PHENOTYPIC PROFILING TO DETERMINE INDIVIDUALS AT RISK FOR ATRIAL FIBRILLATION: A LATENT CLASS CLUSTERING ANALYSIS OF THE PREVEND COHORT

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Introduction: The clinical and pathological heterogeneity variety of risk factors predisposing to AF is large. Better understanding of the phenotypic heterogeneity of those at risk for AF may allow better risk prediction. Latent class clustering analyses may allow the identification of clusters of individuals that share similar risk factors (specific profile), instead of the traditional analyses of specific risk factors of AF.

Methods: We determined the risk of AF using a hypothesis-free, latent class clustering approach, and compared the performance with a traditional risk-factor-based AF prediction model in the community-based PREVEND cohort.

Results: The mean age of the 8,265 individuals was 49 ± 13 years, and 49.8% were men. During 10-year follow-up, 2,419 (29%) individuals developed AF. We build a latent class model based on uncorrelated risk factors (Figure). The model with 6 distinct classes gave the optimum tradeoff between a high statistical likelihood and a low number of model parameters. The smallest class included 347, the largest 2,590 individuals. All clusters had a specific profile (Figure). The incidence of AF varied, being 0.7% (class 1), 1.9% (class 2), 1.4% (class 3), 7.0% (class 4), 4.6% (class 5), and 15.0% (class 6). Logrank p < 0.001. Internal validation was done with parametric bootstrapping. The discrimination (C-statistics 0.605 vs 0.817, deltamc 0.012, p=0.18) and reclassification (IDI -0.013, p=0.008, NRI -0.013, p=0.73, and categoryless NRI -0.081, p=0.22) performance of the cluster-based model was comparable to the traditional risk-factor-based AF model.

Conclusion: Despite the heterogeneity between individuals at risk for AF, latent class clustering produces mutually exclusive groups of individuals with AF risk factors, and is feasible and clinically valid.

Figure

PREDICTION OF ATRIAL ARRHYTHRMIAS AFTER TRANSCATHETER CLOSURE OF ATRIAL SEPTAL DEFECT

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Purpose: Atrial arrhythmia is a well-known long-term complication of atrial septal defects (ASD) in adults even after transcatheter closure. However, the predictors of occurrence of atrial arrhythmia are still unclear.

Methods: We investigated 571 consecutive patients with ASD undergoing transcatheter closure from Jan. 2000 to Mar. 2014. Atrial arrhythmia was defined as atrial fibrillation (AF) and flutter (AFL), atrial tachardia, and supraventricular tachycardia and it was assessed using 12-lead electrocardiogram or 24 hours ambulatory Holter monitors. Demographic, clinical, and electrocardiographic and echocardiographic data were analyzed to predict occurrence of atrial arrhythmia after ASD closure.

Results: The median age at ASD closure was 37 years (interquartile range: 13-44 years), and 404 (70.8%) were female. Before the index procedure, atrial arrhythmia was documented in 260 (46%) patients and the incidence was increased with age (p < 0.01). During the follow-up period (median: 1.3 years, interquartile range: 0.5-3.4 years), a total of 18 (3.2%) patients have developed new onset of atrial arrhythmia. The incidence of new onset atrial arrhythmia, however, was insignificantly different among the ages (p = 0.08). In multivariate analysis, transient AF/AFL during closure may be predictive factors of occurrence of atrial arrhythmia.

Conclusion: No-remodeling 5,180 (2,844-9,434) 0.026
AF 1.976 (1.143-3.416) <0.0015
No-remodeling 5,180 (2,844-9,434) <0.0015
AF: Atrial fibrillation

CLINICAL RESPONSE PREDICTORS IN PATIENTS UNDERGOING CARDIAC RESYNCHRONIZATION THERAPY (CRT): 7 YEARS FOLLOW UP

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Introduction: Although results of large clinical trials support the role of Cardiac Resynchronization Therapy (CRT) as an important therapeutic option in heart failure (HF), 30% of individual patients do not improve clinically after CRT. Aim: To evaluate the factors associated with the clinical outcome of patients undergoing CRT (survival, cardiac remodeling, responders rate).

Methods: The study population consisted of 216 patients (75% men, mean age 69 ± 8 years). The underlying etiology of cardiomyopathy was ischaemic in 45% of patients. Upgrade 44 patients (20%). Definition of remodeling: LVEF improvement 5% or left ventricular end-systolic diameter (LVESD) reduction ≥10mm. Definition of non responder: Absence of improvement of NYHA functional class, hospitalization due to heart failure or death. Results: 46 patients (21%) died during follow up. 85 patients (40%) were hospitalized due to decompensated heart failure. 70% patients had a gradient of ejection fraction (HF) ≥5% and 36% a reduction of the gradient of LVESD. The survival have the electrode in lateral position (p = 0.021) and 127 patients had atrial fibrillation with a duration of QRS about 156ms (129-190).

Conclusions: The patients with atrial fibrillation, broader QRS and non-remodeling were associated to a higher mortality. A lower basal LVEF and the coexistence of coronary artery disease were not associated to a worse prognosis.
INVESTIGATION OF THE FREQUENCY OF SPONTANEOUS ECHO CONTRAST AND THE PREDICTORS OF LEFT ATRIAL APPENDAGE SLUDGE OR THROMBUS FORMATION IN PATIENTS WITH ATRIAL FIBRILLATION/FLUTTER

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Purpose: Recently it is thought that left atrial appendage (LAA) sludge as well as thrombus causes thromboembolic events. The aim of this study was to estimate the frequency of spontaneous echo contrast (SEC) by transesophageal echocardiography (TEE) and to investigate the predictors of sludge or thrombus in patients with atrial fibrillation and/or flutter (AF/AFL).

Methods: One hundred nine patients with AF/AFL who underwent TEE before pulmonary vein isolation (PVI) or electrical cardioversion for exclusion of LAA sludge or thrombus between January 2010 and December 2014 were retrospectively analyzed. Anticoagulant therapy was continued over one month before clinical examination. SEC was defined as dynamic, swirling and smoke-like echoes with optical gain setting during cardiac cycle, and sludge as dynamic gelatinous, precipitous echo-density without a discrete mass at LAA and main cavity during cardiac cycle (grade 3 or 4).

Results: Mean age was 61 ± 10 years and male was 86 (78.9%). Paroxysmal AF was 64 patients (58.7%), persistent AF was 37 (33.9%) and AFL was 8 (7.3%). Fifty patients (45.9%) were prescribed warfarin. SEC was indicated in 14 patients (12.8%), and LAA sludge was in 4 in (3.7%). No LAA thrombus was documented. CHA2DS2-VASc score of 4 patients with sludge was 0, 2, 3, and 5, respectively. LAA emptying velocity was reduced in SEC group than non-SEC group (29.1 ± 14.6 cm/s vs 44 ± 18.6 cm/s, p<0.004). The SEC group was significantly different from non-SEC group as follows, 1)higher serum BMP level (174.0 ± 100.9 pg/ml vs 83.1 ± 105.9 pg/ml, p<0.001), 2)higher serum high-resolution CRP level (0.48 ± 0.66 mg/dl vs 0.13 ± 0.27 mg/dl, p<0.002), 3)higher serum fibrinogen level (292.7 ± 180.7 mg/dl vs 140.4 ± 118.7 mg/dl, p<0.040), 4)fewer patients with paroxysmal AF (6.3% vs 22.2%, p<0.01), and 7)poorly LAA contrast enhancement on acute phase by ECG gated multidetector computed tomography (5.8% ± 5.6%, p<0.01). The LAA morphology and CHA2DS2-VASc score were no significant differences. Among 14 patients with SEC, the patients with sludge were enlarged left atrial volume index (107.1 ± 93.3 ml/m² vs 84.3 ± 7.7 ml/m², p<0.01) and all were used novel oral anticoagulants.

Conclusion: TEE should undergo for investigation of sludge and thrombus in LAA when SEC was suspected in patients with AF/AFL before PVI or electrical cardioversion. The LAA sludge could not be excluded in spite of CHA2DS2-VASc score of 0.

CARDIOVASCULAR INTERCONNECTIONS DEPENDING ON CYSTATIN C IN CHF PATIENTS WITH PERMANENT ATRIAL FIBRILLATION

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Aim: To estimate interconnections between cardiac remodeling and arterial wall parameters depending on renal filtration function according to Cystatin C in ischemic CHF patients with permanent atrial fibrillation.

Methods and Materials: 60 ischemic CHF and permanent AF patients were examined. Average age was 57.02 ± 5.07 yrs. Average PAC of stable angina was 2.31 ± 0.88, average CHF FC was 2.61 ± 0.26. Sphygmoangiography using Vixia VS-1000 (Fucuda, Japan) was performed to evaluate shock-absorbing and conductive functions of arterial wall. To evaluate systolic function LV EF (Sympossion) was estimated using echocardiography. Tissue Doppler imaging of mitral valve annular velocity during passive filling at the septal (septal e’c) and lateral (lateral e’) mitral annulus was used to estimate diastolic function. To evaluate collagen matrix stat-TIMP-1 was analysed. All patients were divided into 2 groups based on cystatin C level. The 1st group included 25 patients with normal cystatin C level (average mean 783.2 ± 86.5 ng/ml). The 2nd group consisted of 35 patients with elevated cystatin C (average mean 2160.7 ± 223.4 ng/ml), (p<0.001).

Results: Carotid-femoral pulse wave velocity (PWVcf) appeared to be significantly higher in the patients of the 1st group that is 11.07 ± 7.06 m/s compared to the patients of the 1st group that is 5.84 ± 2.51 m/s (p<0.01). Between the groups significant differences in terms of CAVI1 (p<0.028) were detected. The patients of the 1st and of the 2nd groups differed significantly in terms of aorta and carotid PWV: 6.72 ± 3.02 vs 9.33 ± 2.87 m/s (p<0.031) and 0.51 ± 0.18 vs 0.72 ± 0.49 m/sec (p<0.023) respectively. LVMVI and LV EF did not differ reliably between the groups (p=0.076 and p<0.125). Septal e’c’ appeared reliably higher in 2nd group and consisted for 9.24 ± 2.19 cm/sec; N 11.06 ± 3.02 cm/sec (p<0.013), as well as Lateral e’c’ 0.97 ± 2.14 cm/sec and 11.30 ± 1.93 cm/sec, respectively (p<0.005). Mean consisted of 9.37 ± 2.05 cm/sec in 1st and 11.04 ± 2.08 cm/sec in 2nd group (p<0.003). Ratio E/e’c’ appeared reliably higher in 2nd group than in 1st, p<0.001. Also, reliable direct correlations between cystatin C and TMDP1 (r=0.67, p<0.046), cystatin C and CAVI (r=0.76, p<0.032), cystatin C and PWVcf (r=0.56, p<0.002), cystatin C and Septal e’c’ (r=0.53, p<0.011) were revealed.

Conclusions: In ischemic CHF patients with permanent AF there is an elevation of stiffness of cardiovascular contour, which is showed in disorder of myocardial relaxation and increase in arterial wall stiffness and decrease of its elasticity along with decrease of renal filtration function by Cystatin C.

ASSOCIATION BETWEEN RED BLOOD CELL DISTRIBUTION WIDTH AND POSTOPERATIVE ATRIAL FIBRILLATION AFTER CARDIAC SURGERY: A PROSPECTIVE OBSERVATIONAL STUDY

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Purpose: Postoperative atrial fibrillation (POAF) is the most common complication after cardiac surgery with a significant impact on morbidity and mortality. Red blood cell distribution width (RDW) may reflect inflammation and oxidative stress and has been associated with cardiac surgery and seem to be a useful prognostic index in this setting.

Methods: Forty four patients (44.4%) patients developed POAF. The multivariate logistic regression analysis with RDW and other parameters revealed that the independent predictor of POAF (OR: 1.46; 95% CI: 1.076-1.994, p=0.015). The ROC curve analysis showed that the area under the curve was 0.70 (p=0.001).

Results: RDW cut-off point of 13.35 was related to POAF with a sensitivity of 80% and a specificity of 60%.

Conclusions: Baseline RDW levels are associated with the occurrence of POAF after elective cardiac surgery and seem to be a useful prognostic index in this setting.

NO EFFICACY OF ANTIARRHYTHMIC DRUGS DURING THE FIRST 3-MONTHS AFTER PULMONARY VEIN ISOLATION IN PATIENTS WITH PAROXYSMAL ATRIAL FIBRILLATION


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Background: Pulmonary vein isolation (PVI) is an effective treatment for patients with paroxysmal atrial fibrillation (PAF). Several studies, however, reported that patient with early atrial fibrillation recurrence (EARF) showed the first 3-months after PVI had a higher rate of late AF recurrence (LAFR) than those without EARF. The efficacy of antifibrhythmic drugs (AADs) during blanking period (the first 3-months after PVI) for prevention of LAFR recurrence is unknown in patients undergoing PVI.

Methods and Results: A total of 208 patients with PAF (151 males, age 65 ± 11 years, mean follow-up 279 ± 279 days) underwent their first PVI of AF in our institute. Eleven patients had congenital heart disease, 12 patients valve disease, 8 patients hypertrophic cardiomyopathy, 10 patients ischaemic disease, and one patient dilated cardiology. We investigated the efficacy of AAD for AF prevention in patients with EARF (98 patients, 66 with EARF [classified 32, class 34]) and those without EARF (109 patients, 47 with AAD [classified 20, class 27]). There are no significant differences between patients with and without EARF in left atrial dimension (40 ± 6.5 vs 39 ± 6.3 mm, respectively, p=0.25) and left ventricular ejection fraction (58 ± 7 vs 58 ± 7 %, respectively, p=0.001). Figure shows the freedom rate from LAFR in each patient population. There was no significant difference in LAFR between patients with and without AAD in each patient population. There was no significant difference in AF recurrence rate between two AADs in each patient population.

Conclusions: AADs do not show clinical significance for AF prevention regardless of EARF after PVI.
IS CHA2DS2-VASc SCORE PREDICTIVE OF LONG-TERM OUTCOME OF CATHETER ABLATION OF ATRIAL FIBRILLATION EVALUATED WITH IMPLANTABLE ECG LOOP RECORDER?


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Catheter ablation of atrial fibrillation (CAAF) is an effective interventional therapy for highly symptomatic patients with paroxysmal / persistent AF.

This prospective study aimed to analyse the predictive value of CHA2DS2-VASc score on the outcome of CAAF. The outcome of the intervention was evaluated by means of an implantable ECG loop recorder and expressed as the overall amount of time spent in AF.

Patients and Methods: We retrospectively analysed 133 patients (108 males - 83%, mean age 45 ± 9 years with paroxysmal/persistent AF who underwent CA AF during 2005-2015 and were monitored with an implantable ECG loop recorder (REVEAL XL, Medtronic, Inc., USA). Complete pulmonary vein isolation was the endpoint of all procedures. The initial 3 month past AF were not included in the ECG follow-up (blinding period).

Results: Mean overall AF burden prior to CA AF was 21.7 ± 17.9%. During the 12-15 months follow-up after CAAF it decreased to 5.1 ± 12.5% (p < 0.01). The maximum statistically significant AF burden reduction was observed 9 month after CAAF. The achieved reduction of AF burden was not related to the value of pre-ablation CHA2DS2-VASc score.

Conclusions: Accumulation of risk factors as expressed in the CHA2DS2-VASc score reflects overall cardiovascular morbidity of the patient. Our analysis suggests that higher levels of baseline morbidity are expressed by higher CHA2DS2-VASc score are not predictive of reduced efficacy of catheter ablation of paroxysmal / persistent AF.

Temporary nonfluoroscopic atrial fibrillation ablation approach. Single centre experience

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Purpose: To compare safety and effectiveness of routine fluoroscopic and nonfluoroscopic approach of catheter ablation of atrial fibrillation (AF).

Method: totally nonfluoroscopic approach for atrial fibrillation ablation was developed in our center. 3D navigation system and catheter with contact force control capabilities were utilized for these purposes. Intracardiac echo (ICE) was used to visualize anatomy of the heart and catheters inside the cardiac chambers. Double transseptal punctures for Lasso guided ablation for these purposes. Intracardiac echo (ICE) was used to visualize anatomy of the heart and catheters inside the cardiac chambers. Double transseptal punctures for Lasso guided ablation for these purposes. Intracardiac echo (ICE) was used to visualize anatomy of the heart and catheters inside the cardiac chambers.

Results: A total of 80 patients (48 men, mean age 60 years, 44 patients with paroxysmal AF) were equally randomized into both groups. Clinical parameters between both groups were similar. Procedural parameters and 6-months follow-up data (from 52 patients so far) can be derived from table.

Conclusions: Radiation exposure can be significantly reduced to a minimum by using the novel NFST technology in addition to standard AF ablation technologies, without negative consequences on procedure duration, complication rate, or clinical outcome. Abandonment of additional fluoroscopy use allowing for working without lead protections following transseptal puncture is possible.

NON-FLUOROSCOPIC SENSOR-BASED CATHETER NAVIGATION IN ABLATION OF ATRIAL FIBRILLATION: A RANDOMIZED COMPARISON WITH ELECTROANATOMIC STANDARD PROCEDURES

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Purpose: A novel platform for nonfluoroscopic sensor tracking (NFST) within precordial x-ray loops has been introduced. Its application in the context of catheter ablation of atrial fibrillation (AF) indicated significant potential for reduction of fluoroscopy. Randomized comparisons with established electrophysiological technologies are lacking.

Patients: Methods: Patients with AF were randomized into two groups before scheduled radiofrequency ablation: (1) catheter navigation using NFST together with established mapping systems and fluoroscopy alone, (2) control group with standard electroanatomic mapping system and fluoroscopy alone. Procedures were performed in the same lab by 2 experienced operators altogether. Moreover, the same strategies (circumferential pulmonary vein isolated followed by voltage mapping ± targeted substrate modification) and ablation catheters were applied.

Results: A total of 80 patients (48 men, mean age 60 years, 44 patients with paroxysmal AF) were equally randomized into both groups. Clinical parameters between both groups were similar. Procedural parameters and 6-months follow-up data (from 52 patients so far) can be derived from table.

