POSTER SESSION: “BEST ABSTRACTS”

P255

ATRIAL FIBRILLATION IN HYPERTROPHIC CARDIOMYOPATHY: IS A HYPERTROPHIED SEPTUM IMPORTANT?

S.I. Im1, K.M. Park1, E.K. Kim2, S.C. Lee2, S.J. Park2, J.S. Kim2, and Y.K. Orl1
1Keim University School of Medicine, Busan, Korea; Republic of; and 2Samsung Medical Center, Seoul, Korea; Republic of

Objectives: Hypertrophic cardiomyopathy (HCM) is a cardiac disease that leads to sudden cardiac death. Recent studies suggest that the overall survival rate from apical HCM is as high as that of asymmetric HCM. However, the influence of the septum on clinical outcomes remains unsolved.

Methods: We evaluated the effects of a hypertrophied septum on morbidity and mortality in patients with HCM at a single, large center. Patients were followed for a median of 6.1 years and were divided into two groups according to the absence or presence of a predominantly hypertrophied septum.

Results: Among 1,360 patients, 559 (41%) had septal hypertrophy. Ninety-two all-cause deaths and 21 cardiac deaths occurred. The total event rates were significantly higher for HCM that predominantly involved the septum (Group A) compared to those of non-septal or focetal septal HCM (Group B) (p < 0.001). Arhythmias occurred in 371 patients, with a significantly higher incidence in Group A than in non-septal HCM (p < 0.001). Among patients with arrhythmias, the atrial fibrillation (AF) rate was significantly higher in Group A than Group B (p < 0.001). Univariate [2.10 (1.65–2.68) p < 0.001] and multivariate [5.44 (2.29–12.92) p < 0.001] Cox analyses found that Group A was a unique parameter for developing arrhythmias. The hazard ratio for cerebrovascular events in Group A was 1.56 ([1.161–2.121], p=0.003) by univariate Cox analysis.

Conclusions: A predominantly hypertrophied septum is a strong, independent predictor of progression to AF in patients with HCM. The incidence of total cerebrovascular events was higher in cases that predominantly involved the septum.

P256

ACCURACY COMPARISON OF CARDIAC COMPUTED TOMOGRAPHY WITH TRANSESOPHAGEAL ECHOCARDIOGRAPHY FOR DETECTING LEFT ATRIAL APPENDAGE THROMBUS IN PATIENTS WITH ATRIAL FIBRILLATION

Sakakushiro-Watanabe Hospital, Osaka, Japan

Purpose: Transesophageal echocardiography (TEE) is a recommended imaging modality for patients undergoing catheter ablation of atrial fibrillation (AF) to exclude left atrial appendage thrombus (LAA thrombus). This study aimed to compare the diagnostic accuracy of cardiac computed tomography (CCT) with TEE in detecting LAA thrombus.

Methods: Consecutive 2502 patients who underwent both TEE and CCT within 2 weeks before AF ablation were included. If filling defects were seen on early-phase images of CCT, late-phase images were used to detect LAA thrombus.

Results: TEE suggested possibility of thrombus in 35 patients (1.5%), whereas only 11 thrombi (0.5%) were detected by CCT. TEE missed one thrombus identified by CCT. Using TEE as reference for thrombus detection, CCT had sensitivity of 29%, specificity of 99%, positive predictive value (PPV) of 91% and negative predictive value (NPV) of 99%. However, there were 19 false positive patients by TEE whose thrombus-like objects were retrospectively diagnosed as spontaneous echocardiographic contrast or pectinate muscles or artifacts by the findings of repetitive TEE or CT and patient background. The overall sensitivity, specificity, PPV and NPV of CCT were improved to 65%, 100%, 100% and 99%, respectively.

Conclusions: TEE could overestimate the detection of LAA thrombus and CCT could underestimate it. We should judge the results in a comprehensive manner for detecting LAA thrombus in patients undergoing AF ablation.

P257

TECHNICAL CHALLENGES OF ROTOR IDENTIFICATION DURING ATRIAL FIBRILLATION USING PHASE SINGULARITY DETECTION

P. Kuklik1, A. Van Hummelen1, S. Zeenering2, B. Muecke1, L. Pison3, H.J. Crijns2, S. Wijffels1, and U. Schotten1
1Maastricht University, Department of Physiology, Maastricht, Netherlands; 2Maastricht University Medical Centre (MUMC), Department of Cardiology, Maastricht, Netherlands; and 3University Medical Center Hamburg Eppendorf, Department of Cardiology, Electrophysiology, Hamburg, Germany

Purpose: Recent studies report presence of stable rotors during persistent atrial fibrillation (PersAF) defined as phase singularities (PS) mapped using basket type catheters. Purpose of this study is to explore technical difficulties inherent to this type of mapping approach.

Methods: Two mapping approaches were used to map both atria: (i) endocardial mapping using 64-electrode mapping catheter (Constellation, Boston Scientific) in N=19 pts undergoing catheter ablation of PersAF and (ii) high-density epicardial mapping in N=21 pts undergoing CABG surgery (12 pts with Paracor AF (PAF) and 9 with PersAF) using 16x16 electrodes arrays with 1.5 mm inter-electrode spacing (10 recordings). Electrogram phase was reconstructed using Hilbert transform preceded by sinusoidal recomposition. Rotors were detected as PS at a set of four neighboring electrodes with a condition of lifespan greater than 1 cycle length of AF. Endocardial mapping coverage was assessed using atrial geometry reconstructed using NavX system and defined as the % of total area within 1 cm from the basket electrodes.

Results: Following problems were identified with respect to sensitivity and specificity for detection of rotors: (i) low atrial coverage using a basket catheter: in the most optimal position the coverage was 43 ± 16% in LA and 60 ± 23% in RA, (ii) lack of objective method to determine basket electrode contact with atrial wall resulting in potential inclusion of non-contact electrograms into analysis, (iii) short lifespan of detected PS in high-density mapping: 1.6 ± 0.6 rotations (max: 6.8 rotations) and their migratory behaviour: drift length 12.6 ± 8.0 mm (max: 71 mm), (iv) poor specificity of PS detection using a grid of 4 electrodes. Analysis performed on an extended detection grid (each PS point was confirmed or rejected based on assessment on 4x4 electrodes grid around PS point) resulted in only 9% of PS points confirmed as rotating waves.

Conclusions: Identification of rotational waves using phase singularity detection in endocardial maps recorded with basket catheters has multiple limitations which should be addressed before use in ablation strategies.

P258

ABLATON SCAR RECOVERY IS SIGNIFICANTLY STRONGER IN ATRIAL FIBRILLATION FREE PATIENTS

P. Galf1, C.F. Puschel2, A. Morris1, J. Cato1, G. Kau1, E. Khilimorskii1, R. Ranjan1, N. Akoum1, and N.F. Marrouche1
1Isala Clinics, Cardiology, Zwolle, Netherlands; 2University of Utah, CARMA center, Salt Lake City, United States of America; and 3University of Utah, SCI Institute, Salt Lake City, United States of America

Background: There is limited data on the recovery of scar in the years after ablation as assessed by delayed enhancement (DE)-MRI in patients with atrial fibrillation (AF).

Methods: 70 consecutive patients with multiple DE-MRIs after ablation were identified and included. The MRIs were performed 3 months, 1 year and 3 years after ablation. Scar tissue was determined manually. The scar tissue of the total left atrial surface area was compared with a Student’s t-test.

Results: Mean age was 71.9 ± 7.3 years with paroxysmal AF (PAF) in 37%. The mean scar burden was 14.5 ± 7.3% at baseline, and was significantly reduced after 1 year (12.6 ± 9.8%, P=0.011) and between the baseline and the 3 years MRIs (7.3% at baseline, and was significantly reduced after 1 year (12.6 ± 9.8%, P=0.017). 31 patients developed an AF recurrence during follow-up. The reduction in scar burden was significantly stronger between AF free and AF recurrence patients for the difference between the baseline and the 1 year MRIs (−3.01 ± 4.3 vs. −0.48 ± 5.3, P=0.031) and between the baseline and the 3 years MRIs (−6.52 ± 7.0 vs. −0.01 ± 8.3, P=0.011).

