curve. Local compression was effective with no further complications.

Conclusion: ultrasound-guided axillary vein puncture technique provides safety in vascular access for lead implantation, avoiding the use of contrast venography and pulmonary complications. Acquisition of the learning curve is fast, especially in centers with a large number of procedures.

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1193

Factors associated with presence of ghosts after lead extraction

Lorenzetti S.; Massaro G.; Frisoni J.; Martignani C.; Ziacchi M.; Angeletti A.; Statuto G.; Marinelli V.; Sanguettoni F.; Biffi M.; Diemberger I.

Institute of Cardiology University of Bologna, Bologna, Italy

Funding Acknowledgements: No funding

Background: Presence of ghosts at echocardiography is a relatively common finding after transvenous lead extraction (TLE) for cardiac implantable electrical device infection (CIEDI). Ghosts are defined as tubular, mobile masses, following the previous lead intracardiac route in the right-sided heart chambers, not related to valvular infective endocarditis and/or subvalvular apparatus. Their presence is associated with poor long term prognosis.

Purpose: We explored the possible predictors of ghosts after TLE considering pre-TLE data.

Methods: We performed a single center prospective observational study in a population of consecutive patients referred for TLE to a teaching hospital for the treatment of CIEDI.

Results: We enrolled 121 patients, 84.3% males, aged 70.6 ± 13.2 years. 222 leads were targeted for TLE. In 73/121 patients a powered sheath was required, mainly laser sheath. Complete radiological success was obtained in all but 5 leads, 3/5 with partial radiological success. Clinical success was assumed in 119/121 patients with 2 subjects experiencing a major complication secondary to a vascular tear promptly repaired by cardiac surgeon. 3 patients developed post-TLE pocket haematoma, and 1 patient had clinical thrombosis of the subclavian vein managed conservatively. 18 patients presented a ghost at post-TLE echocardiography, which was associated with a worse long-term prognosis in terms of death or re-infection (HR 3.975, 95%CI 1.651-9.568; $p = 0.002$). Table 1 reports clinical characteristics associated with presence of ghosts.

Conclusions: Extraction of an implantable defibrillator and presence of systemic involvement of CIEDI, according to the Duke criteria, are independent predictors of post-TLE ghosts. Presence of ghosts is associated with worse long-term prognosis.

Table 1

Univariate analysis				
Heart failure	0.027	1.671	1.062	2.631
ICD	0.019	4.717	1.288	17.281
Lead procedure	0.012	4.511	1.390	14.643
Closed device pocket	0.006	4.437	1.530	12.874
Duke criteria	<0.001	7.581	3.084	18.635
Positive blood cultures	<0.001	17.845	3.834	83.060
Multivariate analysis				
Duke criteria	<0.001	8.950	3.413	23.470
ICD	0.007	7.910	1.758	35.602

ICD, implantable defibrillator.

Subject: Poster session 2 -- Device Complications and Lead Extraction

P1194

One year survival after transvenous lead extraction in patients with lead-associated endocarditis: the importance of pocket involvement.

Diemberger I.¹; Massaro G.¹; Frisoni J.¹; Bonfiglioli R.²; Mei R.²; Lorenzetti S.¹; Angeletti A.¹; Statuto G.¹; Marinelli V.¹; Sanguettoni F.³; Ziacchi M.¹; Martignani C.¹; Biffi M.¹

¹Institute of Cardiology University of Bologna, Bologna, Italy

²University Hospital Policlinic S. Orsola-Malpighi, Bologna, Italy

³Sant'Ambrogio Clinical Institute, Milan, Italy

Funding Acknowledgements: No funding

Background: Cardiac implantable electronic device infections (CIEDI) represent a life-threatening condition with a poor prognosis even after transvenous lead extraction (TLE). The aim of this study was to find the predictors of poor prognosis after TLE according to the presence of lead-associated endocarditis (LAE).

Methods: We performed a single center prospective observational study in a population of consecutive patients referred for TLE to a tertiary hospital for the treatment of CIEDI.

Results: We enrolled 105 consecutive patients with confirmed CIEDI, 81% male, aged 72.7 ± 11.1 years. LAE was observed in 49 patients and device pocket involvement in 81. 24/49 of the patients with LAE were free from pocket involvement (both at inspection and at FDG-PET). Comparing baseline characteristics, LAE free from pocket involvement more frequently occurred after first implant (54% vs. 24%, $p = 0.030$) and >6 months after last device procedure (88% vs. 48%; $p = 0.003$), without other significant differences in terms of implanted hardware or comorbidities. TLE was performed in all the patients, requiring powered sheaths in 64/105, 2 subjects experienced a major complication secondary to a vascular tear promptly repaired by the cardiac surgeon who also completed lead extraction. One year mortality was significantly higher in patients with LAE without pocket involvement, while survival was almost superimposable between patients with pocket CIEDI and patients with LAE and pocket involvement (see Figure 1).

Conclusion: Patients with LAE without device pocket involvement usually develop CIEDI >6 months after first device implant. This subgroup of patients require better characterization in view of the bad prognosis despite complete TLE.

Abstract P1194 Figure 1