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TOTALLY NONFLUOROSCOPIC ATRIAL FIBRILLATION ABLATION APPROACH. SINGLE CENTRE EXPERIENCE

E. Krupopkin, and E. A. Ivanitsky

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Purpose: To compare safety and effectiveness of routine fluoroscopic and nonfluoroscopic approach of catheter ablation of atrial fibrillation (AF).

Method: totally nonfluoroscopic approach for atrial fibrillation ablation was developed in our center. 3D navigation system and catheter with contact force control capabilities were utilized for these purposes. Intracardiac echo (ICE) was used to visualize anatomy of the heart and catheters inside the cardiac chambers. Double transseptal punctures for Lasso guided ablation were performed under ICE control. Ablation parameters were the same for both groups (430, 290, 60 sec. per point).

We prospectively enrolled 230 patients who were randomized into two groups: 113 - to nonfluoroscopic approach and 113 - to nonfluoroscopic approach. The outcome of the intervention was evaluated by means of an implantable ECG loop recorder and expressed as the overall amount of time spent in AF.

Patients and Methods: We prospectively enrolled 230 patients who were randomized into two groups: 113 - to nonfluoroscopic approach and 113 - to nonfluoroscopic approach. The outcome of the intervention was evaluated by means of an implantable ECG loop recorder and expressed as the overall amount of time spent in AF.

Results: Mean overall AF burden prior to CA AF was 21.7 ± 17.9%. During the 12-15 months follow-up after CAAF it decreased to 5.1 ± 12.5% (p < 0.01). The maximal statistically significant AF burden reduction was observed 9 month after CAAF. The achieved reduction of AF burden was not related to the value of pre-ablation CHA2DS2-VASc score.

Conclusions: Accumulation of risk factors as expressed in the CHA2DS2-VASc score reflects overall cardiovascular morbidity of the patient. Our analysis suggests that higher levels of baseline morbidity are expressed by higher CHA2DS2-VASc score are not predictive of reduced efficacy of catheter ablation of paroxysmal / persistent AF.

DECREASE IN ASYMPTOMATIC CEREBRAL LESIONS DURING LEFT ATRIAL ABLATION DUE TO IMPROVED WORKFLOW: A SINGLE CENTER COMPARISON

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Aims: Left atrial radiofrequency ablation during pulmonary vein isolation (PVI) has been associated with an increased risk of asymptomatic cerebral lesions. Uninterrupted anticoagulation (OAC) alone during procedures has not been able to completely prevent cerebral embolism. We compared silent cerebral lesions in a group with an improved workflow during PVI ("new protocol") to standard ablation ("standard"). For both groups uninterrupted OAC was obligatory. Cerebral lesions were assessed by pre- and post-procedural magnetic resonance imaging (MRI).

Methods and results: A total of 220 consecutive patients (110 each) with catheter ablation for paroxysmal or persistent atrial fibrillation were included.

In standard procedures two initial boluses of i.v. unfractionated heparin (UFH) were administered: A first "small" bolus of 3.000 – 5.000 IU before transseptal puncture (TSP), and a second bolus to add up to 3.000 – 5.000 IU before transseptal puncture and isolation of the atrial appendages. In standard procedures two initial boluses of i.v. unfractionated heparin (UFH) were administered: A first "small" bolus of 3.000 – 5.000 IU before transseptal puncture (TSP), and a second bolus to add up to 3.000 – 5.000 IU before transseptal puncture and isolation of the atrial appendages.

Results: A total of 80 patients (48 men, mean age 60 years, 44 patients with paroxysmal AF) were equally randomized into both groups. Clinical parameters between both groups were similar. Procedural parameters and 6-months follow-up data (from 52 patients so far) can be derived from table.

Conclusions: Radiation exposure can be significantly reduced to a minimum by using the novel NFST technology in addition to standard AF ablation technologies, without negative consequences on procedure duration, complication rate, or clinical outcome. Abandonment of additional fluoroscopy use allowing for working without lead protections following transseptal puncture is possible.

Fig 1
STIFFENING OF THE LEFT ATRIUM IMMEDIATELY AFTER PULMONARY VEIN ISOLATION

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Introduction: The stiff left atrial (LA) syndrome is defined as symptomatic pulmonary hyper-tension secondary to reduced LA compliance and has recently been recognized as a complication of pulmonary vein isolation (PVI) for atrial fibrillation (AF). We investigated acute changes in LA stiffness immediately after PVI.

Methods: Sixteen patients (5 female, age 68±9 years) undergoing their first PVI for paroxysmal AF were included. Transthoracic echocardiography was carried out immediately before and after creation of wide, circumferential PVIs using irrigated, point-by-point radiofre- quency ablation. Peak atrial longitudinal strain (PALS) and peak atrial contraction strain (PACS) of the LA, along with left ventricular diastolic function was assessed simultaneously with invasive LA pressure recording. Reservoir phase LA stiffness index was calculated as PALS / mean LA pressure.

Results: Peak and mean LA pressure increased from before to immediately after PVI (from 16.6 ± 10.0 to 21.0 ± 9.4 mmHg, p=0.02 and from 6.0 ± 5.5 to 8.2 ± 5.1 mmHg, p=0.05, re- spectively). At the same time LA strain tended to decrease (PALS: from 15.2 ± 4.7 to 13.3 ± 4.3 %, p=0.08, PACS: from 8.3 ± 2.9 to 6.0 ± 2.9 %, p=0.01) and stiffness index increased (from 0.48 ± 0.78 to 0.76 ± 0.90, p=0.02). There was no change in left ventricular diastolic parameters.

Conclusions: Left atrial catheter ablation to achieve PVI results in an immediate increase in LA stiffness, unrelated to left ventricular diastolic function. This may be a harbinger of later stiff LA syndrome.

IMPACT OF ESOPHAGEAL TEMPERATURE MONITORING-GUIDED ABLATION DURING PULMONARY VEIN ISOLATION ON PULMONARY VEIN RECONNECTION

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Purpose: To investigate if esophageal temperature monitoring during pulmonary vein isola- tion, with temperature alerts leading to early termination of radiofrequency (RF) and/or reduc- tion in power, prevents lesion durability and promotes acute and chronic pulmonary vein reconnection (PVR).

Methods: At our institution the luminal esophageal temperature is continuously monitored during all AF ablations using the SeniTherm probe (St Jude Medical). There are 3 thermocou- ples that can be also visualised on the Velocity LA geometry. Any sites that cause a temperature rise of >3°C with premature cessation of RF and/or reduction in power, prevents lesion durability and promotes acute and chronic pulmonary vein reconnection (PVR).

Results: Fifty-four patients underwent redo procedures (36 male, age 68 ± 8, 59% persistent AF). Forty-six PVs (21% of a total of 216 PVs) in 30 patients (56%) had at least one tempera- ture alert during the index procedure. The median length of lesions causing alerts was 21 (16- 26) mm for LPVs and 18 (15-25) mm for RPVs. The distribution of temperature alerts at the initial procedure was LSPV 24%, LIPV 33%, RPSPV 13% and RIPv 31% (p=0.09). Despite the presence of temperature alerts, PV isolation was achieved in all PVs. Acute PVI, requiring further ablation at the index procedure, occurred in 23 PVs in 12 patients. Chronic PVR was seen in 103 PVs from 44 patients at the redo procedure. No correlation was found between tem- perature alerts and acute or chronic PVR in the associated PV (p=0.51 and p=0.27 respectively).

Conclusions: Just over half of patients undergoing PV isolation will have an esophageal tem- perature alert. Reducing power and RF duration does not increase or decrease the incidence of subsequent PV reconnection. Esophageal temperature probe-guided ablation may therefore in- crease safety without compromising ablation efficacy.

EFFECT OF ARRHYTHMIA BURDEN AND ARRHYTHMIA-RELATED EVENTS ON QUALITY OF LIFE IN PATIENTS UNDERGOING ABLATION FOR ATRIAL FIBRILLATION: A SUBSTUDY OF THE AMIO-CAT TRIAL

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Background: Catheter ablation of atrial fibrillation (AF) aims to relieve patients’ symptoms and improve quality of life (QoL). However, the effect of AF burden on QoL is still unresolved. In this substudy of the AMIO-CAT trial, we aimed to investigate the effect of arrhythmia burden and arrhythmia related events on QoL in patients undergoing catheter ablation for AF.

Methods: The AMIO-CAT trial randomised a total of 212 patients undergoing catheter ablation for paroxysmal (n=107) or persistent (n=105) AF to 8 weeks of post ablation oral amiodarone therapy or matched placebo in a double-blind design. Patients were followed for a total of 6 months post ablation. Three-day Holter-monitorings and QoL assessment by Short-Form Health Survey (SF-36) questionnaires were performed prior to ablation and at 6-8 weeks and 6 months post ablation.

Results: Patients with higher percentage of AF burden had lower QoL scores at baseline, at 6-8 weeks and at 6 months post ablation and relative changes in AF burden from baseline were in- versely correlated with changes in QoL scores throughout the study. Patients with AF-related hospitalizations or cardioversions within the 3-months blinding period and patients with docu- mented recurrence at 6-months follow-up had significantly lower QoL compared to those without.

Conclusion: Arrhythmia burden and relative changes in AF burden as measured by Holter monitoring were inversely associated with patients QoL scores. Moreover, arrhythmia-related events during blinding period and documented recurrence at 6-months follow-up were asso- ciated with lower QoL scores. This suggests that not necessarily complete AF-abolishment but even a reduction of arrhythmia burden by catheter ablation will improve QoL in patients with symptomatic paroxysmal or persistent AF.

SPATIAL RELATIONSHIP OF FOCAL IMPULSES, ROTORS AND LOW VOLTAGE ZONES IN PATIENTS WITH PERSISTENT ATRIAL FIBRILLATION

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Introduction: Focal impulses and rotational activity have been related to occurrence and main- tenance of AF and ablation of these sources leads to AF termination and prevention of recur- rence. Atrial low voltage zones (LVZ) representing fibrosis are associated to a higher incidence and higher recurrence rates of AF. The aim of the study was to characterize the rela- tionship between focal and rotational sources of AF and atrial LVZ.

Methods: In patients (pt) with persistent (per) AF, focal impulses and rotors were mapped and ablated. Voltage map of both atria was done during AF (< 0.5 mV regarded as LVZ) using EnSiteTM NavX® (St. Jude). Endocardial source mapping using RhythmViewTM (Topera Inc) followed. Basket catheter was placed in complementary positions in case of insufficient LA or RA covering. Endocardial source domain of RA and LA, size and percentage of LVZ areas in RA and LA and the number and localization of sources were determined.

Results: In the study, 24 pt undergoing their first ablation for per AF (n=24 (25%) long pers, mean age 61 ± 11 years, 17/24 (71%) male) were included. LVZ covered 13 ± 12% of RA endocardial surface and 53 ± 25% of LA endocardial surface.

LA showed 22% (20%) in LA, RA and RVZ. This suggests that targeting focal impulses and rotors may focus on LA and RA areas different from PVI and LVZ.

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CATHETER ABLATION FOR PAROXYSMAL ATRIAL FIBRILLATION IMPROVES SLEEP-DISORDERED BREATHING

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Introduction: Obstructive sleep apnea was shown to be independently associated with an increased risk of atrial fibrillation. We investigated the efficacy of ganglionated plexus (GP) ablation and circumferential pulmonary vein ablation in patients with sleep apnea syndrome (SAS) and paroxysmal atrial fibrillation (AF).

Methods: A total of 25 patients (male/female = 22/3, 68 ± 8 years) with SAS who underwent RFCA for paroxysmal AF were studied. RF was delivered after all GP sites had been identified in the left atrium and after that extensive pulmonary vein isolation was performed in all patients. Polysomnography was also performed 1 day before and three to five days after RFCA to evaluate the effect of RFCA on sleep-disordered breathing in all patients.

Results: RFCA was successfully performed in all patients. Heart rate variability parameters showed significant changes after RFCA (SDNN: baseline 121.3 ± 51.1 ms, after RFCA 94.1 ± 29.8 ms, P < 0.01, rMSSD: baseline 44.2 ± 34.3 ms, after RFCA 22.0 ± 18.0 ms, P = 0.01, HR: baseline 61.7 ± 8.7, after RFCA 68.8 ± 9.6, P < 0.0001). At the same time, the apnea-hypopnea index (AHI) decreased significantly after RFCA (baseline 28.7 ± 13.9, after RFCA 20.7 ± 13.2, P < 0.0001).

Conclusion: RFCA for paroxysmal AF decreased AHI. Neural ablation may contribute to improve sleep-disordered breathing.

LOW VULNERABILITY OF THE RIGHT PHRENIC NERVE FOR ELECTROPORATION ABLATION

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Introduction: Circular irreversible electroporation is a novel, non-thermal ablation modality for pulmonary vein isolation. A single RFH 1 application can create a deep myocardial lesion. Acute and chronic effects of this new energy source on the right phrenic nerve (PN) are unknown.

Methods: Nerve vulnerability to irreversible electroporation was studied in a porcine model. In 20 animals (66-75 kg), the course of the right PN was pacemapped inside the superior caval vein (SCV). In 19 of 20 animals, the PN could be captured along a 6-8 cm trajectory above the right atrial contour. In these animals, a single 200 J circular electroporation ablation was performed via a multipolar circular catheter in firm contact with the SCV wall (Fig. A).

Results: Directly after ablation, the PN could be captured above the ablation level in 17 of 19 animals, and after 3 to 13 weeks and PN functionality was unaffected in all. Histological analysis in 5 animals, in which the application had been delivered in the muscular sleeve just above the right atrium, showed a transmural circular lesion (Fig. B). However, no lesion was found in the other animals, in which the application had been delivered in the fibrous section of the SCV wall. Conclusions: Data of this study suggest that circular electroporation ablation, at a energy level that can create deep myocardial lesions, spares the targeted right phrenic nerve, even when applied within a distance of 1 to 2 mm. The absence of any detectable lesion in the fibrous section of the SCV wall, compared to the muscular sleeve, suggests that connective tissue is not affected by electroporation ablation.
**VISUALIZATION OF ELECTROPHYSIOLOGICALLY DEFINED JUNCTION BETWEEN THE RIGHT ATRIUM AND THE SUPERIOR VENA CAVA**


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**Purpose:** The electrical superior vena cava (SVC) isolation from the right atrium (RA) sometimes can be challenging because of the risks of phrenic nerve injury, SVC sinus and sino node dysfunction. To isolate SVC safely and efficiently, identification of the SVC-RA junction (VRA) is crucial. We aimed to visualize the anatomic position of VRA on the 3D mapping system for determination of procedure (VRA) with atrial fibrillation (AF).

**Methods:** This study consisted of 8 consecutive AF patients (7 males, age 76 ± 6.1 years). A 3D mapping catheter was located on the VRA area during application of single extra- stimuli from the the right atrial appendage (RAA) to determine RA potentials and SVC potentials. The electrophysiological VRA was defined as the most proximal points where the SVC potentials were recorded, which were tagged on the 3D mapping system around the VRA. Radiofrequency (RF) application for SVC isolation was conducted at the SVC earliest activation on the VRA (Figure 1).

**Results:** Around the VRA, 18.5 ± 3.7 points were tagged on the 3D mapping system. The highest and the lowest VRA points were located on anterior wall (0.9 ± 10%; posterior wall (0.9 ± 10%). Difference in level between the highest and the lowest VRA was 17.1 ± 7.5 mm. The successful SVC isolation was obtained in all patients without any complications. The total number of RF applications was 3 ± 1.9 per patient.

**Conclusions:** The plane of electrophysiologically defined VRA was not perpendicular to the body axis, but obliqued. To recognize the precise location of the VRA, it might contribute safe and efficacious SVC isolation.

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**LEFT ATRIAL SIZE IS ONLY ONE PREDICTOR FOR MID-TERM OUTCOME AFTER ABLATION OF ATRIAL FIBRILLATION USING SECOND-GENERATION CRYOBALLOON**


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**Purpose:** Factors predicting outcome after pulmonary vein isolation (PVI) with second-generation cryoballoon (CBA) have not been sufficiently investigated. The aim of this study was to evaluate the impact of several clinical and procedural parameters on outcome after PVI with CBA.

**Methods:** Consecutive patients (pts) admitted in our institution with CBA since May 2012 were enrolled in the study. After a single transseptal access and PV angiography PVI was performed using a 28-mm CBA. Mapping of PV signals before, during, and after each cryo application was performed with a 3F lasso catheter. The procedural endpoint after PVI was defined as complete elimination of all fragmented signals at the PV antrum with verification of entrance and exit block. The primary endpoint of this study was the first documented recurrence of atrial fibrillation (AF), atrial tachycardia, or atrial flutter (> 30 sec.). The impact of variables (gender, age, type of AF, history of AF, hypertension, LVEF, CHA2DS2-VASc-Score, common ostium, left atrial size, intra-procedural cardioversion, nade temperature, number of applications and application time ) was investigated with univariate Cox regression analysis. All pts were followed prospectively with 7-day Holter ECG recordings every three months.

**Results:** The study group consisted of 391 pts with following characteristics: 242 male, paroxysmal AF (PAF) 296 (76.2%), median age (IQR)=60 (53-66)y, LVEF 62 (59-62)%, history of AF 3.51 (9.8-2%), CHA2DS2-VASc-Score 1(2-2), hypertension 262 (67.2%) yrs, left atrial area (LA area) 19.6 (17.4-22.5) cm2. Common ostium was observed in 41 (10.5%) pts. Nadir temperature was 46.0 (45.0-47.0)°C and number of application was 9 (8-10) /pat with application time 220 (190-240) sec. In 53 (13.6%) pts intra-procedural cardioversion was performed to restore sinus rhythm. After a median follow up of 14 (8-21) months the primary endpoint was reached in 50 of 391 pts (12.8%). There was no significant difference in clinical outcome between patients with PAF (258 /296 (87.2%) pts free of recurrences and persistent AF (63 /85) 78.4%), p=743. Among all parameters analyzed only LA area was found to be predictive of outcome. The optimal cut-off point for LA area was defined as 23 cm². Among 310 pts with LA area < 23 cm² recurrences were noted in 33 (10.6%) vs. 17 (21%) in 81 pts with LA area > 23 cm² (p=0.001), HR=2.27 (95% CI: 1.26-4.07).