Conclusion: The post-ablation scar burden recovers in the years after ablation for AF. Furthermore, the scar burden recovery was significantly stronger in patients who were AF free compared to AF recurrence patients.
CLINICAL EXPERIENCE WITH A NOVEL FETAL HEART MONITOR APPROACH TO PREVENTING PHRENIC NERVE INJURY DURING CYROBALLOON ABLATION OF ATRIAL FIBRILLATION

A. Patel, and R.S. Banker
University of California, Irvine, Medicine, Division of Cardiology, Orange, United States of America

Background & Objectives: Phrenic nerve palsy remains the most frequent complication associated with cryoballon-based pulmonary vein (PV) isolation. We sought to characterize our experience using a novel monitoring technique for the prevention of phrenic nerve palsy.

Methods and Results: One hundred and thirteen consecutive cryoballon-based PV isolation procedures utilizing the 28 mm Medtronic Arctic Front Advance cryoballon ablation catheter between October 2013 and August 2014 were studied. All patients underwent diaphragmatic fetal heart monitoring using an electric doppler ultrasonic probe. In addition, a digital sound meter (DSM) was used to quantitate the amplitude of the sound produced by the continuous electric doppler ultrasound (CEDU), also known as fetal heart monitor. The CEDU was used to monitor the phrenic nerve contractions. First, a baseline measurement of phrenic nerve contraction was quantified with the DSM. Then the CEDU monitoring the phrenic nerve contraction was conducted during cryoblation of the right pulmonary veins. A baseline decibel reading was obtained of the phrenic nerve contraction utilizing the DSM prior to ablation of each pulmonary vein. During cryoblation of each pulmonary vein the DSM was monitored for 15% reduction from the baseline decibel reading. Cryoblation was terminated immediately using a double stop technique when the 15% reduction from baseline was perceived on the DSM. The double stop technique used encompasses both cessation of cryoblation as well as deflation of the balloon, thereby ensuring no further contact of the cryoballon balloon and pulmonary vein.

There were no cases of phrenic nerve palsy that persisted beyond the end of the procedure. In total there were 9 cases where the double stop technique was utilized, and no complete loss of phrenic nerve contraction was recorded using this technique.

Conclusion: Quantification of phrenic nerve contraction using a combination of fetal heart monitoring of the phrenic nerve contraction and a digital sound meter is a reliable and easy to perform technique to prevent phrenic nerve loss during cryoballon ablation of atrial fibrillation.

EXTENT OF ATRIAL LOW VOLTAGE PREDICTS OUTCOMES AFTER ABLATION FOR PERSISTENT ATRIAL FIBRILLATION

University Heart Center Freiburg-Bad Krozingen, Bythology, Bad Krozingen, Germany

Introduction: Atrial fibrosis is implicated in maintenance of persistent atrial fibrillation (AF). We hypothesized that extent of atrial low-voltage may predict outcome in patients undergoing ablation for persistent AF.

Methods: 80 consecutive patients with persistent AF (64+/9 yr) underwent left atrial (LA) voltage mapping at high density (912+/134 sites) in AF using a 20-pole Lasso catheter and the Velocity (SJM) or Carto3 (BW) system. After completion of PV isolation, patients underwent additional ablation of prolonged and fractionated electrograms within low voltage sites (LV<0.5mV). Single procedural recurrence rate (AF and atrial tachycardia (AT)) was assessed at 6, 9, and 12 months by 24h ECG.

Results: The mean extent of LA low-voltage (<0.5mV) was 35±27% for the total study group. Atrial tachyarrhythmia (AT and AF) was maintained in 57/80 (71%) patients after a single procedure and a mean follow-up of 9.1+/2 months. Atrial fibrhythmia freedom was 87% (±0.21) in patients with low extent (<15%), group A, of LA low voltage (< 0.5mV+17/24) in patients with intermediate extent (15%–35%), group B and 61% (±0.33) in patients with high extent (>35%, group C) (p=0.04 for A vs C). AF freedom did not differ significantly between these three groups (87% vs. 21% in group A, vs 75% (±0.24) in group B, vs 79% (±0.31) group C, p=0.5).

Conclusion: The baseline extent of LA low-voltage sites in AF predicts rate of arrhythmia freedom after a single ablation for persistent AF. Patients with increased low voltage areas (>35% of LA surface) present an increased risk for arrhythmia recurrence especially for atrial tachycardia.

FEASIBILITY AND SAFETY OF UNINTERRUPTED PERI-PROCEDURAL APIXABAN ADMINISTRATION IN PATIENTS UNDERGOING RADIOFREQUENCY CATHETER ABLATION FOR ATRIAL FIBRILLATION: RESULTS FROM A MULTICENTER STUDY

L. Di Bnase1, D. Lakkireddy, C. Trivedi, T. Denckel, M. Martinez, S. Mohanty1, P. Mohanty1, J. Sanchez1, J.D. Burkhart2, and A. Natale1
1Texas Cardiac Arrhythmia Institute at St David Medical Center, Un. of Texas and University of Foggia, Austin, United States of America; 2University of Kansas Medical Center, Kansas City, United States of America; 3Heart Center Bad Neustadt, Bad Neustadt a.d. Saale, Germany; and 4Elisabeth University Teaching Hospital, Linz, Austria

Introduction: Periprocedural anticoagulation management with uninterrupted warfarin with a “therapeutic INR” represents the best approach reducing both thromboembolic and bleeding complications in the setting of catheter ablation for atrial fibrillation (AF). The purpose of this study was to evaluate the safety and feasibility of uninterrupted apixaban administration in this setting.

Methods: We performed a prospective multicenter registry of AF patients undergoing radiofrequency catheter ablation at 4 Institutions in USA and Europe with an uninterrupted apixaban setting.

Results: A subset of 54 patients underwent brain dMRI to detect silent cerebral ischemia (SCI).

Conclusion: Uninterrupted apixaban administration in patients undergoing AF ablation, appears to be feasible, and effective in preventing clinical and silent thromboembolic events without increasing the risk of major bleedings.

IS TEE MANDATORY IN PATIENTS UNDERGOING ABLATION OF AF WITH UNINTERRUPTED NOACs? RESULTS FROM A PROSPECTIVE MULTICENTER REGISTRY

L. Di Bnase1, J.D. Burkhart2, C. Trivedi1, S. Mohanty1, P. Mohanty1, D. Lakkireddy2, J. Sanchez2, G.J. Gallaghern1, S. Beberez1, and A. Natale1
1Texas Cardiac Arrhythmia Institute at St David Medical Center, Un. of Texas and University of Foggia, Austin, United States of America; 2University of Kansas Medical Center, Kansas City, United States of America; and 3California Pacific Medical Center, San Francisco, United States of America

Introduction: Transesophageal Echocardiography (TEE) is suggested in patients undergoing atrial fibrillation ablation while on novel oral anticoagulants (NOACs). We sought to evaluate whether TEE is necessary before AF ablation in patients treated with NOACs.

Methods: We performed a prospective multicenter registry of AF patients undergoing radiofrequency catheter ablation on uninterrupted NOACs (apixaban and rivaroxaban).

Results: A total of 970 patients were enrolled in the study. The mean age was 69.5±9 years with 286 (71.5%) male and 334 (83.5%) patients having non-paroxysmal AF. There were no differences in major (1% vs. 0.5%, p=1.0), minor (3.5% vs. 2.5%, p=0.56) and total bleeding complications (4.5% vs. 3.0%, p=0.43) between the apixaban and the warfarin group respectively.