**Conclusions:** PVI with CBA in patients with persistent AF seems to be as effective as in patients with PAF. LA area was revealed to be only one predictor of outcome after PVI with CBA in our cohort.
LINEAR ABLATION OF BOX ISOLATION WITH BIASTRIAL Isthmus Ablation as an Initial Therapy for the Persistent and Longstanding Persistent Atrial Fibrillation

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Purpose: Ablation strategy has not been established for the persistent atrial fibrillation (PerAF) necessitating some substrate modification as well as pulmonary vein (PV) isolation. Box isolation created by linear lesions which isolated all 4 PVs and left atrial posterior wall simultaneously with or without biastral isthmuses ablation were performed and whether it could affect arrhythmogenic substrate of the PerAF were investigated.

Methods: Subjects consisted of 53 PerAF and longstanding PerAF patients. Before and after making box isolation, 3-dimensional map of complex fractionated atrial electrograms (CFAE) of the left atrium (LA) were created, then internal DC shock was applied to terminate AF. After cavotricuspid isthmus ablation, atrial burst stimulation with pacing interval from 300ms to 1800ms was applied from 3 sites of LA, which was repeated after creation of mitral isthmus ablation.

Results: The box isolation eliminated LA surface area of 62.5 ± 14.3 cm² from 175.9 ± 25.1 cm² and decreased LA CFAE area from 92.4 ± 31.7 cm² to 88.3 ± 23.6 cm², which could not terminate any of AF. AF or atrial tachycardia (AT) was induced in 62.5% of the patients with a mean of 26.1 minutes after each application and at the end of the procedure, also using adenosine. During applications of the right PVs the PN is constantly stimulated and excision of the diaphragm is monitored manually. If no PV can be achieved with the assigned cryotheraph duration of 1.2 and 3 minutes, more and/or longer applications are applied until PV is successfully. This is classified as primary unsuccessful PV.

Conclusions: Box isolation decreased arrhythmogenic substrate and appended mitral isthmus ablation suppressed acute AF. AT induction, resulting sufficient long-term success. Linear ablation approach was feasible and might be a strategy for PerAF and longstanding PerAF.

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LESS THAN TWO MINUTES, SECOND GENERATION CRYOBALLOON APPLICATIONS ACHIEVES ACUTE PVI IN 79% WITHOUT PHRENIC NERVE PALSY: PRELIMINARY RESULTS OF THE 1-2-3 STUDY

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Purpose: In patients with paroxysmal atrial fibrillation (PAF), the second generation cryoballoon (Arctic Front Advance) significantly improves procedural outcome of pulmonary vein isolation (PVI) compared to the first-generation. The aim of the 1-2-3 study is to assess PVI after different freeze time cycles with the second generation cryoballoon.

Methods: This prospective, single blinded study, includes patients with PAF, 4 PVs as assessed using the new circular, irrigated multipolar ablation catheter nMARQTM (Biosense Webster, Calif., USA) with the second generation cryoballoon. The nMARQTM catheter was used for ablation. Vein isolation was confirmed using the LASSO balloon (Arctic Front Advance) significantly improves procedural outcome of pulmonary vein isolation (PVI) compared to the first-generation. The aim of the 1-2-3 study is to assess PVI after different freeze time cycles with the second generation cryoballoon.

Results: Until now 20 patients (age 55 ± 8 years) have been included. All patients were randomized to the 1 minute group, 7 and 6 respectively to the 2- and 3-minute group. In all patients the 28 mm cryoballoon was used. In the 1 minute group 22/28 PVs were primary successful, in the 2 minute group 19/28 and in the 3 minute group 17/24. The mean total application time per cryoapplication, from the start of cryotherapy, was respectively 114 ± 14, 147 ± 42 and 204 ± 50 seconds in the different groups. With additional and/or longer applications, PVI could be achieved in all primary unsuccessful applications. In one patient the right inferior PV could not be isolated due to PNPs after isolation of the right superior PV. In 8/26 right sided PVs in the 2- and 3-minute group, applications had to be terminated prematurely due to loss of PN capture whereas no application had to be terminated untreated in the one minute group. All PNPs were (eventually) transient.

Conclusion: Using the second generation cryoballoon two times 14 ± 4 seconds of cryoapplication achieves 79% PVI without PNPs. These preliminary results indicate that shorter initial cryoapplications might be considered.

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PREDICTIVE VALUE OF ATRIAL REMODELING OF ATRIAL TACHYARRHYTHMIA RECURRENT AFTER CATHETER ABLATION OF ATRIAL FIBRILLATION DURING THE LONG-TERM FOLLOW

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Purpose: Both the left atrial volume index (LAVI) and contrasted total atrial conduction time measured using tissue Doppler imaging of the mitral annulus are echocardiographic parameters reflecting atrial remodeling. The aim of this study was to evaluate their prognostic value for atrial tachyarrhythmia (ATA) recurrence after catheter ablation.

Methods: In the study, we analyzed the data from 129 consecutive patients who underwent preprocedural transesophageal echocardiography in sinus rhythm and RFCA for AF. At a mean of 29 months after RFCA, patients were classified as ATA recurrence or non-recurrence. The patients with ATA recurrences had a larger LAVI (p = 0.014) and longer PA-TDI (p = 0.007) than those without recurrences. Although the predictive accuracy of the LAVI cut-off (16.0 ml/m²) was relatively low (AUC 0.63 and 0.64, respectively), the combined index (LAVI + PA-TDI) had a significantly high predictive accuracy for ATA recurrence (AUC 0.77 and 0.78, respectively).

Conclusion: Atrial remodeling was a useful predictor of recurrence following ablation procedure in patients with AF.

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AF ABLATION WITH THE NEW CIRCULAR, IRRIGATED MULTIPOLAR ABLATION CATHETER nMARQTM CATHETER: A SINGLE CENTER EXPERIENCE

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Background: Pulmonary vein isolation (PVI) is the cornerstone in the treatment of atrial fibrillation (AF). Novel catheters emerge in order to improve outcomes. We report the first 104 cases with the new circular, irrigated multipolar ablation catheter nMARQTM catheter (Biosense Webster, CA, USA).

Methods and Results: This study reports a single center, non-randomized study, which included 104 patients (64 male, mean age 66.3 ± 10.3 years, paroxysmal AF 62.4%) treated with nMARQTM catheter for PVI. Forty percent of the patients had a history of previous interventional PVI and 18.8% underwent prior surgical PVI. After transseptal puncture the nMARQTM catheter was used for ablation. Vein isolation was confirmed using the LASSO catheter. Ablation breakthrough by the use of the nMARQTM catheter was added in persistent AF. The mean follow up was 6.9 ± 4.1 months. Freedom from atrial fibrillation after one single procedure was 67.6% in patients with paroxysmal AF and 41.5% in patients with persistent AF. The mean number of energy applications per patient was 14.9 ± 5.3 and the mean duration was 9 ± 14 sec ± 4 min 12 sec. Complications occurred in 3.7% including air embolism, groin hematoma requiring surgical intervention, AV fistula and esophageal ulcer in one patient each.

Conclusion: In this single center study the use of the nMARQTM catheter led to satisfactory short term success rates for both paroxysmal and persistent AF. The nMARQTM catheter can be used safely.
SUCCESSFUL ENDOSCOPIC SURGICAL ABATION IN PATIENTS WITH PERSISTENT ATRIAL FIBRILLATION IS ASSOCIATED WITH RECOVERY OF ATRIAL TRANSPORT FUNCTION

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Purpose: Minimally invasive surgical treatment of stand-alone atrial fibrillation has gained popularity over the past decade especially in presence of persistent atrial fibrillation. Nevertheless, there is paucity of data about the atrial transport function following successful restoration of sinus rhythm (SR) by means of a totally endoscopic, epicardial box lesion set.

Methods: Among 53 patients with persistent AF scheduled to undergo closed-chest, comprehensive echocardiographic assessment of the left atrial (LA) function was performed either preoperatively (T0) and postoperatively at 6 months (T1) and 12 months (T2), the following parameters were evaluated: LVEF, LA diameter-volume area, LA total — passive and active emptying fraction, A’ wave, deceleration time. Only patients with stable sinus rhythm during the follow-up (n=45) were included in the analysis in order to evaluate the impact of the box lesion set following SR restoration.

Results: There was no considerable difference in the LVEF over the follow-up period (T0=60.9 ± 4.6% vs T1=61.9 ± 4.3% vs T2=62.3 ± 6.2%; p=0.392); however, there was a significant reduction either in terms of LA diameter (T0=88.8 ± 3.9% vs T1=84.2 ± 3.6 mm vs T2=84 ± 6.6 mm; p<0.001), LA area (T0=28.2 ± 3.6 cm² vs T1=24 ± 3.9 cm² vs T2=23 ± 3.2 cm²; p<0.001), LA maximal volume (T0=98.9 ± 6.1 mL vs T1=94.2 ± 8.6 mL vs T2=94.2 ± 18.1 mL; p<0.001), LA minimum volume (T0=73 ± 13 mL vs T1=75.2 ± 14 mL vs T2=43.4 ± 13.8 mL; p<0.001) with a considerable improvement also in deceleration time (T0=165.2 ± 31.5 ms vs T1=190.4 ± 41.2 ms vs T2=208.2 ± 78.4 ms; p=0.004). Moreover, there was a recovery of atrial booster function as demonstrated by an active LA emptying fraction of (T0=0% vs T1=9.2% vs T2=23.9% ± 10%; p=0.001) and a normalisation of A’ value (T0=11.7 ± 2.6 mm T2=11.6 ± 1.8; p<0.001 T1/T2 vs T0).

Conclusions: Following successful surgical ablation with a box lesion set and stable restoration of sinus rhythm, a significant recovery of an effective atrial transport function was already detected at 6 months and maintained over the postoperative follow-up period up to 12 months.

INITIAL EXPERIENCE WITH A NEW IMAGE INTEGRATION MODULE DESIGNED FOR REDUCING RADIATION EXPOSURE DURING ELECTROPHYSIOLOGICAL ABATION PROCEDURES


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Purpose: Reduction of radiation exposure during cardiac arrhythmias ablation procedures is desirable. We sought to evaluate the utility of a new image integration module (CARTOMINI) in reducing fluoroscopy times and dose during left atrial arrhythmia (LA) and ventricular tachycardia (VT) ablation procedures.

Methods: Consecutive patients undergoing LA (n=33; T0=AV) ablations using the CARTOMINI module were included. Total fluoroscopy time, radiation dose (total dose area product [TDAP], effective dose [ED]) and procedure duration were evaluated. A retrospective cohort of patients who underwent LA ablation (n=32; T0=AV) ablation without the new image integration module served as control group.

Results: The use of the new image integration module significantly reduced mean fluoroscopy time (7.2 min; p=0.005) in LA ablation UNPV group vs. 28.2 min; p=0.06) in the control group. Furthermore, ED (3.0 mSv; p=0.003) and procedure duration (179 min; p=0.004) were higher in the CARTOMINI module compared with the control group in LA ablation.

Conclusions: This new image integration module significantly reduced total radiation exposure and mean radiation dose without influence in procedure duration during ablation of complex atrial and venricular arrhythmias.

A NOVEL TOOL FOR MAPPING MULTIPLE RHYTHMS FROM A SINGLE MAPPING PROCEDURE

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Purpose: Mapping multiple rhythms typically requires iterative mapping, which can be time-consuming. The ability to quickly map secondary rhythms of interest from the primary map recording has the potential to decrease mapping, but the same method could apply to atrial mapping, thus allowing for mapping secondary and spontaneous atrial arrhythmias in a fraction of the time possible with compared with methods used in practice today.

Methods: Manual and automated electroanatomical mapping was performed in the RV and LV of 5 pts using a 4-pole ablation catheter and new mapping software during sinus rhythm (80 maps). After each map was completed, 12-lead ECG morphology templates of ectopic PVCs were selected from recorded datasets. Automated construction of PVC conduction maps was then performed retrospectively (20 maps).

Results: Combined RV and LV mean mapping times (9 ± SD/Dev) were 461 ± 249, 401 ± 118 and 36 seconds (± SD/Dev) for Real-Manual (LaScc), Live-Automated (LaScc) and Record-Automated (RaM) mapping, respectively. Statistically significant reductions in mapping time were observed in the LaScc vs. Real (P-value<0.001) and LaScc vs. RaM (P-value<0.001) comparisons. Rapid automated “so-mapping” from the original mapping segment produced additional PVC maps in a mean of 6% (SDDev 19) and 3% (SDDev 0.01) of manual and automated mapping times, respectively (Figure).

Conclusions: The ability to automatically create maps of additional rhythms in less than 10% of the time of creating a new map has the potential to shorten certain EP procedures. The data presented relate to ventricular mapping, but the same methodology may be useful for mapping secondary and spontaneous atrial arrhythmias in a fraction of the time possible with compared with methods used in practice today. Reduced mapping and procedure time may produce significant health economic gains.

CATHETER ABLATION OF VENTRICULAR TACHYCARDIA IN THE PRESENCE OF AN OLD ENDOCARDIAL THROMBUS: THE ROLE OF INTRACARDIAC ECHOCARDIOGRAPHY

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Introduction: Catheter ablation of ventricular tachycardia (VT) is in patients (pts) with structural heart disease (SHD) is an effective treatment for prevention of arrhythmia recurrences. However, endocardial ablation may be challenging in the presence of the organized LV endocarditis/thrombus. We aimed to analyze the outcome of VT ablation in the presence of old LV thrombus.

Methods: Out of 165 393 consecutive pts undergoing VT ablation for SHD guided by intracardiac echocardiography (ICE, Accucard, Siemens), 27 pts with detectable thrombus within the LV cavity were identified (14% of total population, mean age 69 ± 12 years). All pts underwent preprocedural transthoracic echocardiography to rule out the LV thrombus, however, in 7/10 pts (70%) the thrombus was undetected and was revealed only by ICE.

Results: All pts with old LV thrombus had postprocedure anticoagulation. In all cases the thrombus was organized and oval in shape. The mean interval between the index myocardial infarction and ablation was 23 ± 9 years. The mean clinical VT cycle length was 170 ± 120 ms. The thrombus prevented assessment of endocardial electrograms within its area, however, catheter ablation was successfully performed in the vicinity of the thrombus. No procedural related complications were observed. All inducible VTs could be abolished in 75% of pts. During the follow-up of 33 ± 16 months, only one patient had VT recurrence.

Conclusions: ICE is superior to transthoracic echocardiography for detection of old endocarditis thrombus. These are typically present in pts with very long history of post-infarction LV aneurysm. In such cases, catheter ablation can be performed safely with a high success rate.
DISTINCT AND WIDE VARIATIONS EXIST IN THE MORPHOLOGY OF THE CAVO-TRICUSPID ISTHMUS:UTILITY OF REAL-TIME INTRACARDIAC ECHOCARDIOGRAPHY


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Background: Right atrial angiography (RAG) is useful for assessing the morphology of the cavo-tricuspid isthmus (CTI). However, it may overlook complicated CTI morphologies. A few studies have reported CTI ablation with intracardiac echocardiography (ICE).

Methods: This study included 90 consecutive patients with atrial fibrillation (AF). During the ablation, the CTI morphology was assessed by both ICE (CartoSound) and bidirectional RAG. The CTI morphology was categorized into three groups: flat (depth < 2 mm), concave (depth >2 mm), and pouch (flat part and possible convex areas) morphologies. The relation between the CTI morphology and radiofrequency (RF) catheter ablation parameters was also examined.

Results: In the ICE imaging, the CTI morphology could be clearly assessed. The CTI was flat in 23 (25%) patients, but apparently concave in another 38 (42%): (A). The remaining 29 (33%) had a distinct pouch (B). The majority of the pouches were located from the middle to the SVC side of the CTI. The Extinction ridge (valve) (ER) was also apparent in 51 (57%) patients. In the bidirectional RAG, a pouch was detected in 21 (23%) patients and ER in 15 (17%), was not less than that of the CTI. A complete block line of the CTI was achieved in all patients without any complications. In patients with pouch and/or ER, a complete CTI block line could be created by careful manipulation of the catheter at those pouches. The morphological differences in the CTI did not statistically affect the procedure time, or the total amount of RF energy delivered.

Conclusion: A considerable number of patients had a complicated CTI morphology with a pouch or ER. Real-time ICE was crucial for clarifying the morphological CTI variations and completing the CTI ablation effectively and safely.

SUCCESS AND LIMITATION OF EPICARDIAL VT ABLATION PROCEDURES IN A LARGE SINGLE CENTRE COHORT

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Purpose: Epicardial ablation (EA) is one option to treat VT. Little is known about acute success rate and limitations of this procedure.

Methods: From 01/2012 to 10/2014, 104 patients (pts) undergoing EA were included. Epicardial access was gained with a subxyphoid puncture in an anterior or posterior approach. Coronary vessels were visualized by angiography and, from October 2013 on, were integrated as fluoros in the 3-D mapping system (CARTO Univu). Acute success rate, complications and limitations of the EA procedure were analysed.

Results: A total of 50 EA out of 420 VT procedures were performed: 42 in 319 consecutive patients (age: 67 ± 11 years, 75% male). EA access was achieved in 48 pts (96%), one patient was excluded due to a failed EA approach. EA was judged successful in 39 pts (80%), incomplete or failed in 11 pts (22%). At baseline, demographic and electrophysiological parameters were similar in both groups. In all patients, a bidirectional block of conduction in the CTI was achieved. In the EA+ group, 26 pts (56%) had a complete CTI block line (Figure A). The remaining 25 (52%) pts had a distinct pouch (Figure B). The majority of the pouches were located from the middle to the SVC side of the CTI. The Extinction ridge (valve) (ER) was also apparent in 51 (57%) patients. In the bidirectional RAG, a pouch was detected in 21 (23%) patients and ER in 15 (17%), was not less than that of the CTI. A complete block line of the CTI was achieved in all patients without any complications. In patients with pouch and/or ER, a complete CTI block line could be created by careful manipulation of the catheter at those pouches. The morphological differences in the CTI did not statistically affect the procedure time, or the total amount of RF energy delivered.