Conclusion: Uninterrupted apixaban administration in patients undergoing AF ablation, appears to be feasible, and effective in preventing clinical and silent thromboembolic events without increasing the risk of major bleedings.
A total of 19 patients (9 male, median age 60.5 yrs) underwent mIBG nuclear imaging. In order to facilitate localization of these GPs, a novel imaging study has been introduced that demonstrated focal uptake of iodine-123 metaiodobenzylguanidine (mIBG, an analog of noradrenaline) in the atrial epicardium. This information was combined with 3D surface reconstruction from contrast computed tomography (cCT) or cardiac magnetic resonance (CMR).

Methods: A total of 19 patients (9 male, median age 60.5 yrs) underwent mIBG nuclear studies using a dedicated cardiac camera (D-SPECT, Spectrum Dynamics). The acquired data was merged with the 3D imaging and subsequently imported into the 3D-electroanatomical mapping system (CARTO, Biosense Webster). During invasive AF ablations (performed in a total of 11 pts), these sites were mapped to perform high frequency stimulation (HFS) to confirm GP locations.

Results: In all pts, both the mIBG and CT or CMR scans were performed without any complications. Subsequently, the acquired information was merged. Median number of GPs was 5, while pre-ablated patients presented with 1-4 GPs. Locations corresponded to anatomical GP sites (LA & RA) in the majority of patients, but individual variations were observed. Sites did not correspond to CFAE sites and radiofrequency ablation resulted only in a single case in transient AV nodal slowing. No conversion to SR occurred during GP ablation. PV isolation was added in all but 1 pt (had previous ablation). Follow-up of in median of 8.9 months demonstrated SR in all PAF and persistent AF patients (1 redo for atrial reentry) and initial AF recurrence was added in all but 1 pt (had previous ablation). Further studies in larger patient cohorts need to confirm these initial observations.

Conclusion: The combination of mIBG and 3D imaging provides a novel type of “road map” for localizing GPs during AF ablation. As an add on to PV isolation, this strategy was found to be beneficial for patients with PAF and persistent AF. In longstanding persistent AF (with multiple previous ablations) the effect of SR restoration was delayed but achievable. Further studies in larger patient cohorts need to confirm these initial observations.
THE SUBSTRATE ANALYSIS USING FAST-FOURIER TRANSFORM OF THE LOCAL VENTRICULAR SIGNALS IN PATIENTS WITH POSTINFARCTION VENTRICULAR TACHYCARDIA

K. Kuroki,1 A. Nogami,1 M. Igarashi,1 Y. Komatsu,2 S. Komuro,2 K. Kusuoki,2 T. Machino,2 N. Murakoshi,3 Y. Sekiguchi4 and K. Aonuma1

1University of Tsukuba, Cardiovascular Division, Tsukuba, Japan; and 2Yokohama Rosai Hospital, Cardiovascular Department, Yokohama, Japan

Purpose: A right bundle branch block (RBBB) with superior axis electrocardiographic (ECG) morphology is common in patients with idiopathic ventricular arrhythmias (VAs) originating from left posterior fascicle (LPF), left ventricular posterior papillary muscles (PPM), and rarely from the cardiac apex. It is important to distinguish the apical crux VA from VAs originating from LPF and PPM which are located endocardially adjacent to the cardiac crux. Such differentiation is important in order to counsel patients and for pre-procedure planning with possible epicardial ablation approach. We describe ECG and clinical characteristics of idiopathic VA presenting with RBBB and superior axis.

Methods: We studied 50 patients who underwent successful catheter ablation of idiopathic VAs originating from the LPF (n = 22), LV-PPM (n = 21) and apical-crux (n = 7). We analyzed QRS morphology, QRS duration and precardial maximum deflection index (MDI) during the VA. The analysis of the QRS morphology focused on the following characteristics: QS pattern or magnitude of R-wave in lead V6; QS pattern or R pattern in the inferior leads; monophasic R wave or rS pattern in aVR.

Results: Syncope was more frequently seen in apical-crux VA as compared with other-VAs (57% versus 6%, p < 0.001). Patients with apical-crux VA more frequently had an MDI > 0.55 compared with LPF-VA and PPM-VA (P = 0.02). A monophasic R wave in aVR and QS or r/S ratio < 0.15 in V6 (p < 0.001) could distinguish apical-crux VA from other-VAs with a high accuracy. All patients with VA underwent attempted ablation in the endocardium (success rate: LPF 89%, PPM 78% and Crux 14%). Only 1 of 7 patients with apical-crux VA had acute success with ablation in the middle cardiac vein. In 2 of apical crux patients, epicardial ablation using subxiphoid approach was performed successfully.

Conclusions: This is the first study to describe the clinical and ECG characteristics that differentiate apical crux VAs from other VAs with RBBB and superior axis. We could distinguish LPF-VA, PPM-VA and apical-crux-VA, using the combination of the clinical and ECG characteristics. These findings might be useful for counseling patients and planning an ablation strategy.

BACKGROUND

It is known that conducting channels of ventricular tachycardia (VT) identified by voltage limit adjustment (VLA) include many bystander isthmuses. The goal of this study is to evaluate the efficacy of fast-Fourier transform (FFT) analysis to depict the true VT channels.

Methods: FFT analysis of ventricular potentials during sinus rhythm was performed in 11 VTs of 9 postinfarction patients. The true VT channels were identified by entrainement mapping or multiple pace mapping within the low-voltage area. The FFT data were expressed as an area ratio (AR) that quantified the relative contributions of 40-1000 Hz frequencies. The high AR area between the low AR areas on 3-dimensional map was regarded as high-frequency channel. We examined the relationship between the FFT or VLA channels and the true VT channels.

Results: Eighteen channels were depicted by VLA in all 9 patients. However, true channels were determined in only 8 of 18 VLA isthmuses. Eleven high-frequency channels were detected by FFT map in all 9 patients, and 9 of 11 channels were the active channels during VT. FFT map could find true VT channels more precisely than VLA map (9 of 11 vs. 8 of 18, p < 0.01). Conclusions: A three-dimensional FFT map can be a novel substrate map that provides the new information to assume the true VT channels, especially in the intramural circuits.

Background: It is known that conducting channels of ventricular tachycardia (VT) identified by voltage limit adjustment (VLA) include many bystander isthmuses. The goal of this study is to evaluate the efficacy of fast-Fourier transform (FFT) analysis to depict the true VT channels.

Methods: FFT analysis of ventricular potentials during sinus rhythm was performed in 11 VTs of 9 postinfarction patients. The true VT channels were identified by entrainement mapping or multiple pace mapping within the low-voltage area. The FFT data were expressed as an area ratio (AR) that quantified the relative contributions of 40-1000 Hz frequencies. The high AR area between the low AR areas on 3-dimensional map was regarded as high-frequency channel. We examined the relationship between the FFT or VLA channels and the true VT channels.

Results: Eighteen channels were depicted by VLA in all 9 patients. However, true channels were determined in only 8 of 18 VLA isthmuses. Eleven high-frequency channels were detected by FFT map in all 9 patients, and 9 of 11 channels were the active channels during VT. FFT map could find true VT channels more precisely than VLA map (9 of 11 vs. 8 of 18, p < 0.01). Conclusions: A three-dimensional FFT map can be a novel substrate map that provides the new information to assume the true VT channels, especially in the intramural circuits.

CONCLUSIONS

A Right bundle branch block (RBBB) with superior axis electrocardiographic (ECG) morphology is common in patients with idiopathic ventricular arrhythmias (VAs) originating from left posterior fascicle (LPF), left ventricular posterior papillary muscles (PPM), and rarely from the cardiac apex. It is important to distinguish the apical crux VAs from VAs originating from LPF and PPM which are located endocardially adjacent to the cardiac crux. Such differentiation is important in order to counsel patients and for pre-procedure planning with possible epicardial ablation approach. We describe ECG and clinical characteristics of idiopathic VA presenting with RBBB and superior axis.