Conclusion: A considerable number of patients had a complicated CTI morphology with a pouch or ER. Real-time ICE was crucial for clarifying the morphological CTI variations and completing the CTI ablation effectively and safely.

ABLATION OF FREQUENT PVC IN PRIMARY PREVENTION PATIENTS MEETING CRITERIA FOR ICD IMPLANT. SAFETY AND APPROPRIATENESS OF WITHHOLDING THE IMPLANT

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Introduction: Ablation of frequent premature ventricular complex (PVC) has shown to improve left ventricular ejection fraction (LVEF) in patients with LV dysfunction. The objective of this study is to evaluate if patients candidate for primary prevention (PP) implantable cardioverter-defibrillator (ICD) implant could remove this indication after PVC ablation.

Methods: Sixty-two [29 (47%) men, 53 ± 13 years old, 10 ischemic heart disease] consecutive patients with PP indication for ICD implant and frequent PVC underwent PVC ablation. ICD implant was withheld and indication was re-evaluated at 6 and 12 months after ablation.

Results: LVEF progressively improved from 28 ± 4% baseline to 41 ± 11% and 42 ± 12% at 6 and 12 months respectively, (p = 0.001). NYHA class improved during the follow-up from 2.3 ± 0.5 baseline to 1.4 ± 0.5 and 1.5 ± 0.5 at 6 and 12 months respectively, (p = 0.001). Thirty-nine (63%) patients removed the indication for PP-ICD implantation during the follow-up, 36 (92%) of them within the first 6 months. Baseline PVC burden and a sustained successful ablation were independent predictors for removing the indication of ICD implantation. A cut-off value of 17% PVC burden had a sensitivity of 95% and a specificity of 91% for removing ICD indication after ablation. No sudden cardiac deaths or malignant ventricular arrhythmias were observed.

Conclusion: In patients with frequent PVC, ablation improves LVEF and allows removing the PP-ICD implant indication in the majority of them. To withhold the ICD implant and a 6 months evaluation for ICD indication after ablation seems to be a safe and appropriated strategy.

WAITING TIME AFTER CAVO-TRICUSPID ISTHMUS ABLATION FOR TYPICAL ATRIAL FLUTTER AND LONG TERM PROCEDURAL SUCCESS

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Introduction: The aim of this study was to determine the rate of recurrent Atrial Flutter (AFi) and Atrial Fibrillation (AF) after isolated cavo-tricuspid isthmus (CTI) ablation and to evaluate the impact of a waiting period to search for early resumption of the CTI block on the long-term outcome.

Method: Between January 2010 and December 2013, 319 consecutive patients (age: 67 ± 12 years, male: 78%) were referred to our center for typical AFi ablation. 155 patients underwent a conventional CTI ablation procedure with continuous re-evaluation of the CTI block during 25 minutes (WT+) while 164 were treated with no waiting period (WT-). All patients were regularly followed-up at 1, 3 and then every 6 months with a medical questionnaire and 24 hours Holter-ECG.

Result: At baseline, demographic and electrophysiological parameters were similar in both groups. In all patients, a bidirectional block of conduction in the CTI was achieved. In the WT+- group, 10 patients (7%) presented a recovery across the CTI time to recovery: 17 ± 7 s and were re-ablated at the end of the waiting period. After a median follow-up of 21 months (range: 1 to 51), the rate of recurrent AFi was significantly higher in the WT- group as compared to the WT+ group (11.6% (19/164) vs. 2.5% (4/155) respectively, p=0.007, figure 1). However, there are no significant difference in AF recurrence between the WT- and the WT+ groups (30% (45/155) vs. 32% (53/164), p=0.66). Among these patients with AFi, clinical re-ocurrence, 4 were treated medically and 19 underwent a second ablation procedure. During Follow-up, ablation procedure occurred in 28 patients in the WT- group (16 AFi redo and 12 AF ablations) and in 10 patients from the WT+ group (3 AFi redo and 7 AF ablation).

Conclusion: Waiting 25 minutes after CTI ablation to check for early resumption allows for decreasing significantly the rate of recurrent atrial flutter but have not influence on the risk of further episode of AF.
CONTACT FORCE-GUIDED VERSUS CONTACT FORCE-BLINDED CATHETERABLATION OF TYPICAL ATRIAL FLUTTER: A PROSPECTIVE STUDY

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Purpose: Whether contact force (CF) sensing ablation technology is useful for CavoTricuspid Isthmus (CTI) ablation is unknown. We prospectively evaluated procedural parameters and outcomes of CF-Guided versus CF-Blinded CTI ablation for atrial flutter in our academic institution.

Methods: Sixty-six consecutive patients (mean age 62 ± 12.3 yrs) undergoing CTI ablation for atrial flutter were prospectively enrolled in CF-Guided (n=33) or CF-Blinded (n=33) groups. A ThermoCool SmartTouch catheter (power 25-35 W) was used in all. The procedural endpoint was bidirectional isthmus block following a 20-min waiting period. In the CF-Guided group, CF target range was 20-22 g whereas in the CF-Blind group, the operator was blinded to CF data. Post-hoc analyses of CF parameters were performed to evaluate the optimal CF.

Results: The procedural endpoint was achieved in all patients. No major complications were seen. Total radiofrequency (RF) energy delivery required to achieve bidirectional block was significantly lower in the CF-Guided group compared to the CTI-Blind group (15.5 ± 5.7 min vs 19.2 ± 12.4 min, p<0.05). Fluoroscopy duration was 8.6 ± 6.2 min in the CF-Guided group vs 15.5 ± 7.4 min in the CF-Blind group (p<0.02). Procedure duration was 83 ± 42 min in the CF-Guided group vs 94 ± 37 min in the CF-Blind group (p=0.06). Post-hoc analysis of all ablation procedures showed a significant correlation between CF and total RF delivery time (r2=0.17; p=0.01).

Conclusions: CTI ablation for atrial flutter using CF-Guided is associated with a significant reduction in RF delivery and fluoroscopy time. A significant correlation between CF and total RF delivery time was observed.

ABLATION OF TACHYARRHYTHMIAS IN EARLY CHILDEHOOD

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According to latest consensus of experts, there is an age borderline of 5 years, after which radiofrequency ablation (RFA) becomes first line therapy in most tachyarrhythmias. We study safety and efficacy of RFA in children under 5 years old.

Methods: From 2002 88 patients underwent RFA in age of five and under. There were 46 patients with WPW, 29 with atrial tachy, 8 with ventricular arrhythmias and 5 with AVNRT. Majority of patients were at age of 4-5 years and under 1 year old, 35 and 22 correspondingly. Ablation was performed after failure of medication. Signs of arhythmogenic cardiomyopathy had 68% of patients. For EP-study and RFA were used one 5 Fr or 7Fr ablation catheter and one diagnostic catheter. Usually bifemoral access was used, but in some cases we also used transesophageal reference catheter. In 20 patients with atrial ectopy we used non-fluoroscopic navigation system that allows to minimize radiation exposure. Access to the left side of the heart was provided using the biatrial approach or the transseptal approach. In 84 patients out of 88 - 95%. Intraprocedural complications were transient AV-conduction disturbances in 8 patients (9%) and coronary artery damage in 6 patients (7%).

Results: First RFA procedure was effective in 78 patients (88,5%) but in 18 cases (23%) there were recurrences that was treated with 2nd procedure in all cases. There were still 3 cases of second recurrence in this group and third effective procedure was performed with good long term follow up. In 10 patients that was ineffective with first procedure in 6 cases there was a second procedure with good long term efficacy. That means that in general RFA was effective in 84 patients out of 88 - 95%. Intraprocedural complications were transient AV-conduction disturbances in 4 patients, transient right and left bundle branch block in 3 patients due to bumpy. In one case with septal puncture there was asymptomatic hemopericardium. Reverse remodeling of arhythmogenic cardiomyopathy in all patients.

Conclusions: RFA is safe and effective approach for difficult heart rhythm disorders management when medication fails. There is higher recurrence rate possibly due to minimally effective power applied. It is important to have echo and cardiac surgery back up for management of possible complications.

OUTCOMES AFTER MULTIPLE CATHETER ABLATIONS OF VENTRICULAR TACHYCARDIA IN PATIENTS WITH STRUCTURAL HEART DISEASE

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Purpose: Catheter ablation (CA) of ventricular tachycardia (VT) is increasingly being adopted as a treatment in patients with recurrent VT and structural heart disease (SHD). However, VT recurrences after CA are common and repeated CA may be necessary. The purpose of this study was to evaluate the efficacy and safety of repeated VT ablation procedures in patients with SHD.

Methods: Out of 300 patients (87.3% male, mean age 65 ± 12 years, mean ejection fraction 33% ± 11; ICM in 205 pts) ablated for sustained VT, 193 (64.3%) patients with VT recurrence were identified. Of them, 91 patients (30.3%) underwent ≥ 2 VT ablations, 29 (9.6%) ≥ 3 and 8 (2.7%) ≥ 4 procedures over a median follow-up of 21 months; IQR 13 -24.

Results: Acute success was achieved in 77.3% of the patients ablated once, in 71.3% after the second CA, in 66.7% after the third CA, and in 58.9% after the fourth CA. Periprocedural complications occurred in 9 patients (9%) during the first CA, 4 patients (4.4%) during the second CA, 1 patients (3%) during the third CA, and at none during the fourth CA, p<NS. VT recurrence rates after each subsequent ablation was 64.3%, 61.7%, 62.5%, and 55.6%. No significant progression in ventricular impairment and coronary artery disease were observed at every new CA. The number of repeated CA was an independent predictor for cumulative VT recurrence with a HR=1.53, 95% CI 1.26-1.86; P < 0.0001 for each new CA.

Conclusions: Repeated VT ablations in patients with SHD had similar acute success and safety. However, the number of previous CA was associated with increased probability for cumulative VT recurrence. Alternative therapeutic strategies should be attempted in patients after multiple failed CA.

EFFECT OF NON-SUSTAINED VENTRICULAR TACHYCARDIAS BURDEN ON ELECTRICAL THERAPIES AMONG ICD PATIENTS WITH LEFT VENTRICULAR DYSFUNCTION

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Non-sustained ventricular tachycardias (NSVT) are frequently observed among ICD patients with left ventricular dysfunction (LVD). Whether NSVT are related to the type and response to ICD therapies is unknown.

Objective: To evaluate prospectively the relationship between NSVT burden and electrical therapies due to monomorphic VT (MT)

Methods: 416 patients with LVD (LVEF < 50%) and standard indications for ICD without Cardiac Resynchronization Therapy were followed for 41 ≥ 27 months after implant. ICD programming (de-activation and therapy) was standardized, including anti-tachycardia pacing (ATP) as first therapy for slow (CL <390 ms) and fast VT (CL 250-320 ms). NSVT was defined as any VT of ≥5 beats which did not met the detection criteria occurring within the first 6 months after ICD implant.

Results: A total of 250 patients (60%) presented at least one NSVT (median: 2, interquartile range=0-7). We classified the patients into three groups according to the number of NSVT: no NSVT (n=166, group 1), 1-5 NSVT (n=130, group 2) and ≥ 5 NSVT (n=120, group 3). The cumulative incidence of appropriate therapy due to monomorphic VT (MT) was 28%, 48% and 66% in groups 1, 2 and 3, respectively (p < 0.001, log-rank test). During the follow-up, 1414 MTs were recorded in 183 patients (primary prevention: 55%; LVEF ≤ 31; ischemic etiology: 65%). ATP was effective in 1063 (74%), 16 were slowed but not terminated by ATP and 362 (25%) MTs required at least one shock (SH) to be terminated. The adjusted mean ATP effectiveness per patient was 74% (95% CI: 69-79). Generalized Equation Estimating Method (GEEEM) ATP was more effective in patients with ≥ 5 NSVT: 70% (59-82, group 1 vs. 66% (54-77, group 2) vs. 82% (76-89, group 3), p=0.02 (groups 1-2 vs. 3), GEEM. As a consequence, the proportion of MT terminated with SH was significantly lower in patients with ≥ 5 NSVT, 30% (18-40 vs. 33% (22-42) vs. 16% (10-22), p=0.01 (GEEM). Although the mean of MTs per patient increased with the number of NSVT (6 vs. 7 vs. 10, p=0.06 for trend) the mean of SH did not (1 vs. 1.4 vs. 1.5, p=0.06 for trend).

Conclusions: Among ICD patients with LVD, the burden of NSVT within the six months after implant is associated with an increase in the incidence of appropriate therapies due to VT. However, the ATP effectiveness is higher in patients having more NSVT. These individuals have a lower proportion of MT terminated with SH and a similar promethium of SH per patient. 3-Among patients with ≥5 NSVT, a significant proportion of MT may be self-terminating.
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NEWLY DETECTED ATRIAL ARRHYTHMIC EPISODES IN SINGLE LEAD ICD WITH ATRIAL SENSOR AND EARLY CLINICAL INTERVENTIONS TRIGGERED BY REMOTE MONITORING

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Purpose: To retrospectively evaluate either the detection and the management of atrial high rate episodes in patients without history of atrial tachyarrhythmias implanted with a single lead implantable cardioverter defibrillator (ICD) able of atrial sensing.

Methods: From July 2010 to November 2014, 29 patients (mean age 60.3 ± 10.1 years, 96% males) with no documented atrial arrhythmic episodes and with no symptoms attributable to them were implanted with a single lead ICD with atrial sensor (DX system, Boston Scientific). The indication was primary prevention for 24 (83%) and secondary one for 5 (17%); the mean left ventricular ejection fraction was 44.9% (range: 29.8 - 57.2%). The median follow up period was 21.2 months ([IQR 12.4-34.3] . A pre-patient analysis of the atrial high rate episodes and of the resulting clinical interventions was performed.

Results: The mean atrial sensing of the DX system was 4.6 ± 2.6 mV. Atrial high rate episodes detected by the devices occurred in 5 (17.2%) patients. Among them four patients were asymptomatic. The mean ventricular response of the atrial arrhythmic episodes was 91.6 ± 10.6 bpm. In three patients phone contact was performed only, with no further action. Two patients had an unobserved ambulatory visit, antithrombotic and antiarrhythmic drugs were introduced in their therapy. The mean duration of the atrhythmic episodes in the four subjects who had a single event was 9.4 [range: 1 - 29] hours. The remaining patient experienced several episodes with increasing extent until persistent atrial arrhythmia. The reaction time to the remote alerts was < 24 hours in the 40% of the cases and between 24 and 48 hours in the 60%.

Conclusions: The addition of an atrial sensor in the single lead ICD may unmask asymptomatic atrial arrhythmic episodes, and together with remote monitoring it may allow prompt patient’s management. Controlled studies are needed to evaluate if such early reactions may improve patient’s clinical outcome.

P861

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Conclusions: The addition of an atrial sensor in the single lead ICD may unmask asymptomatic atrial arrhythmic episodes, and together with remote monitoring it may allow prompt patient’s management. Controlled studies are needed to evaluate if such early reactions may improve patient’s clinical outcome.

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THE IMPACT OF AGE ON CLINICAL OUTCOMES PATIENTS WITH PRIMARY PREVENTION ICD/CRT-Ds

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Purpose: To evaluate the impact of increasing age on the clinical outcomes from primary prevention ICD/CRT-D population.

Methods: Patients with ICD / CRT-D devices implanted primary prevention indications were identified from a retrospective analysis of a single centre ICD database (Medtronic PacArt system 3rd edition) from 1st January 2006 to 1st November 2014. Clinical outcomes defined as: survival to follow up with no therapy (T1), death prior to follow up with no therapy (T2), delivery of appropriate (life-prolonging) therapy with survival to follow up (T3) and delivery of appropriate (life-prolonging) therapy with death prior to follow up (T4). Patients were categorised in to deciles (D) of age according to their age at device implant or replacement (60-69 years (D1), 70-79.9 years (D2) and >80 years old (D3)).

Life prolonging therapy was defined any ATP/shock delivered for a ventricular arrhythmia with cycle 300ms or less (≥200 beats per minute).

Results: In total 349 primary prevention cases were analysed (D1=128, D2=174, D3=47). Overall, 85.7% were male, 73.8% were of ischaemic aetiology and 19.7% generator exchange. Median follow up time was 31.3 months for D1, 41.6 months for D2 and 28.6 months for D3. No significant differences between groups was observed for device type with 65.3% CRT-D. As deciles increased T1 decreased significantly (71.9% versus 58.1% for D1 versus D2 (p=0.019) and 71.9% versus 53.2% for D1 versus D3 p=0.03) and T2 increased 9.4% versus 13.2 for D1 versus D2 (p=0.04) and 9.4% versus 21.3% for D1 versus D3 p=0.04). However as deciles increased, there was no significant difference in the proportion of those who received potentially life-prolonging therapy, 10.9% versus 12.1% for D1 versus D2 (p=0.9) and 10.9% versus 10.6% for D1 versus D3 (p=0.9). Furthermore, the risk of dying for those who received potentially life-prolonging therapy increases with age, from the D1 to D2 (HR 1.353 95% CI 1.156-5.043 P=0.19). Age and gender were significantly associated with the use of potentially life-prolonging therapy prior to follow up. This data are useful for improving clinical decision making in elderly patients who meet primary prevention ICD implant criteria.
C. Lennerz 1, H. Pavací 2, C. Grebmer 1, H. Vrazic 3, V. Semmler 1, M. Kottmaier 1, M. Kornmayer 1, RARE BUT PRESENT
we describe how S-ICD can also co-work successfully with cardiac contractility modulation
arrhythmic therapy with no intravascular leads. The S-ICD does not have pacing functions. We

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DEFIBRILLATOR: FIRST SINGLE-CENTER EXPERIENCE WITH THE SUBCUTANEOUS IMPLANTABLE CARDIOVERTER-
DEFRIBRILLATOR (S-ICD) IN PATIENTS WITH CARDIAC CONTRACTILITY MODULATION

Conclusions: In select patients, S-ICD can be combined with a pacemaker. Combination of a S-ICD with CCM and with VNS may be practical for reducing the number of trans-vacular
leads. S-ICD appeared safe with CCM over a long follow-up period. Additional reports on S-
ICD co-work with IPGs are warranted.

MRI-compatible CIEDs are not protected from EMI caused by smartphones. There was no evidence of EMI using the LTE standard for testing.

A total of 308 CIED recipients (103 pacemakers, 103 ICDs, 66 CRTs) were included in the
for a potential re-programming and stored electrograms for inappropriate tachycardia detection.

Pacing and shock function was disabled in ICDs. All other CIED parameters were left unchanged.

6 lead ECG was continuously recorded and investigated

maximal transmission power (standard mode) or the modulation of the transmission power in a

50Hz tact (50Hz mode). During all tests a

for this study. This specific basis ensured that each of the smartphones went through a standardized


distance between conventional mobile phones and their CIED as electromagnetic interference

camedia, Cardiology, Zagreb, Croatia

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ELECTROMAGNETIC INTERFERENCE BETWEEN SMARTPHONES AND CURRENT CARDIAC IMPLANTABLE ELECTRONIC DEVICES: RARE BUT PRESENT

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Methods: Between 7/2011 and 11/2014 six patients had S-ICD in combination with CCM, three patients with single-chamber pacemakers with trans-venous or epicardial pacing electro-
des received S-ICD, and one S-ICD patient received VNS. In all patients intraoperative S-ICD testing, crosstalk tests and postoperative sensorgram testing were performed.

Results: In all 10 patients device implantations were successfully performed without complica-
tions. S-ICD therapy was shown to be technically feasible with concomitant IPGs including
CCM, pacemaker and VNS. Mean follow up was nearly 17 months (in CCM 5 cases had up to 35 months of follow-up, mean 20.4 months). S-ICD testing and crosstalk check before and
during exercise enable successful programming of the S-ICD for proper functioning with con-
comitant ICG. None of the devices had to be permanently inactivated and no patient received
inadequate shock.

Conclusions: In select patients, S-ICD can be combined with a pacemaker. Combination of a S-ICD with CCM and with VNS may be practical for reducing the number of trans-vacular
leads. S-ICD appeared safe with CCM over a long follow-up period. Additional reports on S-
ICD co-work with IPGs are warranted.

Conclusions: EMIs between smartphones and CIEDs is an infrequent event with a prevalence of 0.3 %.
The recommendation of a safety distance between smartphones is warranted to be maintained.

MR3-compatible CIEDs are not protected from EMi caused by smartphones.

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PACEMAKER REPLACEMENT IN NONAGENARIANS: PROCEDURAL SAFETY AND LONG-TERM FOLLOW-UP


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Purpose: The rate of pacemaker (PM) implantations is continuously growing. Given that life-expectancy of the population is projected to increase, a large number of elderly patients is expected to be implanted in the future. Since PM batteries can last as long as 8-10 years, an increasing number of PM recipients will require replacement of functional devices while being nonagenarians. We aimed at analyzing the short and long-term outcome after PM re-
placement in nonagenarians.

Methods: Patients aged ≥ 90 yo referred to a tertiary centre for PM replacement from January 2004 to July 2014 were retrospectively included. The primary clinical endpoint was total mortality. Secondary endpoints included early and delayed-procedure related complications, and predictive risk factors of total mortality.

Results: 62 patients were included (93 ± 2.5 yo at the time of PM replacement). Duration of the procedures was 35.7 ± 17.2 min. Mean hospital stay was 2.2 ± 1.1 days. One patient died from a post-operative complication. During the follow-up, 37 patients (59.7%) died. Survival rates were 84.2% (95%CI:71.7-96.1%), 66.9% (95%CI:51.6-78.2%) and 22.7% (95%CI:10.6-37.7%) after 1, 2 and 5 years, respectively. Atrial fibrillation (OR 2.44, 95%CI:1.05-5.8) and non-physiological pacing, i.e. VVI pacing in patients in sinus rhythm (OR 2.52, 95%CI:1.2-6.5) were independent predictors of mortality.

Conclusions: PM replacement in nonagenarians is a safe and straightforward procedure. These data suggest that procedures can be performed in this old and frail population, patients living for a median time of 30 months after the replacement. Atrial fibrillation and non-physiological pacing were independent predictors of mor-

P866

DEFIBRILLATION TESTING FOR RIGHT-SIDED IMPLANTABLE CARDIOVERTER-DEFIBRILLATORS (ICD)


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Purpose: For standard left-sided ICDs, defibrillation testing (DT) by ventricular fibrillation induction was recently shown not to improve ICD shock efficacy or reduce mortality. It remains to be determined whether these results can be extrapolated to right-sided ICDs.

Methods: We assessed the prevalence of failed DT and the association between DT, shock efficacy, and survival in a retrospective cohort of patients with right-sided ICDs implanted between July 2004 and July 2014.

Results: A total of 176 patients, age 63 ± 17 years, 74% male were included. The average left ventricular ejection fraction (LVEF) was 32 ± 13%, with ischemic cardiomyopathy in 52%. ICDs (VVI 44%, DDD 19%, CRT 37%) were implanted for primary prevention in 52%. DT was performed in 124 (70%) patients, 32 (25%) of whom failed their first shock at 24 ± 10 J. The only factor independently associated with test failure was a lower LVEF (OR 0.95, 95% CI 0.92-0.98). At 45 ± 32 months of follow-up, 6 patients had appropriate ICD shocks, 2 of whom had failed DT at implant. Only 1 shock failure was observed during follow-up, occurring in a patient who failed DT (he subsequently survived). DT was not predictive of shock efficacy. Overall survival rates were similar in patients with or without DT (p=0.75) and whether or not the first DT shock was successful (p=0.75).

Conclusion: The first attempt at DT fails in a high proportion (25%) of right-sided implants. Nevertheless, DT failure and lack of DT were not associated with future shock efficacy or overall survival. These results challenge the pertinence of routine DT in patients with right-sided ICDs and underscore the need for a randomized prospective controlled trial.
DETERMINING THE SAFETY OF MAGNETIC RESONANCE IMAGING IN CARDIAC PACEMAKER PATIENTS, RESULTS FROM THE INFINITE MRI STUDY

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Background: MRI is considered a promising tool for imaging cardiac pacemaker leads. However, concerns have been raised about the potential for device damage due to the high magnetic fields present during MRI. The purpose of the study was to evaluate the safety of the ImageReady MR conditional pacing system in vivo.

Methods: A total of 264 patients with permanent pacemakers were enrolled in the study. Patients were divided into two groups: one group treated with ASA (1.4 to 4, p=0.19), and other groups remained SFM unchanged. TGA - thrombin generation was significantly lower in VKA group (TGA AUC changed from 1235.7 to 559.5, p<0.001), but ASA group showed a non-significant reduction (1865.9 to 1849.4, p=0.439).

Conclusion: There were no adverse effects related to the pacemaker or the MRI scan in the study. Lead measurements taken at MRI visit within a narrow timeframe pre and post scan, did not show any clinical-relevant change that could indicate an effect of the MRI scan on the device or the tissue interaction.(table).

THE EVALUATION OF TRICUSPID REGURGITATION FOLLOWING IMPLANTATION OF RIGHT VENTRICULAR SEPTAL AND APEX PACING LEADS BY 3D ECOCARDIOGRAPHY


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Background: Right ventricular leads used in implantable cardiac pacemakers or defibrillators are reportedly a risk factor for tricuspid regurgitation (TR). TR caused by a right ventricular lead is usually managed through follow-up care until the condition becomes severe, and surgical outcomes are unfavorable. Although, with conventional 2D echocardiography, it is difficult to depict the link between a lead and the tricuspid valve, 3D echocardiography allows more detailed examination to be performed, resulting in the publication of many studies. However, the link between a right ventricular septal pacing lead and the tricuspid valve has not been investigated.

Purpose: We examined the positioning of the right ventricular septal pacing lead passing through the tricuspid valve and the severity of TR using 3D echocardiography and compared with the right ventricular apex pacing.

Methods: The subjects were 71 patients aged 60-80 years managed at our pacemaker clinic. The right ventricular septal pacing group was 49 (RVS) and the apex pacing group was 22 (RVA).

In all patients, 3D echocardiographic images were acquired.

Results: In the RVS group and RVA group, the mean age was 72 ± 4.4 to 72 ± 4.1 years; mean duration of follow-up: 45.6 ± 25.8 to 54.8 ± 33.1 months; mean ejection fraction, 62.4 ± 8.1% to 61.6 ± 6.5%, respectively. In the RVS group, the position of the pacing lead passing through the tricuspid valve, as depicted by 3D echocardiography, was the anterior-septal commissure in 24 cases, central part of tricuspid valve in 10, posterior-septal commissure and central part in 18 and anterior-posterior commissure in 6 in the RVA group. In the RVA group, the position was the posterior-septal commissure in 10 cases, central part of tricuspid valve in 10, anterior-septal commissure in 4 and posterior-septal commissure in 1. TR severity was trivial in 22/10 cases, mild in 25/7 cases, moderate to high in 2/3, moderate in 0/2, severe in 0/1. In the RVA group, none had moderate TR.

Discussion: In this study, the right ventricular septal pacing lead was inserted through the anterior and central part of the tricuspid valve in many of our cases compared with apex pacing, and none had severe TR. This would suggest a small impact of right ventricular septal pacing on TR. Further research with a larger sample size and longer follow-up is warranted.

ACTIVATION OF COAGULATION CASCADE IN PATIENTS WITH IMPLANTABLE DEVICES

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Aim of the study is to verify whether presence of implanted electrode leads to the change of haematological markers of thrombi formation. In patients after implantation of electrode treated with acetylsalicylic acid or no specific medications, there is increasing in haematological markers of thrombi formation. In children weighing 10kg, cephalic, subclavian and axillary vein diameters were measured by ultrasound prior to implantation. Measured diameters were used to make a choice of the surgical technique. First follow-up visit was 1 month after implantation and after that on each 6 months.

Results: From 1.9.2013 till 30.11.2014 we included 342 patients in our study. In further analysis we included 264 patients with unchanged medication before and 1 month after implantation.

181 males, 83 females, age 71 (54-87). Medication: no specific anticoagulation or antiplatelet medication were present in 82 pts (51.7%), acetylsalicylic acid (ASA) in 91 pts (54.5%). Vitamin K Antagonists (VKA) in 64 pts (24.2%) and other medications in 27 pts (10.2%). Fibrogenes increased in all groups unchanged. D-dimers: there was significant increase in DD in patients treated with ASA (0.6 to 1.1) and in group with no medication (0.5 to 0.9). The in patients treated with VKA (0.4 to 0.4) and other medications (0.4 to 0.9) remained unchanged. Soluble fibrin monomers 1 month after implantation were higher in group treated with ASA (1.4 to 4, p<0.001) and in group with no medication (1.6 to 3.1, p=0.19), in other groups remained SFM unchanged - thrombin generation was significantly lower in VKA group (TGA AUC changed from 1235.7 to 559.5, p<0.001), in group with no medication was TGA - AUC changed (1896.3 to 1807.7, p=0.011), but in ASA group there was no significant change (1865.9 to 1849.4, p=0.439).

Conclusion: In patients after implantation of electrode treated with acetylsalicylic acid or no specific medications, there is increasing in haematological markers of thrombi formation. In patients treated with vitamin K antagonist, markers of thrombus formation remains unchanged.

LONG-TERM FOLLOW-UP OF TRANSVENOUS CARDIAC PACING IN CHILDREN: SINGLE-CENTER EXPERIENCE IN 161 PATIENTS

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Purpose: The purpose of this study was to show that cephalic vein cutdown technique for endovascular lead implantation is reliable technique with low complication incidence and could be used as technique of choice for pacemaker lead implantation even in the smallest children.

Methods: The study included 161 children with endovascular antitrycardia pacemakers. Implantations were performed from December 1986 to December 2012. The preferred lead implantation technique was cephalic vein cutdown. If the lead implantation was not possible using this technique, we used external jugular vein puncture, axillary vein puncture and finally subclavian vein puncture technique (using this order of preference). When making this order, we were guided by the facts that preparation technique means less surgical trauma and also that axillary vein puncture is better than subclavian vein puncture if we want to avoid lead damaging by costs-clavicular pin. In children weighing ≤10kg, cephalic, subclavian and axillary vein diameters were measured by ultrasound prior to implantation. Measured diameters were used to make a choice of the surgical technique. First follow-up visit was 1 month after implantation and after that on each 6 months.

Results: One (0.6%) AAI, 5 (3.1%) VDD, 35 (21.8%) DDD, 120 (74.5%) VVI pacemakers were implanted. Indications for pacing were complete AV block in 154 (95.7%), sinus node dysfunction in 6 (3.7%) children and tricuspid valve block with syncope in 1 (0.6%) child. Mean age at implantation was 6.0 years (1 day – 15.0 years). Forty-three children were ≤10kg in weight at implantation – mean 6.14kg (2.25 – 9.9kg). There were 196 leads implanted on first implantation – mean 6.14kg (2.25 – 9.9kg). There were 196 leads implanted on first implantation and after that on each 6 months.

Conclusion: Low complication incidence during long-term follow-up confirms that cephalic vein cutdown technique for endovascular lead implantation is also feasible and reliable in this specific group of patients, not only in adults where is already considered as the technique of choice.
EFFECT OF HEART RATE ON THE INTRINSIC AND THE VENTRICULAR-PACED QRS DURATION

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Background: The QRS duration may be affected by pacing-induced changes in heart rate. We evaluated the effect of heart rate on the intrinsic and the ventricular-paced QRS duration in implanted device recipients with normal or reduced left ventricular ejection fraction (EF).

Methods: We studied 239 outpatients with preserved intrinsic ventricular activation and normal (n=92) or reduced (n=147) EF who had the right ventricular lead positioned in apex (RVA) or in mid-septum (RVS). Patients were stratified according to their underlying EF as well as to their baseline narrow or wide QRS complex. The QRS duration was measured at baseline and during atrial-based pacing at 100 beats/min with long or short atrioventricular delay to ensure intrinsic or ventricular-paced QRS activation.

Results: At baseline, patients with normal EF compared to those with reduced EF had shorter intrinsic and ventricular-paced QRS (P < 0.05), whereas ventricular pacing increased the QRS duration in both normal and reduced EF patients with either narrow or wide QRS (P < 0.001). The increase in heart rate shortened the intrinsic QRS only in patients with normal EF, and further increased the ventricular-paced QRS duration particularly in patients with reduced EF and either narrow or wide QRS (P < 0.001), irrespective of RVA or RVS pacing (P < 0.01). ROC curves demonstrated that following heart rate increase, assessment of intrinsic or ventricular-paced QRS may be useful to predict patients with reduced EF.

Conclusion: Heart rate increase is associated with further QRS prolongation in patients with reduced EF, regardless of the baseline intrinsic QRS duration as well as of the right ventricular RVA or RVS pacing site.

UNDECIDED ABOUT GETTING A PACEMAKER? TAKE ONE FOR A TEST DRIVE

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Background: Bradycardia due to sinus or AV nodal disease is commonly a slowly progressive problem over many years. Symptoms are often minimized or felt to be due to aging. Some patients, and even implanters, are ambivalent about proceeding with pacemaker implantation where there may not be clear evidence of benefit. We offer these patients a 2-3 week “test-drive” to allow them to assess the potential benefits of permanent pacemaker implantation.

Methods: Over a 45-month period, six patients (3M/3F, aged 46-82 yrs) with sinus bradycardia, 4, slow conduction of atrial fibrillation-1, and Mobitz 1 2nd degree AV block-1 underwent percutaneous placement of permanent pacing leads via a subclavian approach into the right atrium-4, right ventricular septum-1, or both-1. The lead(s) was then attached to a non-stere permanent pacemaker which was sewn to the skin and an occlusive dressing was applied. The device was then programmed to a rate-responsive mode at appropriate heart rates for each patient. After 2-3 weeks, the devices were removed.

Results: All six patients subsequently chose to undergo permanent pacemaker placement. There were no complications associated with the initial implantation procedure, the trial period, or device removal.

Conclusions: In bradycardic patients who are undecided about pacemaker implantation, a 2-3 week trial with a percutaneously-placed temporary permanent pacemaker allow the patient to experience the clinical impact of pacing therapy and may aid in their decision whether to proceed with the permanent implant.

ACUTE TRANSITORY ATRIO VENTRICULAR BLOCKAGE IN AFRICAN; CONSIDER SICKLE CELL ANEMIA

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Background: Even though sickle cell disease has a high prevalence amongst the black race and despite its well known potential of microinfarction there have been only a few reports regarding the acute myocardial damage during vaso-occlusive crises. The risk of atrio ventricular block during these crises has never been described in a large survey.

Patients and results: Ten patients (six men and four women, mean age 39 years old) were hospitalized for an acute atrio ventricular block. The patients were all African or Caribbean natives. Three patients were found with a heterozygous phenotype for hemoglobin S (sickle trait) and seven were found with a homozygous phenotype. The most common symptoms were asthenia (10 cases), shortness of breath (8 cases) and acute coronary syndrome (1 case) (syncope was not reported). Four patients had a second degree atrio ventricular block and six patients had third degree block. The treatment involved bed rest, intravenous hydration, and pain relief with opiates prevention of endocarditis and pneumococcal vaccination. All the cases of atrio ventricular block were only transitory and none of the patients underwent a pacemaker implantation.

ELECTROMECHANICAL CHARACTERIZATION OF LEFT VENTRICULAR PACING VECTORS IN CRT

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Purpose: Recent advancements in CRT pacing lead technology allowing for the implementation of multiple pacing vectors have created an avenue for “patient-specific” CRT optimization. Concomitantly, alternative measures of dysynchrony to assess CRT response are being investigated. One such technique, electromechanical wave imaging (EWI) is an ultrasound-based method that noninvasively estimates cardiac strains at high spatial (<1 mm) and temporal (2000 Hz) resolutions simultaneously. EWI strains can then be used to generate electromechanical activation maps, which have been validated in simulations, animal models, and patients.