Methods: We studied 50 patients who underwent successful catheter ablation of idiopathic VAs originating from the LPF (n = 22), LV-PPM (n = 21) and apical-crux (n = 7). We analyzed QRS morphology, QRS duration and precardial maximum deflection index (MDI) during the VA. The analysis of the QRS morphology focused on the following characteristics: QS pattern or magnitude of R-wave in lead V6; QS pattern or R pattern in the inferior leads; monophasic R wave or rS pattern in aVR.

Results: Syncope was more frequently seen in apical-crux VA as compared with other-VAs (57% versus 6%, p < 0.001). Patients with apical-crux VA more frequently had an MDI > 0.55 compared with LPF-VA and PPM-VA (P = 0.02). A monophasic R wave in aVR and QS or r/S ratio < 0.15 in V6 (p < 0.001) could distinguish apical-crux VA from other-VAs with a high accuracy. All patients with VA underwent attempted ablation in the endocardium (success rate: LPF 89%, PPM 78% and Crux 14%). Only 1 of 7 patients with apical-crux VA had acute success with ablation in the middle cardiac vein. In 2 of apical crux patients, epicardial ablation using subxiphoid approach was performed successfully.

Conclusions: This is the first study to describe the clinical and ECG characteristics that differentiate apical crux VAs from other VAs with RBBB and superior axis. We could distinguish LPF-VA, PPM-VA and apical-crux-VA, using the combination of the clinical and ECG characteristics. These findings might be useful for counseling patients and planning an ablation strategy.

CARDIAC IMPLANTABLE ELECTRONIC DEVICES ADVERSE EVENTS REPORTING SYSTEM (CIED_AERS): RATIONALE AND PRELIMINARY RESULTS

K. R. Silva,1 B. A. Alves1, T. S. Kawauchi1, C. M. M. Albertini1, J. V. Barros2, I. C. Maurino1, G. Melo1, M. Martinelli1, and R. Costa1

1Heart Institute (InCor) - Clinics Hospital of the University of São Paulo Medical School, São Paulo, Brazil; and 2Clinics Hospital of the University of São Paulo Medical School, NEIT, São Paulo, Brazil

Introduction: The reporting of serious adverse events is a requirement for clinical studies necessary to ensure the protection of human subjects. The reporting process is a multi-step procedure, involving a number of individuals from initiation to final review, and must be completed in a timely fashion. To effectively satisfy these requirements, we developed an electronic Adverse Events Reporting System (AERS) web platform designed for cardiac implantable electronic devices (CIED) patients denominated as CIED_AERS.

Methods: Prospective and multicenter registry of all CIED procedures performed at 13 cardiovascular centers. Outcome measures will be complications, mortality, re-operations, re-hospitalizations and costs over 12-months of follow-up. The CIED_AERS platform was designed based on validated international medical terminology (MedDRA, AHA/ACC). CIED_AERS combines three different data sources: electronic health records, REDCap (Research Electronic Data Capture) and a Business Process Management (BPM) software in order to provide a simple and user-friendly interface for data collection and management.

Preliminary Results: Data from 1,354 consecutive CIED procedures performed between January 2014 and January 2015 were collected by using the CIED_AERS platform. The majority of patients (53.1%) underwent new CIED implants. Median age was 68 years (range: 1 day to 99 years old). A total of 55 patients (4.5%) experienced at least one complication before the discharge and 48 (4.1%) within the first 6 months. A total of 15 (5.6%) patients died. Three patients died from infection related to the CIED procedure. According to the Adverse Events Committee there was no indication that any other patients died from procedure-related complications.

Conclusion: CIED_AERS is a flexible and suitable solution to perform the reporting and monitoring of adverse events in multicenter research settings. Such approach has the potential to facilitate data integration between healthcare and research settings, also being an useful framework to be used in other biomedical registries.
MINIMIZED VENTRICULAR PACING TO PREVENT THE FIRST ONSET OF AF IN PACEMAKER PATIENTS WITHOUT ATRIAL ARRHYTHMIA HISTORY: RESULTS FROM THE ANSWER STUDY

S. Benoua1, P. Defaye1, J. Moreno1, G. Macaluso2, G. Jauvert3, M. Barbut4, J. Noah5, E. Garcia Campo6, P.H. Sicot7, and M.O. Stockburger8, ANSWER Study Investigators

1Clinic Pasteur de Toulouse, Cardiology - Management of Cardiac Arrhythmias, Toulouse, France; 2University Hospital of Grenoble, Cardiology, Grenoble, France; 3University Hospital Ramon y Cajal de Madrid, Madrid, Spain; 4Private Hospital Beauregard, Marseille, France; 5Clinique Medico-Chirurgicale Ambroise Pare, Neuilly sur Seine, France; 6Nouvelles Cliniques Nantaises, Nantes, France; 7Cardiologiem, Hamburg, Germany; 8Hospital Xeral-Cies, Vigo, Spain; 9Sorin Group, Clamart, France; and 10Charite University Hospital, Berlin, Germany

Introduction: Atrial fibrillation (AF) is a frequent comorbidity in the pacemaker (PM) patient population and has been associated with high risk of heart failure (HF), stroke and death. The aim of this post hoc analysis of the ANSWER study was to identify predictors of first onset of AF occurrence within 3 years after implantation.

Methods: ANSWER is a randomized, multicenter, international trial comparing the SafeR mode, designed to reduce unnecessary right ventricular pacing (Vp), with standard DDD (AV delay left to physician’s discretion) for a three year follow-up. Enrolled patients (pts) suffered from sinus node disease (SND), intermittent AV block (AVB) or allegedly permanent AVB, with or without atrial arrhythmia (AA). One month after implant, patients (pts) were randomized 1:1 to either SafeR or DDD. First onset of AF was ascertained from the pacemakers’ memories. Predictors of AF were identified using a Cox proportional-hazards model in pts without previous AA history among 13 parameters (age, indication, gender, NYHA class, LVEF, coronary disease, cardiomyopathy, valvular disease, HF history, arterial hypertension and pacing mode).

Results: Out of the total 650 pts enrolled in the ANSWER study, 380 pts (58.6%) were without history of AA (71.4% males, 40.9% SND, 51.9% intermittent AVB and 7.2% permanent AVB). Among them, 369 pts were randomized (184 in SafeR and 185 in DDD). One month after implant, patients (pts) suffered from sinus node disease (SND), intermittent AVB or allegedly permanent AVB, with or without atrial arrhythmia (AA). One month after implant, patients (pts) were randomized 1:1 to either SafeR or DDD. First onset of AF was ascertained from the pacemakers’ memories. Predictors of AF were identified using a Cox proportional-hazards model in pts without previous AA history among 13 parameters (age, indication, gender, NYHA class, LVEF, coronary disease, cardiomyopathy, valvular disease, HF history, arterial hypertension and pacing mode).