Methods: CRT patients (n=8) were recruited during their routine device interrogations at Columbia University Medical Center. High framerate ultrasound acquisitions were obtained for each patient in the apical 4- and 2-chamber views in native rhythm and under a variety of pacing protocols, including unipolar, bipolar, and extended bipolar pacing vectors. 12-lead ECG measurements were taken for each pacing configuration following the ultrasound acquisition. Inter-frame strains were estimated from the acquired radiofrequency data for the entire view over a full cardiac cycle. Electromechanical activation times for each point in the tissue obtained using different pacing vectors.

Conclusions: Electromechanical activation times for each point in the tissue obtained using different pacing vectors. Concurrently, alternative measures of dyssynchrony to assess CRT response are being investigated. Concurrently, alternative measures of dyssynchrony to assess CRT response are being investigated. Electromechanical activation times for each point in the tissue obtained using different pacing vectors.
FEATURE-TRACKING CARDIOVASCULAR MAGNETIC RESONANCE TO PREDICT RESPONSE FOLLOWING CARDIAC RESYNCHRONIZATION THERAPY

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Purpose: A panoply of studies have explored the inter- and intra-ventricular mechanical dysynchrony in relation to response to cardiac resynchronization therapy (CRT). Feature tracking cardiovascular magnetic resonance (FT-CMR), the CMR equivalent of speckle-tracking echocardiography, allows rapid, semi-automatic assessment of wall motion. We hypothesised that dysynchrony measures derived from a pre-implant FT-CMR predict response to CRT.

Methods: 124 consecutive CRT recipients (age 67 ± 12 yrs [mean ± SD], LVEF: 22 ± 9.6%) underwent pre-implant dysynchrony assessment for quantification of SD of the time to peak strain (SDT2P), the circumferential uniformity ratio estimate (CURE) and a radial uniformity ratio estimate (RURE), derived from FT-CMR, do not predict response to CRT.

Conclusions: SDT2P was a weak predictor of symptomatic response (ROC: 0.65, 95% C.I. 0.55-0.75) and a poor predictor of echocardiographic response to CRT. SDT2P was higher in symptomatic responders (17% vs. 13%, p = 0.049). As shown in the figure, however, SDT2P, CURE or RURE failed to predict symptomatic or echocardiographic response to CRT.

A SIMPLE SCORE FOR PREDICTING CRT-RESPONSE BASED ON DATA FROM A MULTICENTRIC REGISTRY

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Introduction: Cardiac resynchronization therapy (CRT) has emerged as a highly effective treatment option in patients with advanced heart failure. Unfortunately, almost none of the available dyssynchrony measures (SDT2P, CURE and RURE) derived from FT-CMR, the CMR equivalent of speckle-tracking in echocardiography, allows rapid, semi-automatic assessment of wall motion. We aimed to derive a CRT response score based on simple clinical and widely validated predictors of response in order to improve the selection of patients for this intervention.

Methods: All consecutive patients implanted with a CRT plus defibrillator in a multi-centre national registry were included. Clinical independent predictors of a favourable response to CRT (either clinical or echocardiographic) were assessed. A risk score was created based on the relative odds ratio of each of the variables. The likelihood of CRT response in the different stages was assessed.

Results: Among the 1011 patients implanted with a de novo CRT-D, 75.8% were responders. Independent and significant predictors of CRT response in the first 6 months on multivariate logistic regression were: female gender (OR=2.08), New York Heart Association class /C21 (OR=2.71), left ventricle ejection fraction ≥ 25% (OR=1.75), QRS duration ≥ 150 ms (OR=1.70) and estimated glomerular filtration rate > 60 ml/min (OR=2.01). All predictors were assigned 1 point. The chances of CRT response progressively increased according to the assigned score: 46.7%, 47.9%, 65.9%, 77.7%, 85.5% and 93.3%, respectively from 0 to 5 points. Patients were divided in 3 groups according to the likelihood of response: low (0 or 1 points), median (2 or 3 points) and high (4 to 6 points) probability of response to CRT. Likelihood of survival at 6 years was approximately 35% in low response, 60% in intermediate and 80% in the high response group (p log rank <0.001).

Conclusions: A simple and hypothetically widely used score for optimization of patient selection for CRT therapy was derived from our registry. Association between CRT response and 5 years survival is also suggested from our data. Prospective validation of this score in further populations before its introduction in routine clinical practice is necessary.

TARGETING THE LATEST ACTIVATED REGION IS THE BEST STRATEGY FOR OPTIMIZING RESPONSE TO CRT: FACT OR FICTION?

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Cardiac resynchronization therapy (CRT) benefits patients with chronic heart failure and left bundle branch block (LBBB). Position of the left ventricular (LV) pacing lead is an important determinant of CRT response, but the underlying mechanism is not completely understood. We used a finite element (FE) model of biventricular (BiV) electro-mechanics to investigate how LV lead position influences hemodynamic response to CRT.

Methods: LV myocardial activation time (AT) was computed by solving the Eikonal-diffusion equation. Complete LBBB (LBBBc) was simulated by defining Purkinje exit points at the posterior LV endocardium. Both cases had a different location of the latest activated region (LAR) during baseline. CRT was simulated as BiV pacing, a fixed-point stimulation in the RV apex combined with stimulation from one of 16 different epicardial LV free wall (LVfw) locations (figure). Computations of activation patterns served as input for mechanical simulation of pump function. CRT response was defined as % change in LV dp/dt relative to LBBB.

Results: Total activation time was 174 ms during LBBBc, and 144 ms during LBBBf. For LBBBf simulation, response to CRT showed a good, but not perfect correlation with AT during baseline of the paced region (panel A), while there was no such correlation for LBBBf simulation (panel B). For both LBBBc and LBBBf, largest response to CRT was obtained when the LV lead was located so that the intra LV dyssynchrony, defined as the difference between mean LVfw AT and mean septal AT, was minimal (panel C).

Conclusion: Acute hemodynamic response to BiV pacing is highly determined by resynchronization of activation in the LV. This is not necessarily achieved by pacing the LAR.
**EFFECT OF STEM CELL THERAPY ON ELECTRICAL AND MECHANICAL ACTIVATION IN HEART FAILURE PATIENTS**

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**Methods:** We aimed at evaluating the effects of autologous bone marrow mononuclear cell (BMMC) transplantation on electrophysiological (EP) and mechanical activation in patients with heart failure (HF) by using a novel software tool for the comprehensive analysis of EP and mechanical activation maps.

**Results:** The software was able to track the activation time in all cases, and no significant differences were observed between patients with and without BMMC transplantation. The mechanical activation maps showed a significant increase in the time interval between the earliest and latest events, with a decrease in the time interval between the earliest and latest depolarization events. End-diastolic (EDV) and end-systolic volumes (ESV), and ejection fraction (EF) were also computed. The effect of BMMC transplantation was evaluated using a linear mixed model, including the follow-up time as a fixed factor, while the different patient and the anatomical location of the recording (in terms of AHA segment) were entered as random factors to account for the inter-patient variability and the different spatial distribution of recording locations.

**Conclusion:** The use of BMMC transplantation was associated with a significant improvement in both EP and mechanical activation, indicating a potential beneficial effect on heart failure.

**TRIPLE-SITE VENTRICULAR (TRIV) PACING IS SUPERIOR TO CONVENTIONAL BIVENTRICULAR PACING: A PROSPECTIVE OBSERVATIONAL TRIAL WITH MINIMUM INVASIVE HEMODYNAMIC ASSESSMENT**


Hospital Lisbon North, Hospital Santa Maria, Lisbon, Portugal.

**Introduction:** Multi-site pacing and multi-site pacing are emerging as new methods of cardiac resynchronization therapy (CRT). Their efficacy and indications, however, have been scarcely studied so far. The optimal method of resynchronization therapy remains unclear. We aim to compare triple site ventricular (TRIV) pacing to conventional biventricular (BV) pacing.

**Methods:** Prospective observational study of patients with prior atrial fibrillation and CRT implantation. All patients had 3 leads implanted. Two right ventricle (RV) leads were positioned in the apex and at the outflow tract septal wall (RVOT). A left ventricle (LV) lead was implanted in the coronary sinus at usual in a conventional CRT. Within 1 month after implantation, all patients underwent minimum invasive hemodynamic assessment using the Vigileo FloTrac (Edwards Lifesciences) for the determination of cardiac output in each pacing configuration: triple site pacing (TRIV), RV apex-LV, and RVOT-LV. Mean QRS and echocardiographic ejection fraction were obtained (using the Simpson biplane method) were also assessed for each configuration.

**Results:** We included 33 patients, 72% male, 72 ± 11 years old. Mean cardiac output and mean QRS width measurements in the three different pacing configurations are showed in table 1. Cardiac output was significantly higher and the QRS width shorter in the TRIV configuration in comparison with both RV configurations. Mean ejection fraction was 29% with TRIV and 23% with both RV configurations (p = 0.01).

**Conclusion:** TRIV pacing is hemodynamically superior to conventional BV pacing, producing higher cardiac output and shorter QRS duration in patients with atrial fibrillation, LV dysfunction and CRT indication. The echocardiographic ejection fraction was not accurate in detecting differences between pacing configurations.

**CARDIAC RESYNCHRONIZATION THERAPY ON FUNCTIONAL CAPACITY AND NEUROCOGNITIVE PROFILE, A POSSIBLE ROLE ON THE SLOWING OF FRAILTY DEVELOPMENT**

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**Introduction:** Cardiac resynchronization therapy (CRT) proved to significantly reduce hospitalization and mortality in severely diseased heart failure (HF) patients. Despite growing knowledge on the effects of CRT, some physio-pathological implications of this important form of therapy are to be clarified. Aim of this study was to evaluate the influence of CRT on functional and cognitive profile trajectories, which are closely associated with frailty development.

**Methods:** All consecutive patients who received a CRT-P or CRT-D device between June and December 2013 in three Italian centers were enrolled in the study. At baseline and at the 6-month evaluation, functional profile was evaluated with the Short Physical Performance Battery (SPPB), a tool exploring strength, endurance and balance, highly predictive of incident disability and mortality. Cognitive profile was assessed with the Mini-Mental State Examination (MMSE) and with the Trail Making Test (TMT) A and B, which also explore executive functioning.

**Results:** We enrolled 52 consecutive patients (age: 68 ± 10 years, age ≥ 75 years 26.6%; men: 73%) with severely depressed systolic function (LVEF: 28 ± 5%, coronary artery disease: 40%; and optimized medical therapy (ACE: 79%, ARB: 89%, beta-blockers: 83%). At the 6-month evaluation, mortality was 3.8% (N=2/52) with a proportion of responders to CRT of 61%. LVEF significantly increased (35 ± 7 vs. 28 ± 5%, p = 0.0001), while LV end-systolic diameter (48.8 ± 56.9 mm, p = 0.001) and NYHA Class (1.8 ± 0.7 vs. 2.5 ± 0.6, p = 0.0001) reduced. SPPB improved both in its overall score (10.2 ± 2.4 vs. 9.1 ± 2.7, p=0.012) and in scores exploring walking speed (3.5 ± 0.8 vs. 3.1 ± 1.2, p=0.005) and endurance (3.1 ± 1.1 vs. 2.7 ± 1.1, p=0.015). These changes matched with a better cognitive profile, as expressed by a higher MMSE score (27.3 ± 3.0 vs. 26.2 ± 4.6, p=0.089). Times to complete TMT A and TMT B did not change at the follow-up.

**Conclusions:** CRT, through a great improvement in cardiac conditions, significantly ameliorates functional capacity and neurocognitive profile of patients after only 6 months from device implantation. Specifically designed clinical trials are needed to confirm these findings, which suggest a possible action of CRT on the slowing of HF progression from severe disability to death.
INCIDENCE AND PREDICTORS OF SUBCLAVIAN VEIN OBSTRUCTION FOLLOWING BIVENTRICULAR ICD IMPLANTATION: A CONTRAST VENOGRAPHY STUDY
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Aim: The number of biventricular implantable cardioverter defibrillator (Bio-ICD) implantations, as well as follow-up procedures such as generator exchange and lead revision are increased. Venous obstruction becomes a significant challenge in lead revision procedures. The data about the incidence of subclavian venous (SCV) obstruction after Bio-ICD implantation is very limited. The aim of this study was to determine the incidence and predictors of venous obstruction after Bio-ICD implantation.

Methods: One hundred and thirteen consecutive patients admitted for their first/second elective Bio-ICD generator replacement and/or lead revision were included. Left SCV puncture method for all three leads implantation was inclusion criteria. All patients underwent left arm contrast venography and the images were analyzed by two attending cardiologists. Venous obstruction was classified as moderate stenosis (50-75% diameter reduction), severe stenosis (<50%) or total occlusion. We assessed clinical risk factors (such as DM, HT, hyperlipidemia, body mass index, co-existing diseases (COPD, peripheral arterial diseases), underlying disease for Bio-ICD implantation, laboratory parameters, models of implanted device and leads, previous history of lead revision, previous history of lead extraction procedure with special extraction devices, clinical symptoms, baseline rhythm, history of antiprosthetic/anticoagulant therapy and total lead duration.

Results: All leads were placed for an average of 42.7 ± 18.9 months. All patients had dual shocking lead-ICD leads. SCV obstruction of various degrees was found in 78% of the patients. Complete occlusion was found in 26%, severe stenosis in 33% and moderate stenosis in 20% of the patients. The incidence of venous obstruction was increased in patients with a previous history of lead revision (71%) and previous history of lead extraction procedure with special extraction devices (100%). Previous history of lead revision and previous history of lead extraction procedure with special extraction devices were significantly related with total occlusion (r=0.64, p<0.001 and r=0.34, p<0.001, respectively). Anticoagulation therapy during and after treatment had statistically strong negative correlation with total occlusion (r=-0.51, p<0.001).

Conclusion: This study demonstrated that subclavian vein obstruction occurs relatively frequently after ICD implantation. Patients with previous history of lead revision and previous history of lead extraction procedure had increased risk for total occlusion. Anticoagulation therapy may help to prevent total occlusion of SCV.

COMPLETE EXTRACTION OF ABDOMINAL PACING AND ICD LEADS- A UNIQUE CASE SERIES
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Introduction: Abdominal pacing/ICDs generators are now rarely implanted, owing to the smaller sized percutaneous units. They were typically inserted by the surgeon through the retroperitoneus and the leads are tunneled from the abdominal site to left infracavicular area and the leads are then inserted transvenously through a subclavian or axillary vein approach. It is extremely rare that these systems need to be extracted and there are no published data on the techniques or outcomes. The procedure poses different risks and technical difficulties compared to standard lead extraction procedures.

Methods: Retrospective case record analyses of extractions were undertaken over last 10 year period in single high volume centre.

Results: A total of 280 lead extraction cases have been performed over the last 10 years. A total of 5 of these cases were extraction for abdominal ICDs comprising only 1.8% of extractions. All procedures were performed under general anaesthesia. The mean age was 51.4 yrs, 4/5(80%) were female. Indications and demographics are shown in the table.

Two separate incisions were needed to access the generator, connectors and to remove the endo-vascular portions of the leads. The abdominal portion of the leads were dissected free and pulled through to the shoulder. Laser extraction was then used to remove the intravascular portions of the leads. All 5 patients had successful complete removal of the leads and generators and re-implantation of new percutaneous devices with no complications.

Conclusions: Abdominal pacing/ICD lead extractions are rare and pose unique technical challenges but can be safely and successfully removed by a combination of simple traction, dissection and laser extraction tools.

TRANSVENOUS EXTRACTION OF VERY OLD (OVER 20-YEAR-OLD) LEADS USING MECHANICAL SYSTEMS - EFFECTIVENESS AND SAFETY
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Purpose: To analyse the effectiveness and safety of transvenous lead extraction (TLE) of leads older than 20 years using mechanical systems.

Methods: The study included 242 pts, mean age 67.2 ± 12.3 years, 65 female, qualified to TLE. Patients were divided in two groups: A - 13 yrs, 14 leads extracted with dwell time ± 240 months (also 10 lead extracted with dwell time >240 months). B - 229 pts, 332 leads extracted.

Results: In both groups did not differ in terms of age, gender, NYHA functional class, left ventricle ejection fraction (LVEF) and indications to TLE. In group A more device-related procedures performed in the past and more unipolar leads compared to group B. In all patients from group A the complete success was achieved and neither major or minor complications were observed. In group B a minor success was achieved and 12 major complications were observed. All complications were minor and were related to minor success and TLE scenario.

Conclusions: This study shows that extraction of leads older than 20 years seems to be comparable safe and effective in extraction of younger leads. On the other hand, it requires longer fluoroscopy time and frequent utilisation of advanced tools.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A</th>
<th>Group B</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of patients (years ± SD)</td>
<td>66.7 ± 8.3</td>
<td>67.2 ± 12.3</td>
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<td>Female gender [n, %]</td>
<td>119 (85.58%)</td>
<td>233 (70.06%)</td>
<td>p=0.241</td>
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<tr>
<td>Number of extracted leads</td>
<td>14</td>
<td>332</td>
<td></td>
</tr>
<tr>
<td>Age of extracted leads (months ± SD)</td>
<td>214.9 ± 85.8</td>
<td>70.9 ± 214.9</td>
<td>p&lt;0.0001</td>
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<tr>
<td>Complete success [n, %]</td>
<td>13 (100.0%)</td>
<td>220 (66.16%)</td>
<td>p=0.7669</td>
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<tr>
<td>Clinical success [n, %]</td>
<td>0 (0.0%)</td>
<td>5 (1.52%)</td>
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<tr>
<td>Failure [n, %]</td>
<td>0 (0.0%)</td>
<td>4 (1.27%)</td>
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<tr>
<td>No complication [n, %]</td>
<td>13 (100.0%)</td>
<td>217 (64.87%)</td>
<td>p=0.688</td>
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<tr>
<td>Minor complication [n, %]</td>
<td>0 (0.0%)</td>
<td>7 (2.13%)</td>
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<tr>
<td>Major complication [n, %]</td>
<td>0 (0.0%)</td>
<td>5 (2.22%)</td>
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<td>Simple trauma [n, %]</td>
<td>0 (0.0%)</td>
<td>3 (0.9%)</td>
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<td>Transitory phenomenon [n, %]</td>
<td>17 (10.08%)</td>
<td>239 (72.09%)</td>
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<tr>
<td>Electro mechanical system [n, %]</td>
<td>5 (3.33%)</td>
<td>312 (9.37%)</td>
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<td>Fluoroscopy access time (minutes)</td>
<td>50.8 ± 14.0</td>
<td>58.8 ± 9.6</td>
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Lead to lead strong scar connection and difficulties of TLE

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Early Repolarization in Unexplained Syncope

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Background: Early repolarization (ER) is characterized by 1-mm elevation in the anterolateral or inferior leads of the 12-lead electrocardiogram. It has been associated with increased risk for idiopathic ventricular fibrillation and mortality. However, its prevalence in syncope of different etiologies is unknown and was evaluated in this study.

Methods: The study sample comprised 170 consecutive patients with vasovagal syncope (positive tilt table response and a representative history, group 1, n=59) or syncope that remained unexplained after complete work-up (group 2, n=111). ER was defined as an elevation of the QRS-ST junction of at least 0.1 mV from baseline in at least two adjacent inferior (II, III, AVF) or anterolateral (I, AVL, V4 – V6) leads.

Results: Age, gender, heart rate, PQ interval and QRS duration were similar between the two groups but QTc interval was shorter in group 2 compared with group 1 (378 ± 26 vs. 395 ± 25 ms, p < 0.001). ER was more frequently observed in group 2 than in group 1 (225 vs. 6.8 %, p=0.032). ER in inferior leads was more prevalent in group 2 (17.1 vs 3.4 %, p=0.01) while ER in anterolateral leads was similar between group. The type of ER was identical in both groups, i.e. slurring was observed in 80 % and notching in 20 %.

Conclusion: Early repolarization in inferior leads and with an horizontal/descending in 0% in group 1 matched with 13.5% (p=0.002) in group 2.

The role of QT intervals in prognosis of syncope of unknown origin

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Background: It's known that prolonged Tpeak-to-Tend interval (TpdE) is associated with increased risk of mortality in patients with cardiac diseases such as coronary artery disease (CAD), long QT syndromes and hypertrophic cardiomyopathy and that increased QT dispersion (QTDisp) is a major risk factor for torsades de pointes tachycardia. The aim of the study was to evaluate the role of QT intervals in prediction of new syncope spells during one year after initial assessment of patients with syncope of unknown origin (SUD).

Method: During a two year period 85 patients with SUD evaluated, Demographic characteristics were recorded and specific diagnostic protocol used. QTD<300ms, QTD<250ms lead with QTD(max) , QT dispersion, QTD corrected lead with QTD(max), Tpeak/Tein lead with QTD(max) and Tpe/Tdispersion/T-pedushaped measured. Patients were followed for a mean period of one year.

Results: 85 patients with mean age 56 ± 20, 32 women(38,8%) and 53 men(61,2%) enrolled. 67 out of 85(78,8%) had no structural heart disease. QT intervals measured and mean values calculated : mean QTD(max) 411 ± 47ms, mean QT Disp 362 ± 40 ms, mean QTpeak 324 ± 43 ms, mean QTDisp 49 ± 17ms, mean QTc 428 ± 51 ms, mean TpTe 87 ± 18 ms and mean TpEdisp 36 ± 11 ms. It was detected that TpdE was sex related, more prolonged in men (91 vs 82 p 0.027) and QTpeak was age related, more prolonged in age above 65 years(339 vs 314 p 0.01). Moreover patients with CAD had prolonged QTD(max)447 vs 402 p(0.009), QT min(393 vs 354 p 0.009), QTpeak(555 vs 316 p 0.008) and QTc(455 vs 421 p 0.007). During one year mean follow up 14 patients (16,5%) had at least one syncope episode. In order to evaluate the predictive role of QT intervals in recurrence of syncope spells cut-off values calculated : QTD(max) > 300ms [sensibility 71%, specificity(69%], QT min > 350ms[71 %, specificity [69%], QT peak > 351ms [79 %, specificity(56%], QTDdisp > 26 ms[64 %, specificity(85%], Tpeak > 90 ms[71 %, specificity(85%]. TpEdisp > 25 ms[46 %, specificity(96%], with a ROC curve of 0.71, 0.69, 0.66, 0.53, 0.67, respectively in relapse of syncope episodes.

Conclusions: In our study QT intervals could poorly predict the reappearance of syncope spells. However, it was detected that patients with CAD or age older than 65 are more susceptible to QT intervals variables and that the absence of such risk factors reduces the recurrence rate of syncope. Consequently, those patients need thorough diagnostic assessment and frequent reappraisal.

Right Ventricular Diastolic Dysfunction in Children with WPW Syndrome: Invasive Hemodynamic Study

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Purpose: To evaluate the impact of ventricular pre-excitation on right ventricular (RV) diastolic function in children with Wolf-Parkinson-White syndrome (WPW).

Methods: In 2003-2014, 1350 children aged 1 to 17 years with WPW received catheter ablation (CA) of accessories pathways (AP) in one catheterization laboratory. 70 of them (35 females) were included into the study. Main group – 47 pts with WPW (21 asymptomatic WPW). Control group – 23 pts with atrioventricular nodal re-entrant tachycardia (AVNRT). Each case was evaluated by means of invasive right ventricular pressure recording immediately before and 40 minutes after atrioventricular node ablation. Those data have been included into logistic regression model. Regression coefficients, odds ratio and probability of RV diastolic function disturbance depending on localization of AP was calculated.

Results: RV diastolic function was impaired in 23 (49%) pts in main group before intervention-al treatment. There were no RV diastolic dysfunctions after CA in all cases. Disturbance of RV diastolic function was not found in control group before and after CA in all pts. The probability (P) of RV diastolic function disturbance has been calculated using regression model. In pts with right-side AP P was 0.9, in papaseptal – 0.7, in left-side – 0.1 (p < 0.05). There was no significant difference in RV diastolic function in symptomatic and asymptomatic WPW. Probability of RV diastolic function disturbance in right-side AP higher than in papaseptal AP. Left-side AP associated with low risk of RV diastolic dysfunction. Ventricular pre-excitation via AP causes the same RV diastolic function in symptomatic and asymptomatic WPW.

Acute Right Ventricular Apex Pacing with an Altered Activation Pattern Reduces Electrical Parameters but does not Modify Torsade de Pointes Incidence in the Anesthetized Chronic Complete AV-BLOCK Dog

University Medical Center Utrecht, Department of Medical Physiology, Utrecht, Netherlands

Purpose: Complete AV-block leads to bradycardia and an uncontrolled altered ventricular activation pattern of the non-ventricular atrium. This atrium in turn sustains electrical activity that initiates arrhythmias. The ensuing ventricular remodelling reduces repolarization reserve, is region specific (early vs. late activated areas), and enhances susceptibility for dofetilide induced Torsade de Pointes (TdP) arrhythmias, which often occur in the late activated regions. Administration of amiodarone and dofetilide further increase the cycle length (CL) and sometimes shift the focus of the TdP. To control the latter effects, we paced the hearts acutely from the right ventricular apex (RA) at 1000 ms CL and investigated the electrophysiological and arrhythmic consequences.

Methods: 54 anaesthetised (pentobarbital sodium) dogs were studied (24 > 3 months old AV-block) with coronary flow limited to the right ventricle (RV), 24 animals in IVR and 22 RV A paced. ECG, endocardial RV and LV monophasic action potential duration (MAPD) were recorded.

Results: CL of the IVR dogs was 1283 ± 282 ms and the rhythm originated from the RV apex in 27/32 animals. LVMAPD, spatial (ΔLVMAPD = LV - RVMAPD) and temporal dispersion of repolarization (STV_LV) were larger in IVR (table 1). Despite these baseline differences Tdp inducibility remained similar, 59% (19/32) vs 64% (14/22). Dofetilide increased CL of the IVR dogs to 1432 ± 320 ms while the relative increase of LVMAPD and STV_LV were similar in both groups although absolute values remained larger in IVR (table 1). In contrast, the relative increase in ΔLVMAPD was nearly twice as high in the RVA paced dogs and thereby reaching similar absolute values as IVR (table 1). TdP remained originating from the late activated region in IVR.

Conclusions: RVA pacing does not affect Tdp outcome or origin. The lower absolute repolarization values in RVA paced dogs are most likely due to the higher heart rate. However, ΔLVMAPD is the only electrical parameter increasing to the same magnitude suggesting the importance of spatial dispersion of repolarization for development of Tdp.

Table

<table>
<thead>
<tr>
<th>IVR_BL</th>
<th>IVR_DOF</th>
<th>% Increase</th>
<th>RVA paced BL</th>
<th>RVA paced DOF</th>
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<tr>
<td>LVMAPD 303 ± 51</td>
<td>475 ± 114*</td>
<td>57</td>
<td>257 ± 29*</td>
<td>404 ± 30*</td>
<td>57</td>
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<td>STV_LV 1.3 ± 0.6</td>
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<td>139</td>
<td>167</td>
<td>0.9 ± 0.4*</td>
<td>2.2 ± 1.7*</td>
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<tr>
<td>ΔLVMAPD 40 ± 27</td>
<td>43 ± 6*</td>
<td>139</td>
<td>21 ± 23*</td>
<td>70 ± 54*</td>
<td>237</td>
</tr>
</tbody>
</table>

*p < 0.05 (DOF vs BL), †p < 0.05 (RVA vs IVR)
### EXPRESSION OF MiRNAs AND MORPHOLOGICAL CHANGES IN MYOCARDIAL PATIENTS WITH ATRIAL FIBRILLATION


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**Introduction:** It is discussed that miRNAs are potent mediators of atrial remodeling. AF is accompanied by the development of fibrosis, hypertrophy of myocardium and atrial dilation.

**Conclusions:** By using RT-PCR we determined that several miRNAs, including miR208a, 195, 499, 29a, are involved in the regulation of interstitial fibrosis (mir208a), mitral valve ring dilatation (mir208b) and tricuspid (mir133a) valve rings. The level of expression of miRNAs was evaluated by RT-PCR. Statistical analysis was made using non-parametric Mann-Whitney U test and Spearman correlation.

**Results:** The screening of 9 miRNAs revealed increased expression in PAF patients (mir208a, mir208b, and LSAF patients) compared with the SR group (p < 0.05), and miRNAs upregulation in LSAF patients (mir1, 133b, 499, 29a) compared with PA patients (p < 0.05). Correlation analysis showed miRNAs involvement in atrial structural remodeling in patients with different forms of AF. In PAF patients miRNAs upregulation correlated with increased atrial fibrosis (mir133b), lipidomatosis (mir208a, 133b), IAA (mir208a/b, 133a, 499, 195, 29a, 21) and cardiomyocyte hypertrophy (mir208b) (p < 0.05). In PAF patients miRNAs expression correlated with internal fibrosis (mir208a/b, 133a) and dilatation of the mitral (mir208b) and tricuspid (mir133a) valve rings (p < 0.05). In LSAF patients miRNAs expression correlated with mitral fibrosis (mir208a, 133a) and dilatation of the mitral (mir208b) and tricuspid (mir133a) valve rings (p < 0.05). In LSAF patients miRNAs expression correlated with mitral fibrosis (mir208a, 133a) and dilatation of the mitral (mir208b) and tricuspid (mir133a) valve rings (p < 0.05).

**Conclusion:** A number of miRNAs are involved in atrial structural remodeling in patients with AF.

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### SPECTRUM OF LONG QT GENE MUTATIONS IN THE REPUBLIC OF IRELAND


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**Aims:** Using the same database of genetic mutations in the National Centre for Medical Genetics (NCMG), we sought to describe the prevalence of positively identified LQTS gene mutations in those patient sent for analysis of KCNQ1, KCNE1, SCN5A, KCNE2 and KCNQ2 genes. We also sought to describe the relative incidence of each positively identified gene mutation to gain an insight into the prevalence of the different LQTS mutations within the Irish population.

**Methods:** A retrospective review of all patient and family files referred for LQTS gene analysis in the National Centre for Medical Genetics was performed, and the relevant genetic information was entered into a database. The specific gene mutations analysed for each patient were recorded, as well as the amino acid change coded for by that mutation, as well as the region of the gene affected.

**Results:** Of the 454 samples analysed, 180 (42.4%) tested positive for an LQTS gene mutation. 64 patients tested positive for a KCNQ1 gene mutation (15.6%), 63 patients tested positive for a KCNQ2 gene mutation (33%), 36 patients tested positive for an SCN5A gene mutation (20%), 17 patients tested positive for a KCNE1 gene mutation (9%) and 4 patients tested positive for a KCNE2 gene mutation (2.2%).

**Conclusion:** These results suggest an over-representation of SCN5A and KCNQ2 mutations when compared to the previously described spectrum of LQTS gene mutations in the five most common LQTS genes in a European and North American cohort.

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### CARDIOMYOPATHIES ASSOCIATED WITH MUTATIONS IN SCN5A GENE

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The SCN5A gene encodes the alpha subunit of the Nav1.5 sodium channel, which is responsible for the inward sodium current (INa). Genetic alterations in the SCN5A gene may affect the structure, function or level of expression of the Nav1.5 sodium channel. These diverse and often functionally opposites alterations of cardiac myocytes electrical excitability result in various cardiac arrhythmias, and all of them are often associated with a structurally normal heart. It was recently demonstrated that the phenotype expression of SCN5A genetic mutations could be expanded from electrical disorders with an apparently normal heart to cardiovascular hypertrophy. Currently, more than 10 mutations in the SCN5A gene have been described which lead to the development of DCM and/or atrial cardiomyopathy in conjunction with a wide range of cardiac arrhythmias and conduction disorders.

We did perform DNA diagnostics for primary arrhythmias since 1998 year, and 232 unrelated families underwent molecular genetic testing, including direct Sanger sequencing of SCN5A gene. Twenty-one mutations in 22 unrelated families in SCN5A gene were found, one proband have carried two mutations in two SCN5A alleles inherited from both parents. Detailed clinical and instrumental examinations including ECG, EchoCG, cardiac MRI, and neurological examination were performed for SCN5A mutation carriers (probands) regardless of underlying diagnosis of primary arrhythmia.

The screening had revealed 4-5 families (18%) with undiagnosed structural cardiac remodeling (Table 1).

**Conclusion:** It seems that the prevalence of different variants of cardiac remodeling in SCN5A mutations carriers is higher than previously thought. A detailed understanding of all the phases (molecular, cellular, organ) of myocardial remodeling in patients with SCN5A mutations is required to select the most effective strategies for personalized therapy based on existing treatments.

<table>
<thead>
<tr>
<th>Mutation</th>
<th>Age, y.o.</th>
<th>Gender</th>
<th>Primary diagnosis</th>
<th>Cardiomyopathy</th>
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<td>F</td>
<td>PVC</td>
<td>ARVC</td>
</tr>
<tr>
<td>p.E446K</td>
<td>54</td>
<td>M</td>
<td>CCD</td>
<td>Dilated cardiomyopathy</td>
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<tr>
<td>p.S131H</td>
<td>p.A372D</td>
<td>16</td>
<td>SNS</td>
<td>Cardiac hypertrophy</td>
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<tr>
<td>p.P205A</td>
<td>20</td>
<td>F</td>
<td>LQTS, VF, SD</td>
<td>Cardiac hypertrophy</td>
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</tbody>
</table>

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### XANTHINE OXIDASE INHIBITOR PREVENTS ATRIAL FIBRILLATION SENSITIVITY BY INHIBITION OF OXIDATIVE CAMKII IN DAHL SALT-SENSITIVE RATS

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**Background:** Beneficial effects of xanthine oxidase inhibition on heart failure have been reported in both experimental and clinical studies. However, the effects of the reagents for atrial fibrillation (AF) remain to be fully elucidated. We investigated the effects of a novel xanthine oxidase inhibitor febuxostat on AF compared to allopurinol in rat model.

**Methods:** Four-week-old Dahl salt-sensitive rats were fed either 0.3% (low-salt) NaCl or 8% (high-salt) NaCl diet. High-salt diet rats were divided into 3 groups: orally administered to vehicle (8%-control), febuxostat (5mg/kg/day) or allopurinol (50mg/kg/day).

**Results:** AF duration in 8%-vehicle (35%), 36 patients tested positive for an SCN5A gene mutation (20%), 17 patients tested positive for a KCNE1 gene mutation (9%) and 4 patients tested positive for a KCNE2 gene mutation (2.2%).

**Conclusion:** These results suggest an over-representation of SCN5A and KCNQ2 mutations when compared to the previously described spectrum of LQTS gene mutations in the five most common LQTS genes in a European and North American cohort.

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RESULTS OF CLINICAL TESTING OF A CLOUD COMPUTING BASED AMBULATORY ECG MONITORING AND ARRHYTHMIA DETECTION SYSTEM

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Introduction: Current ambulatory arrhythmia detection systems suffer from high overhead costs related to both maintenance of local computational resource and technician input. Cloud computing offers off-site, scalable, data storage and analysis, at low cost. In this study, we conducted a first-in-human trial of a novel cloud-based arrhythmia detection system (MeMoCloud™). Informatics, Lawrence Livermore National Laboratory, supplied transmission of real-time ECG data to cloud servers for extended periods of ambulatory monitoring. This system has a web and IP interface to both enable and review monitoring data.

Methods: Forty consecutive patients (21 males, 19 females, and ages 18 - 80) with diagnosed primary arrhythmias including atrial fibrillation (11), supraventricular tachycardia (8), paroxysmal atrial fibrillation (5), ventricular ectopy (3), sinus node dysfunction (2), and inappropriate sinus tachycardia (2) were enrolled. Patients were fitted with the device, consisting of 4 body-surface electrodes connected to a recording unit capable of continuous ECG capture and symptom annotation via a press-button feature. Data was transmitted from the device via Bluetooth® to a Smart Phone and subsequently uploaded to the cloud on the 3G commercial cellular network. Custom software analyzed transmitted data in the cloud for occurrence of arrhythmias.