Conclusion: In a sub-set of the ANSWER study including patients without history of AA, older age and primary indication AVB were identified to be independent predictors of first onset of AF. In addition, minimized Vp proved to be superior to standard dual chamber pacing to prevent the first onset of AF in the whole cohort.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Hazard Ratio</th>
<th>95% Lower Limit for Hazard Ratio</th>
<th>95% Upper Limit for Hazard Ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomization group</td>
<td>SafeR</td>
<td>0.766</td>
<td>0.587</td>
<td>0.999</td>
<td>0.049</td>
</tr>
<tr>
<td>Age</td>
<td>per 1 year increment</td>
<td>1.013</td>
<td>1.001</td>
<td>1.026</td>
<td>0.035</td>
</tr>
<tr>
<td>Primary indication</td>
<td>AVB</td>
<td>0.676</td>
<td>0.517</td>
<td>0.884</td>
<td>0.004</td>
</tr>
</tbody>
</table>

EARLY ELECTRICAL PERFORMANCE OF A NOVEL LEADLESS TRANSCATHETER PACEMAKER SYSTEM: DATA FROM THE MICRA CLINICAL STUDY

C. Steiwender1, P. Ritter2, G. Duray3, K. Socziina4, L. Chintz5, O. Razali6, L. Mont7, T. Sheldon8, K. Stromberg9, and D. Reynolds10

1Linz General Hospital, Johannes Kepler University School of Medicine, Department of Cardiology, Linz, Austria; 2CHU Université de Bordeaux and L’Institut de Rhumatologie et de Modélisation Cardiologique LIRYC, Department of cardiaq pacing and electrophysiology, Bordeaux, France; 3Medical Centre, Hungarian Defence Forces, Clinical Electrophysiology Department of Cardiology, Budapest, Hungary; 4Kyorin University Hospital, Department of Cardiology, Tokyo, Japan; 5New York University, New York, United States of America; 6National Heart Institute, Electrophysiology and Pacing Unit, Kuala Lumpur, Malaysia; 7Università de Barcelona, Hospital Clinic, Catalonia, Spain; 8Medtronic Inc., Mounds View, MN, United States of America; and 9University of Oklahoma Health Sciences Center, OU Medical Center, Cardioccualr Section, Oklahoma City, Oklahoma, United States of America

Introduction: The longevity of Micra® transcatheter pacing system is of special interest. The objective was to describe pacing thresholds at implant and at Month 3 (M3) with focus on the strength duration curve, longevity and threshold > 1.0V.

Methods: Threshold (T), impedance (Z), percentage (%VP) and heart rate (HR) were measured in 60 patients at implant and M3. The strength-duration curve including rheobase and chronaxie was determined based on pacing thresholds at 0.24, and 1.0 ms pulse width using the Lapicque equation, thresholds at 0.4 ms were also collected. The longevity was estimated from the M3 threshold, %VP, HR, and Z.

Results: Sixty patients completed the M3 follow-up. Nearly all patients (59/60) were programmed to the nominal 0.24ms pulse width. T at implant was 0.57 ± 0.31V at 0.24ms, 0.46 ± 0.29V at 0.4 ms; and 0.37 ± 0.22V at 1.0ms. T at M3 was 0.51 ± 0.22V at 0.24 ms, 0.43 ± 0.18V at 0.4ms, and 0.34 ± 0.13V at 1.0ms. There was a trend towards lower T at M3 vs. implant (p=0.057). The M3 rheobase=0.29V and chronaxie=0.18ms (Fig). Maximum pacing T was 2.0V at implant and 1.25V at M3.

Conclusion: Pacing threshold of the Micra pacemaker is low at implant and stable at M3. Estimated longevity of the device is comparable with current VVI pacemaker systems.
HEART RHYTHM CONDUCTION DISTURBANCES IN PATIENTS WHO UNDERWENT TRANSCATHETER AORTIC VALVE IMPLANTATION - TAVI

B. Stenhagen1, K. Mårtensson2, P. Clouder3, J. Kalarus4, and M. Zembalu5

1Department of Cardiology, Compendium Heart Diseases & Electrotherapy, SRCH, Medical University of Szlejem, Szlejem, Poland; 2SZSZC, Department of Cardiology and Transplantology, Szlejem, Poland;
3Department of Cardiology, Gulbenkian Institute of Science, Lisbon, Portugal; 4Brussels Cardiovascular Institute, Brussels, Belgium; and 5Orli Clinic, Brussels, Belgium

Very few data exist on the clinical impact of transcatheter aortic valve implantation (TAVI) on heart rhythm conduction disturbances and early predictors for pacemaker (PM), implantable cardioverter defibrillator (ICD) or cardiac resynchronization therapy (CRT-D).

Methods: We analyzed 1,013 patients from POLTAVI registry (13.6% of whom PM or ICD or CRT-D was implanted during hospital stay) with severe symptomatic aortic stenosis and high risk for surgery.

Results: Before TAVI procedure in patients who needed PM or ICD or CRT-D implantation after TAVI significantly more often RBBB (P=0.004), VF/VT incidence (P=0.015) and larger aortic annulus diameter (P=0.007) were observed. During TAVI procedure in patients with implanted pacing devices significantly more often RV pacing was needed (P=0.001). In ESC performed after TAVI in patients who needed pacing device implantation significantly wider QRS (≥120 ms) and more often bifascicular block with or without RBBB block were observed (P=0.002). Early predictors of Edwards Sapien Valve were qualified for implantation of pacing device. The independent risk factor for electropacing after TAVI in logistic regression analysis was CoreValve implantation (HR 3.95; 95% CI 1.78-8.65; P=0.0007). Conclusions: The prevalence of pacing procedure in TAVI registry is nearly the same as described in literature. The independent risk factor for PM implantation was CoreValve implantation. RBBB before the TAVI procedure bifascicular block with or without RBBB block, necessary for electropacing during the TAVI procedure and larger aortic valve diameter were the main reasons to long-term pacing.

<table>
<thead>
<tr>
<th>ECG after TAVI</th>
<th>without pacing device</th>
<th>with pacing device</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinus rhythm</td>
<td>199 (79.6%)</td>
<td>10 (23.5%)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Heart rate (beats/min)</td>
<td>73 ± 12.0</td>
<td>71 ± 12.7</td>
<td>0.03</td>
</tr>
<tr>
<td>QRS (ms)</td>
<td>137.5 ± 27.4</td>
<td>137.3 ± 36.4</td>
<td>0.0002</td>
</tr>
<tr>
<td>Bifascicular block</td>
<td>82.84%</td>
<td>75 (15.6%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Bifascicular block and A-V block</td>
<td>6 (2.1%)</td>
<td>9 (13.1%)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

PREVALENCE OF CARDIAC RESYNCHRONIZATION THERAPY: EFFECT OF EVOLVING CLINICAL GUIDELINES

M. Stahlberg1, K. Mårtensson2, C. Linde3, F. Braunschweig1, M. Edner1, and L.H. Lund3

1Karolinska University Hospital, Department of Cardiology, Stockholm, Sweden; 2Uppsala Clinical Research Center, Uppsala, Sweden; and 3Lundagård University, Department of Cardiology and Department of Medicine and Health Sciences, Linköping, Sweden

Objective: To describe the prevalence of indication for cardiac resynchronization therapy (CRT), applying evolving clinical guidelines recommendations.

Methods: The study population was 17,525 patients in the Swedish Heart Failure Registry with reduced ejection fraction (≤39%). Prevalence of indication for CRT was defined as actual % with CRT criteria not possible to assess but all assumed to have met criteria (%) - 5% of patients without CRT but meeting criteria for any CRT recommendation in clinical guidelines (heart failure and pacing) published by the European Society of Cardiology (ESC) and American Heart Association (AHA/ACC) in 2007 (ESC/AHA 2007, 2010 ESC/AHA 2012, ESC 2012 and AHA/ACC 2012 and 2013 ESC 2013 and AHA/ACC 2013).

Results: The actual prevalence of CRT was 11%. The prevalence of indication for CRT in the study population increased significantly from 27% when applying the first guideline recommendations for CRT indication (ESC/AHA 2007) to 39% when applying the most recent guidelines (ESC 2013)(Figure).

Conclusions: Actual CRT utilization is orders of magnitude lower than indicated, regardless of which guidelines are considered. The proportion of patients with HF and reduced EF that has an indication for CRT increases significantly and substantially when applying more recent guideline recommendations for CRT use. This may primarily reflect the more recently documented efficacy of CRT in less symptomatic patients (NYHA II).