Results: Patients were successfully monitored for 14-30 day periods, with no significant adverse events. Event notification function was confirmed in all patients. Heart rhythm was successfully captured by the device and extracted by automated rhythm analysis in 39.5% cases. Primary arrhythmia events were confirmed within a first pass of cloud computing in the initial 72 hours on monitoring for all patients.

Conclusions: We have demonstrated clinical feasibility of a cloud computing based ECG ambulatory monitoring system. The system holds promise in reducing overhead costs, and streamlining the clinician-computer interactions, required with standard Holter and Event monitoring systems. Use of the application using the IP address interface which supports Holter, event monitoring and Mobile Cardiac Telemetry (MCT) should be evaluated in the near future.

CLINICAL AND ELECTROPHYSIOLOGICAL CHARACTERISTICS OF CHILDREN WITH CHRONIC SINUS TACHYCARDIA

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Purpose: The aim of the study was to identify clinical and electrophysiological characteristics of children with chronic sinus tachycardia.

Methods: 525 children with supraventricular tachycardia (SVT) were examined with chronic sinus tachycardia diagnosed in 23 children (10 boys and 13 girls). Mean age to the moment of the examination was 2.8 ± 3.9 (1-7) years. Average duration of arrhythmia was 1.9 ± 2.4 (0.8 - 16) years. Autonomic tone was estimated in all of the children. Examination included ECG, 24-hour Holter monitor, echocardiogram, treadmill test, transesophageal pacing study and pharmacologic autonomic blockade.

Results: Chronic sinus tachycardia amounted to 4.4% among all SVT in children. Mean age of sinus tachycardia manifestation in boys was 12.1 ± 3.6 (7-17) years, in girls – 10.2 ± 4.9 (3-16) years. 77.3% of children had some complaints: 47.8% had palpitations, 17% had physical exercises intolerance, and 12.5% of children had a history of syncope. In 22.7% arrhythmia was asymptomatic and it was found in 78.5% children. Fifty children, 43.5% of children, and vagotonic in 8.7% of children. On the echocardiograms left ventricular dilatation was found in 1 child only, and 26.8% of patients had mitral valve prolapse in combination with left ventricular abnorlal chords. In transeosophagous pacing study average sinus node recovery time (SNRT) was 741 ± 120.1 (315-1000) ms, average corrected SNRT was 255.8 ± 105.3 (73-450) ms, average maximal AV node conduction rate was 208.8 ± 23.6 (180-280) impulses per minute, AV nodal conduction was absent in 6 children. In 12 children, atrial antiarrhythmic pharmacologic autonomic blockade during transeosophagous pacing study (1% sol. abidantan 0.2 mg/kg IV ± 0.1% sol.atropinis sulfaat 0.04 mg/kg IV) Two groups of children were formed after this trial: in 50% of children intrinsically low heart rate was elevated and maximal AV conduction rate was less than 200 impulses per minute in another half of the group intrinsic heart rate was normal and AV conduction was accelerated.

Conclusions: Chronic sinus tachycardia accounts for 4.4% among all SVT in children; in 50% chronic sinus tachycardia is due to accelerated sinus node autonomy and in 50% it is due to increased sympathetic impact on the regulation of the sinus node activity.
DESCRIPTION OF EXTRASYSTOLES IN HEALTHY PEDIATRIC SUBJECTS
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The purpose of the study is to describe the morphology and origin of isolated extrasystoles found in healthy children. We have included 156 subjects, aged 1 month – 18 yo, who showed extrasystoles in their ECG. Subjects with underlying disease were excluded. Localization of site of the premature beats origin has been done using the QRS morphology on surface ECG.

Results: Most of extrasystoles have a ventricular origin (84%) and a slight male preponderance (1.2 male: 1 female). There are no significant differences between age and origin of the premature beat. They originate in more than one area of the heart but are most common in the outflow tract area. Nearly 80% of premature beats originate from the right ventricular outflow tract that present with a distinct ECG pattern of left bundle branch block and inferior axis. Other common outflow tract sites include left ventricular outflow tract, the aortic sinuses of Valsalva, the area of aorto-mitral continuity or the superior basal septum near the His bundle. They all manifest an early preexcited R-wave transition. Fascicular ventricular premature beats are very rare.

Conclusion: Ventricular premature beats are more frequent than supraventricular extrasystoles in children. Most of them can be classified to have an RVOT origin. It is important to distinguish these from related to arrhythmogenic right ventricular cardiomyopathy because of different prognosis. Despite many morphological similarities, those originating in the LVOT can be accurately identified.

ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY WITH EPSILON WAVES IN PERIPHERAL AND PRECORDIAL LEADS
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A 43-year-old woman with a medical history of severe arrhythmogenic right ventricular cardiomyopathy (ARVC) was admitted to our hospital with symptoms of congestive heart failure. The patient had an implantable cardioverter defibrillator and was referred on the heart transplant waiting list. Standard 12-lead electrocardiogram (S-ECG) revealed sinus rhythm with heart rate of 40 bpm, PR = 200 ms, right frontal axis deviation, incomplete right bundle branch block, QT (interval prolongation (QT) interval 0.4600 msc; QT corrected interval 0.49 msc), T-waves inversion in V1-V6 and in I, II and AVF and small “epsilon waves” (EW) in the right precordial leads (Fig.1a). However, EW were clearly visible also in the peripheral leads, by quadrupling the sensitivity of the recorder(40 mm/sV) (Fig 1b).

EW are low-amplitude waves localized between the end of the QRS complex and the beginning of the ST segment. EW are caused by postactivation of the right ventricular myocardium and are considered a major diagnostic criteria for ARVC.

The reported ECG prevalence of EW in ARVC ranges from 4% to 29%. They are usually seen only in leads V1 through V3. In our view, it is possible that detection of EW also in the limb leads, with a S-ECG, could be related to a severe and extensive involvement of the right ventricle.

Our report suggest that detection rate of EW in other leads beyond “classical leads” V1-V3 may be improved simply by increasing the sensitivity of S-ECG.
CLINICAL USEFULNESS OF BAROREFLEX SENSITIVITY TEST IN THE DETECTION OF CARDIOVASCULAR AUTONOMIC NEUROPATHY IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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University Clinical Hospital Military Memorial Medical Academy – Central Veterans Hospital; Department of Interventional Cardiology and Heart Rhythm Disorders, Lodz, Poland

Introduction: Cardiovascular autonomic neuropathy (CAN) is one of the most common chronic complications of diabetes. It is defined as an impaired control of the cardiovascular system by the autonomic nervous system. The gold standard in detecting it is the Ewing test suite. The usefulness of other methods is still a subject of research. Goal: The goal of this study was to assess the clinical usefulness of baroreflex sensitivity (BRS) test in the detection of CAN in patients with type 2 diabetes mellitus.

Material and Methods: The study included diabetic patients: 24 with CAN, diagnosed through the Ewing test (the mean age 58 ± 7 years, BMI 33.6 ± 5 kg/m², HbA1c 8.3 ± 3; duration of diabetes 13 ± 2.7 years), and 24 without CAN (56 ± 3 years, BMI 32.2 ± 5 kg/m², HbA1c 9.1 ± 2, 9.3 ± 2 years, respectively). The control group consisted of 12 patients without diabetes, homogeneous regarding gender and age. BRS was assessed in the supine (L-BRS), and in the standing position (S-BRS).

Results: L-BRS was lower in the group with CAN vs the non-CAN group (6.2 ± 4 vs 9.6 ± 4 ms/mmHg, p=0.009), S-BRS respectively (8.4 ± 3 vs 6.9 ± 4 ms/mmHg, p=0.02). BRS well differentiates patients with and without polyneuropathy. The highest sensitivity of L-BRS and S-BRS for detecting CAN is by cutoff ≤7.5 ms/mmHg.

Conclusions: The study confirms the usefulness of baroreflex sensitivity in the early detection of CAN among patients with type 2 diabetes. We recommended cutoff points for BRS for detecting CAN among patients with type 2 diabetes mellitus.
EFFECTS OF WORSENING RENAL FUNCTION ON FIBRIN CLOT STRUCTURE IN ATRIAL FIBRILLATION PATIENTS RECEIVING WARFARIN

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1University of Birmingham, University of Birmingham Centre for Cardiovascular Sciences, Birmingham, United Kingdom, and 2Second Affiliated Hospital of Nanchang University, Nanchang, China. People’s Republic of

Introduction: Chronic kidney disease (CKD) is common amongst atrial fibrillation (AF) patients. While warfarin remains the mainstay treatment in stroke prevention in AF, the level of protection conferred against thrombosis is commonly counter-balanced by an increased bleeding risk among those with progressively worse renal function. This is possibly due to changes in fibrin clot structure. Coagulation and clot lysis can be assessed by Thrombelastography/TEG, thrombosis and turbidimetric assays.

Methods: Blood samples from 153 AF patients with renal dysfunction, treated with warfarin, were collected and analysed by TEG, thrombosis and turbidimetric assay. Basic demographics and renal profile (inclusive of CKD status, Glomerular Filtration Rate[GFR] and creatinine level) were also collected. Renal dysfunction is categorised into mild (GFR 60 to >90) and moderate-severe CKD (GFR <60).

All results are analysed by statistical methods involving t-test and Mann-Whitney test.

Results: Using TEG, similar R-time was seen between moderate-severe and mild CKD subjects (7.05 minutes vs 7.58 minutes, p = 0.269).

However, moderate-severe CKD is associated with shorter k-time (1.85 minutes vs 2.12 minutes, p = 0.038) and steeper a-angle (65.2° vs 61.5°, p = 0.027). A tendency towards formation of clot with larger maximum amplitude (MA) was observed (67.4 mm vs 64.2 mm, p = 0.076). However, there is no difference in percentage of clot-aatioy at 60 minutes.

Turbidimetric assay confirmed the anticoagulation effect of warfarin with similar lag-time. Nevertheless, moderate-severe CKD is associated with greater rate of fibrin clot formation (RCF) (203 vs 162, p = 0.045). Fibinogen assay also showed steeper slope of fibrin clot lysis in moderate-severe CKD subjects (55.7 vs 41.5, p < 0.0001) and a tendency for prolonged time to lyse 50% of fibrin clot (206 seconds vs 195 seconds, p = 0.095).

Conclusions: Worsening renal function (with decreasing GFR and increasing creatinine level) is associated in increased thrombotic potential, as shown by altered coagulation with reduced time taken for conversion of fibrinogen to fibrin monomer (reduced k-time), steeper a-angle and increased rate of fibrin clot formation. This will explain the persistent increased incidence of stroke and systemic embolism among CKD patient with AF, despite adequate anticoagulation.

As the resultant fibrin clot formed appears to be abnormal, with thicker fibers which are more sensitive to fibrin clot lysis, this will also explain the increased incidences of hemorrhage in anticoagulated subjects with renal dysfunction.

ICD THERAPIES IN THE ERA OF REMOTE MONITORING: FOLLOW-UP OF 881 PATIENTS WITH A VERY LOW RATE OF INAPPROPRIATE THERAPIES


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Purpose: Remote monitoring (RM) is now accepted as a safe alternative to standard follow-up (FU) for ICD but little is known about rate of therapies in this population in real life.

Methods: We analyzed the long term arrhythmic events and device-related outcomes of patients (pts) equipped with ICD/CRT-D and remote monitoring FU in our institution from 2008 to 2015.

Pts were equipped with Boston (49%), Medtronic (39%), St Jude Medical (11%), Biotronik (3%) and Sorin (2%) RM systems. FU started after hospital discharge. Automatic FU with RM was performed every 3 months, with at least one standard FU (sFU)/year. In emergency cases, pts were invited for in-hospital control visits.

ICD (CRT-D) were programmed with 2 zones (VT zone >180 bpm / VF zone >220 bpm). All RM alerts and related EGMs as well as the reasons for therapies were reviewed by two physicians.

Results: 881 pts (82% male, 64 ± 11 y.o.) were enrolled. 49% had ischemic cardiomyopathy, 35% dilated cardiomyopathy, 38% previous history of AF, 64% were primary prevention ICD. CRT-D (46%) and dual chamber (43%) ICD were mainly represented, single chamber ICD 11%.

During a FU period of 34 ± 15 months, we noted 21 ± 15 automatic RM FU and 2 ± 2 sFU visits/pt. 115 pts (13%) had major alerts: 53 ICD lead dysfunction, 47 batteries depletions, 9 electrical storms, 6 therapies off. Among the 259 pts (29%) with minor alerts, 172 referred to AF, with for 76 pts early detection of unknown AF resulting in therapy modifications. Other minor alerts referred mainly to CRT (loss in biventricular pacing in 138 pts, high LV lead impedance in 6 pts).

Appropriate therapies (app) occurred in 204 pts (23%): 376 app shocks occurred in 97 pts (11%), and 5684 app ATPs in 184 pts (21%).

Inappropriate therapies occurred in 41 pts (5%): 74 inappropriate shocks occurred in 29 pts (3%): and were mainly due to supraventricular tachycardia (AF 52%, atrial tachycardia 10%, sinus tachycardia 14%, lead dysfunction 10%, T over sensing 7%, electromagnetic interference 3%). 285 inappropriate ATPs occurred in 26 pts (3%), due to AF in 50% of cases.

Conclusion: In a large single center observational study, RM has demonstrated to be an effective method of FU for ICD recipients. Early diagnoses of AF or lead failure allow rapid management of patients and are associated with a very low rate of inappropriate shocks.

LEFT ATRIAL APPENDAGE OCCLUDER FOR STROKE PREVENTION - THE INSTITUT JANTUNG NEGARA (THE NATIONAL HEART INSTITUTE OF MALAYSIA) WATCHMAN REGISTRY


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Background: The safety and efficiency of left atrial appendage (Watchman) occluder device for patient not suitable for long oral anticoagulants (OACs) for stroke prevention has been well established in recent clinical trials. Patients from Asia Pacific regions are not well represented in the current pool of data. Could the current evidence for Watchman therapy be translated in a real world experience?

Objective: We sought to characterize the safety and efficacy outcomes of a single center experience with the Watchman device.

Methodology: We conducted a prospective registry from July 2010 to August 2014. A total of 127 patients with non-valvular atrial fibrillation and CHA2DS2VASc score of at least 2 were screened. Inclusion criteria for implantation were: prior bleeding (33%), high risk of bleeding (27%), erratic INR (22.6%), and, poor compliance with medication (13%). Patients were followed up with a trans-esophageal echocardiogram (TEE) at days 5, 180 days and 360 days. All the safety and efficacy data were collected in our hospital’s database.

Results: A total of 115 (90.6%) suitable patients had successful implantation of the LAA occluder. The mean age was 68.1 ± 11.8 years with mean left ventricle ejection fraction of 56.3 ± 11.7%. There were 60 (54.9%) males, mean CHA2DS2VASc score of 4 and HASBLED score of 2.9. Most of patients were on OACs (72.3%) and dual antiplatelet therapy (11.9%) prior the implantation of the device. Majority of the patients were implanted with LAA occluder size 27mm (32.2%) and 24mm (24.3%). Majority (66.6%) were prescribed OACs post implant, followed by Double Anti Platelet in 29.8%. There was no incidence of pericardial effusion, however 2 (1.9%) patients developed non-major gastrointestinal bleed within 7 days of procedure.

Complete endothelialization of LAA occluder was achieved in 97.3% of patients at 45 days, 97.8% at 180 days and 96.7% at 360 days with 94.5%, 91.9% and 96.6% of patients had oral anticoagulation withdrawn respectively.

At 12 months follow-up, one patient (0.86%) had a stroke, none had systemic embolism and 7 patients (6.1%) had a cardiovascular or unexplained death.

Conclusion: To date we have the biggest registry data for Watchman implant in the Asia Pacific region. The outcomes of our LAA occluder registry showed a comparatively safe and effective alternative therapy in preventing embolic events among non-valvular AF patients.
PATTERNS OF NEWLY DETECTED ATRIAL FIBRILLATION AND ANTITHROMBOTIC TREATMENT IN EUROPE (GLORIA-AF PHASE II)

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Purpose: Anticoagulants (vitamin K antagonists [VKAs] or non-VKA oral anticoagulants [NOACs]) are recommended for patients with non-valvular atrial fibrillation (AF) and additional risk factors for stroke, regardless of the AF pattern. We assessed antithrombotic treatment in relation to AF pattern and stroke risk in routine care in Europe.

Methods: Patients with newly identified AF and stroke risk (CHA2DS2VASc score ≥1) were enrolled in the global GLORIA-AF Registry Program and data on initial antithrombotic therapy were collected. This cross-sectional analysis presents treatment according to AF type and stroke risk.

Results: A total of 4,703 patients were enrolled in Europe between Nov 2011 and Feb 2014. Median age: 73 years, 47.2% were female, 72.7% had hypertension, 21.3% diabetes mellitus, and 88.4% had a high stroke risk (CHA2DS2VASc scores ≥2). AF was paroxysmal in 45.4% (n = 2134), persistent in 38.8% (n = 1827), and permanent in 15.7% (n = 740). Of the patients with high stroke risk and paroxysmal AF, 88.8% (n = 1670) were treated with oral anticoagulants as compared to 93.0% (n = 2116) of high-risk patients with persistent/permanent AF. In patients with moderate stroke risk (male and CHA2DS2VASc =1) and paroxysmal or persistent/permanent AF, 81.6% (n = 168) and 88.5% (n = 231) received oral anticoagulation, respectively. The figure shows the initial antithrombotic therapy by AF type and stroke risk.

Conclusions: In the first years of NOAC availability in Europe a high proportion of patients with moderate or high stroke risk received appropriate oral anticoagulation. Antithrombotic practices did not fully reflect guideline recommendations as overall patients with permanent or persistent AF more often received oral anticoagulation as compared to patients with paroxysmal AF.