PREVALENCE AND CLINICAL SIGNIFICANCE OF LBBB ACCORDING TO CLASSICAL OR STRICT DEFINITION CRITERIA IN PERMANENT PACEMAKER PATIENTS

A. Mocci1, G.B. Bondolfi1, M. Lovric1, A. Velecoscu1, O. Rosi2, M. Leggio2, and D. De Cristofaro2

1Maria della Stella Hospital, Orvieto, Italy; 2Boston Scientific Spa - Italy, Milan, Italy; and 3San Filippo Neri Hospital, Rome, Italy

Purpose: Previous studies have shown that the presence of Left Bundle Branch Block (LBBB) is associated with an increased risk of cardiac mortality and HF. Recently, new criteria to define strict LBBB have been proposed. We aimed to compare QRS ≥140 ms for men and ≥130 ms for women along with mid-QRS notching or slurring in ≥2 contiguous leads. We assessed the prevalence and the prognostic significance of LBBB according to classical (QRS ≥120 ms) or strict criteria in permanent pacemaker patients.

Methods: We retrospectively enrolled all consecutive patients who underwent pacemaker implantation at the study center, from 2003 to 2014. Patients with ejection fraction ≤35% or a prior diagnosis of HF were excluded. Ventricular leads were routinely implanted in the right apex.

Results: Pacemaker implants were included in 731 patients with a standard pacemaker indication. LBBB was reported in 54 (7.5%) patients, and strict-LBBB in 15 (2%) patients. During a median follow-up of 48 (18-62) months, 147 (20%) patients reached the combined endpoint of death or HF hospitalization. Patients with LBBB and with strict-LBBB displayed significantly higher rates of death or HF hospitalization (log-rank test, all P < 0.0001). In particular, strict-LBBB was associated with the worst outcome (Figure). The categorical variable (no-LBBB, LBBB or no-strict-LBBB+strict-LBBB) was confirmed as independent predictor of death or HF hospitalization after adjustment for relevant clinical covariates (HR=1.61; CI 1.16-2.23, P<0.0004).

Conclusions: Among patients who underwent standard pacemaker implantation, the prevalence of LBBB was 7% with classical definition criteria and 2% with strict criteria. The prevalence of LBBB, and in particular of strict-LBBB at the baseline, predicted a poor outcome in terms of death or HF hospitalization.

THE EFFECT OF USING FLOSEAL ON REDUCING THE INCIDENCE OF POCKET HEMATOMA FORMATION IN PATIENTS REQUIREING PACEMAKER OR IMPLANTABLE CARDIODEFIBRILLATOR WITH CONCOMITANT DUAL ANTIPLATELET THERAPY


University Hospital La Paz. Department of Cardiac Surgery, Madrid, Spain

Background: In recent years, many studies have demonstrated the increased incidence of pocket hematoma after permanent pacemaker (PPM) or implantable cardioverter-defibrillator (ICD) implantation with concurrent dual antiplatelet therapy (DAPT). Objectives: This study was designed to assess the effect of using Floseal (hemostatic matrix) on reducing pocket hematoma formation in patients receiving DAPT at the time of PPM or ICD device implantation.

Methods: We performed prospective study on all patients undergoing PPM and ICD implantation with concomitant DAPT. Results: Of the 2,769 device implantation, 120 patients were on DAPT (4.3%). Compared with the control Group not taking antiplatelet agents (n=300), the DAPT without the application of peri-procedural Floseal (n=65) significantly increased the risk of pocket hematoma (16.7% vs 2%, P < 0.001). The use of peri-procedural Floseal in patients with DAPT (n=60) reduced the risk of pocket hematoma (3.3% vs 16.7%, P=0.04). There was no statistical difference in pocket hematoma formation between patients with DAPT with the application of peri-procedural Floseal (n=60) and the control group not taking antiplatelet agents (n=300) (3.3% vs 2%, P=0.47).

Conclusions: In patients undergoing PPM or ICD device implantation, concomitant DAPT markedly increases the risk of pocket hematoma. The application of Floseal reduces the risk of pocket hematoma formation in these patients and therefore may play an important role in the management of patients with high risk of bleeding complications.
USE OF COREVALVE AND PROLONGED PQ AND QR TIMES ARE ASSOCIATED WITH PACEMAKER DEPENDENCE IN PATIENTS WITH A NEW LBBB AFTER TRANSCATHETER AORTIC VALVE IMPLANTATION

St Antonius Hospital, Department of Cardiology, Nieuwegein, Netherlands

Use of CoreValve and prolonged PQ and QR times are associated with pacemaker dependence in patients with a new LBBB after transcatheter aortic valve implantation (TAVI).

Methods: Patients undergoing TAVI in our institution from June 2007 to December 2014 were included if they developed a new LBBB after TAVI and had not previously implanted PM. Electrocardiography was routinely performed the day before and after TAVI and the electrocardiographic characteristics (e.g., cardiac rhythm, heart rate, axis, PQ and QR times) were analysed. PPM implantation was indicated in patients with acquired persistent or intermittent third-or second-degree type 2 atrophicventricular (AV) block at least 7 days after TAVI or symptomatic second-degree type 1 AV block. After PPM implantation patients were routinely followed up. PPM dependence was defined as ventricular pacing > 95%.

Results: Of 140 patients undergoing TAVI, we included 140 (24.6%) patients who developed a new LBBB (80 ± 7 years, 51% female, log-rank ScoreCardioSCORE 22 ± 14.9%), 10% of whom 3 patients turned out not to be PPM dependent. Patients who received a PPM had a total AV block or prolonged PQ (228 ± 37ms vs. 184 ± 43ms, p < 0.01) and QR time (142 ± 18ms vs. 128 ± 26ms, p < 0.01) after TAVI compared to those without a PPM indication. The rate of PPM dependence was higher after CoreValve versus Sapien implantation (18.2% vs. 5%, p < 0.05).

Conclusions: In patients with a new LBBB after TAVI, PPM dependence is associated with the use of a CoreValve prosthesis, prolonged PQ time, and broader QR complex after TAVI. The PQ time is a univariate predictor for PPM dependence.

HOW ROBUST IS THE MICRA TRANSCATHETER PACEMAKER FIXATION?

T.A. Simmons², M.D. Bonner³, F.A.E. Bracke⁴, M.D. Eggert⁵, P. Ritter¹, and D. Reynolds³
¹Catharina Hospital, Eindhoven, Netherlands; ²Medtronic Cardiac Rhythm and Heart Failure Research, Mounds View MN, United States of America; ³University of Bordeaux, Dept of pacing and electrophysiology, Bordeaux, France; and ⁴University of Oklahoma, Cardiovascular section, OU Medical Center, Oklahoma City, United States of America

The Micra Transcatheter Pacing System (TPS) is a capsule implanted via the femoral vein at the right ventricle (RV) using a custom delivery tool. As such, the system eliminates lead-related complications inherent to current transvenous pacemakers. The four, atrumatic nitinol tines that constitute the novel fixation system are extended while inside the delivery tool. The pacing electrode is separate from the fixation tines. Applying gentle contact pressure to the RV and retracting the delivery tool, the tines spring back into their original form, engaging myocardium. Once the capsule is deployed out of the delivery tool a pull and hold test is used to assess how many of the four tines are engaged in the myocardium. It is recommended that at least two engage the myocardium for redundancy and adequate stability. Two times have 16x the holding energy necessary to hold the device in place. Preclinical testing showed no dislodgements and no device or tool perforation or tamponade in 113 chronic implants in 89 animals. We describe the preliminary results of the ongoing Micra clinical trial.

Methods: Patients were implanted with the Micra TPS as part of the worldwide Micra clinical trial. After each deployment, a pull and hold test was performed to fluoroscopically assess the number of times engaged. The Micra was recaptured and repositioned if this was less than 2 or if sensing and threshold values were unsatisfactory. A pacing threshold at 0.24 ms was measured at implant, discharge, 1 month, and 3 months.

Results: Of the 140 patients implanted, 60 were followed to 3 months. The prerequisite number of times was engaged and sensing and threshold values were satisfactory at first device deployment in 56.6%. One reposition was required in 22.1%, two in 8.6%, and more than two in 10.7%. Pacing thresholds were low and stable: 0.64 at implant, 0.56 at discharge, 0.49 at 1 month and 0.51 at 3 months. No dislodgements were discovered in the 140 patients based on pre-discharge x-rays and through measurements, and no case of tamponade. One patient experienced pain due to pericardial effusion treated by pericardiocentesis 24 hours after 17 attempts required for a satisfactory position.

Conclusions: The lack of any dislodgement and the low and stable thresholds indicate Micra fixation is robust, without occurrence of tamponade in preclinical and clinical study to date. The combination of easy deployment in the majority of patients, robust fixation and low complication rate is encouraging for this novel fixation.
In 2594 (81%) of the 3183 pt. implanted with a CRT device a LV-PS were classified, etiology, ICD, NYHA class, QRS duration, and LVEF. all cause mortality and clinical response (improved NYHA class at follow-up). Baseline variables adjusted for in the Cox and logistic regression analysis included: age, gender, heart failure etiology, ICD-NYHA class, QRS duration, and LVEF. Results: In 2594 (81%) of the 3183 pt implanted with a CRT device a LV-PS were classified, 826 (32%) died during follow up, and 1021 (51%) were clinical responders. The LV-LP was anterior in 360 (14%) pt., lateral in 2074 (80%) pt., and posterior in 160 (6%) pt., and basilar in 435 (17%) pt., mid-ventricular in 1935 (74%) pt., and apical in 224 (8%) pt. As compared to an anterior LV-LP the hazard ratio of mortality with a lateral and a posterior LV-LP was 0.77 (95% CI 0.64-0.92, p=0.003) and 0.71 (95% CI 0.53-0.97, p=0.029), respectively (figure). The adjusted odds ratio of clinical response with a lateral and a posterior LV-LP was 1.37 (95% CI 1.05-1.83, pr=0.012) and 1.15 (95% CI 0.71-1.88, pr=0.56), respectively, compared to an anterior LV-LP. There was no statistical significant differences in clinical outcome between any lead position in the LAX view. Conclusions: An anterior LV-PS is associated with increased mortality and clinical non-response in CRT patients and should be avoided.
**TRANVERSE REMOVAL OF PACING AND ICD LEADS: SINGLE ITALIAN REFERRAL CENTER EXPERIENCE**


**Introduction:** Device related complications are rising the need of Transverse Lead Removal (TLR). Transverse extraction of Pacing (PL) and Defibrillating Leads (DL) is a highly effective technique. Aim of this report is to analyse the longstanding experience performed in a single Italian Referral Center.

**Methods:** Since January 1997 to December 2014, we managed 2250 consecutive patients (1718 men, mean age 65.3 years) with 4114 leads (mean pacing period 71.8 months, range 1-376). PL were 3328 (1582 ventricular, 1391 atrial, 355 coronary sinus leads), DL were 786 (765 ventricular, 6 atrial, 15 superior vena cava leads). Indications to TLR were infection in 83% (systemic 28%, local 55%) of leads. We performed mechanical dilatation using a single polypropylene sheath technique (Cook Vascular - Leechburg PA, USA) and if necessary, other intravascular tools (Catchers and Lasos, Onyxka, Gremzig-Whynel, G); an Approach through the Internal Jugular Vein (IA) was performed in case of free-floating leads or failure of the standard approach.

**Results:** Removal was attempted in 4105 leads because the technique was not applicable in 9 PL. Among these, 4019 leads were completely removed (97.9%), 44 (1.1%) partially removed, 42 (1.0%) not removed. Among 4620 exposed leads, 625 were removed by manual traction (15.5%), 298 by mechanical dilatation using the venous entry site (74.6%), 32 by femoral approach (0.8%) and 279 by IA (7.0%). All the free-floating leads were completely removed, 25.8% by IA and 74.2% by JA. Major complications occurred in 13 cases (0.6%): cardiac tamponade (12 cases, 2 deaths), hemotorax (1 death).

**Conclusions:** Our experience shows that in centers with wide experience, TLR using single sheath mechanical dilatation has a high success rate and a very low incidence of serious complications. TLR through the Internal Jugular Vein increases the effectiveness and safety of the procedure also in case of free-floating or challenging leads.

---

**SPATIO-TEMPORAL ORGANIZATION OF APD-ALTERNANS IN THE IN-VIVO HUMAN HEART AND INTERACTIONS WITH APD-RESTITUTION PROPERTIES**

M. Ottani, P. Taggart, B. Haveron, M. Harvard, and P. Lamberts

**University College London, London, United Kingdom**

Action Potential Duration alternans (APDA) is proarrhythmic and APD restitution curve maximum steepness (Smax) has been suggested as an underlying mechanism. However, the spatial organization of alternans in the in vivo whole human heart and the role of restitution are unclear.

240 unipolar epicardial electrograms were recorded in 7 patients undergoing cardiac surgery using a multielectrode sock. Rapid pacing (cycle lengths (CLs) from 600 to 150 ms) induced APDA susceptible and -resistant sites were localized during online analysis. APD was measured as activation recovery interval. 31-S2 restitution protocols were performed in a 7 patient subgroup by pacing immediately adjacent to the APD-susceptible and -resistant sites.

APDA was spatially heterogeneous in all patients (Fig. A1). The number of sites exhibiting APDA and the relative magnitude of APDA increased in shorter CLs (Fig. A2). The number of sites exhibiting APDA at least at one CL in the left and right ventricles was equivalent, as it was between apex and base (Fig. A4). Smax was spatially heterogeneous (Fig. B1). There was no difference in either Smax or the number of curves with Smax>1 between alternans-susceptible and -resistant sites (Fig. B2). APDA was observed over a range of CLs (corresponding to the APD restitution curve plateau).

This study demonstrates: 1. Heterogeneity of APDA in human epicardium for the first time. 2. Heart rate dependency of APDA. 3. APDA is unrelated to APD restitution, indicating alternative mechanisms are operable and accessible by this experimental approach.

**Figure legend:** (A1) Heterogeneous spatial distribution of APDA. (A2-3) Heterogeneity of APDA. (A4) No spatial/bound differences in APDA. (B1) Restitution curves (examples). (B2-3) Comparison of Smax.

---

**USEFUL ELECTROCARDIOGRAPHIC FEATURES TO HELP IDENTIFY THE MECHANISM OF ATRIAL TACHYCARDIA AFTER PERSISTENT ATRIAL FIBRILLATION ABLATION**

P. Pascale1, L. Rottn1, A.J. Shah1, D. Scherr1, Y. Komatsu1, N. Derval2, M. Hocini1, M. Haissaguerre3, and P. Jais3

1Service of Cardiology, Centre Hospitalier Universitaire Vaudois and University of Lausanne, Lausanne, Switzerland; 2Bern University Hospital, Cardiology, Bern, Switzerland; and 3Hôpital Cardiologique du Haut-Leveque and Universite Victor Segalen, LIRYC Institute, Bordeaux, France

**Purpose:** Surface ECG analysis to help identify the mechanism of atrial tachycardias (AT) after left atrial (LA) ablation is much limited by the fact that substrate ablation alter the normal activation pattern. The purpose of this study is to describe and identify useful ECG characteristics.

**Methods:** All consecutive pts who underwent mapping and ablation of AT arising after PAF ablation were included. Surface P waves were analyzed during higher (2:1) grades of AV block.

**Results:** 205 ATs with visible P waves were identified in 132 pts (macroreentry 56%, centrifugal AT 44%). Low voltage P wave (< 0.1 mV) was observed in 35% of cases. An isoelectric line > 80 ms was more common in centrifugal ATs compared to macroreentries (61% vs 39%; p < 0.001), but its value to distinguish both mechanism was limited (PPV 61%, NPV 65%). A minority of pericristal AT displayed the classic sawtooth pattern (27%). However, the "precordial transition" (a gradual transition from an upright component in V1 to a negative component with progression across the precordium) remained often observed (25%). Fig. A1 and identified pericristal ATs with 59% sensitivity and 98% specificity. Two unique features helped identify perimetal ATs (at p = 59%). In the absence of a "precordial transition", the presence of a negative or negative-positive P wave in any of the leads V2-V6 (Fig. B1) identified perimetal ATs with 59% sensitivity, 98% specificity. The presence of a "notched" negative component at the beginning of a positive P wave in the inferior leads (Fig. C) specifically identified clockwise perimetal ATs (sensitivity 21%, specificity 98%).

**Conclusions:** Only few unique ECG characteristics help identify the mechanism of AT after LA ablation. Knowledge of these characteristics may help plan and perform ablation.
PROGNOSIS IN PATIENTS WITH ATRIAL FIBRILLATION AND CHA2DS2-VASc SCORE ≥1 IN A COMMUNITY BASED COHORT STUDY

L. Fauchier1, C. Leccoz1, N. Clementy1, D. Angouvalot2, D. Babuty1, and G.Y.H. Lip2
1Tours Regional University Hospital, Hospital Trousseau, Tours, France; and 2University of Birmingham, Birmingham, United Kingdom

Objectives: Patients with atrial fibrillation (AF) and a CHA2DS2-VASc score ≥1 may have an intermediate risk of stroke and are recommended to receive antithrombotic therapy but several recent guidelines propose slightly different management in such setting. It remains unclear which specific criteria that constitute CHA2DS2-VASc score contribute equally to the ischemic stroke risk, particularly in patients with CHA2DS2-VASc score ≥1. In addition, most recent trials with OAC did not include these patients at lower risk of stroke. Our objective was to describe the outcome of patients with NCC according to some selected risk-stratification criteria for ICD PP implantation in a community based cohort of unselected AF patients with a CHA2DS2-VASc score ≥1.

Methods and Results: All patients with AF seen in our institution between 2000 and 2010 were identified in a database. The adverse outcomes were investigated during follow-up. Among 962 patients with AF, 1077 (12%) had a CHA2DS2-VASc score ≥1 in whom an oral anticoagulant was prescribed in 49%, antiplatelet therapy alone in 21%, and no antithrombotic treatment in 26%. During a follow-up of 958 ± 1146 days, 71 of these patients sustained events with 29 stroke, 727 thromboembolism (yearly rate 1.0%) and 49 deaths (yearly rate 1.7%). The lowest yearly rate of these combined events was seen in female patients (3.6%) and was higher in patients with hypertension (1.8%), vascular disease (2%), age 65-75 (2.8%), heart failure (3.2%) and diabetes (4.4%) (overall p=0.004). Prescription of oral anticoagulation was not associated with a better prognosis for death/stroke/thromboembolism in female (HR=1.24, 95% CI 0.12-12.5, p=0.86 after adjustment on age and antiplatelet use) whilst it was independently associated with a better prognosis in all other patients with CHA2DS2-VASc score ≥1 (adjusted HR=0.49, 95% CI 0.26-0.84, p=0.01). Antiplatelet therapy was not associated with a better prognosis in these patients.

Conclusion: In a real life cohort study, AF patients with CHA2DS2-VASc score ≥1 had a risk of death/stroke/thromboembolism which was low in female patients and significantly higher in other patients. Oral anticoagulation was associated with a better prognosis in these patients except for females. This supports the current expert consensus in the European guidelines for oral anticoagulation in these not so ‘low risk’ patients when they are not female patients.

LONG-TERM SURVIVAL FOLLOWING ICD AND CRT-D IMPLANT IN A LARGE UNSELECTED POPULATION

J. Sims, S. Charlton, A. Patel, and S. Liu
Medtronic, Mounds View, United States of America

Introduction: Long-term survival of implantable cardioverter-defibrillator (ICD) and cardiac resynchronization therapy-defibrillator (CRT-D) patients in widespread practice has not been broadly studied. It is unclear how long patients survive following their initial device implant in a real world, non-clinical trial setting.

Methods: Retrospective data for ICD and CRT-D device patients in the United States enrolled in the Medtronic database since 1997 were retrospectively analyzed. Patients were excluded if an initial device implant date was unknown. Mortality data was obtained from the Medtronic device registration database and cross-referenced with the U.S. Social Security Death Index. Data for active patients were censored as of Nov 5, 2013. A Kaplan-Meier survival analysis was conducted to evaluate patient survival after their initial device implant.

Results: 329,455 patients were identified with an initial implant of an ICD or CRT-D device between January 1998 and November 2013 (mean age 64 ± 13, 73.5% male, 70.6% ICD). The figure depicts survival of these patients following their initial device implant. The four and eight year post-implant survival of all patients (ICD and CRT-D) was 85.5% and 49.5%, respectively. The survival rates for these patients were higher than previously reported in landmark clinical trials.

Conclusion: In this retrospective analysis of a large cohort of patients with various device indications and comorbidities, survival following initial ICD or CRT-D implant is higher than previously reported clinical trials. The data indicate that despite initial risks and economic factors associated with device implantation, better long-term survival of these patients in a real world setting suggests that device therapy is a beneficial therapeutic option.

NON-COMPACTION CARDIOMYOPATHY, RISK STRATIFICATION FOR PROPHYLACTIC INDICATION OF IMPLANTABLE CARDIAC DEFIBRILLATOR. LONG TERM SINGLE CENTRE REGISTRY

University Hospital. Favahoro Foundation, Capital Federal, Argentina

Purpose: ACC/AHA/HRS 2012 guidelines recommended ICD implantation for primary prevention (PP) of SCD (class IIb-C) in pts with Non-Compaction Cardiomyopathy (NCC) to reduce the risk of sudden cardiac death (SCD). NCC has a wide spectrum of presentation and outcomes. It seems inappropriate to issue a general recommendation for PP of SCD. The aim of the study was to describe the outcome of pts with NCC according to some selected risk-stratification criteria to decide ICD PP implantation.

Methods: From 1997 to June 2014, 103 pts with NCC and no previous SCD or VT/VF were analyzed. Selected criteria for ICD PP implantation were LVEF < 30%, LVEF < 35% + NYHA FC III or ≥ 2 of the following risk factors: family history of SCD [FH-SCD], syncope or NSVT. Pts with those criteria were considered the High Risk Group (HRG). All other pts were considered the Low Risk Group (LRG).

Results: I. HRG (61 pts). Forty-two pts (70%) had ≥ 2 risk factors that were diagnostic of NCC and received an ICD. Mean age was 47 ± 16 years (29 men), 18 pts (41%) had NYHA FC I, 23 pts (53%) FC II-III, mean LVEF was 31 ± 17%, 30 pts (70%) had LVEF < 30%, 4 pts (9%) LVEF < 35% + NYHA FC II-III. 9 pts (21%) had ≥ 2 risk factors that were diagnostic of NCC. During a mean follow-up of 65 ± 37 months, 4 pts had SCD, 3 pts (7%) died from causes other than SCD, 1 pt (2%) had a ventricular tachycardia. II. LRG (42 pts): Only 1 pt (2%) had ≥ 2 risk factors that were diagnostic of NCC. Mean age was 38 ± 14 years (28 men), 41 pts (97%) had NYHA FC I, 1 pt II, mean LVEF was 52 ± 10%, 2 pts had NSVT and 2 syncope. During a mean follow-up of 49 ± 38 months, 1 pt died due to stroke 3.1%.

Conclusion: In our study population, the main finding during a long term follow-up was that according to the selected risk-stratification criteria, pts without HF or < 2 risk factors that were not implanted with an ICD showed a good outcome with no arrhythmic death. Pts with poor left ventricular function or ≥ 2 risk factors who received an ICD had a similar rate of appropriate therapies that those reported in trials about ischemia or non-ischemia cardiomyopathy. This registry suggests that pts with NCC might be stratified for prophylactic implantation of ICD.