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Oral Presentation

DEPRESSED β-ADRENERGIC INOTROPIC RESPONSIVENESS AND INTRACELLULAR CALCIUM HANDLING ABNORMALITIES IN DUCHENNE MUSCULAR DYSTROPHY (DMD) PATIENTS’ INDUCED PLURIPOTENT STEM CELL-DERIVED CARDIOMYOCYTES (iPSC-CMs)

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Introduction: DMD caused by dystrophin mutations, is an X-linked disease affecting male and rarely adult females. DMD is characterized by progressive muscle degeneration, loss of ambulation and death mostly by late 20’s.

Hypothesis: To decipher the basis for cardiac pathology, we tested the hypothesis that DMD iPSC-CMs exhibit impaired intracellular Ca²⁺ handling and autonomic responsiveness.

Methods: [Ca²⁺] transients and contractions were recorded from control, male and female DMD iPSC-CMs using the IonOptix system.

Results: Since cardiac function is modulated by β₁-adrenergic input, we investigated the inotropic response to isoproterenol. While in control cardiomyocytes isoproterenol caused positive inotropic and lusitropic effects, in DMD iPSC-CMs the response was blunted. Since in DMD cardiomyocytes isoproterenol caused a control-like positive chronotropic effect, we concluded that the blunted inotropic response in DMD cardiomyocytes was not due to a defective β₁-adrenergic cascade. Next, we tested whether impaired downstream element(s) mediating positive inotropic interventions is depressed in DMD cardiomyocytes. Like isoproterenol, in control iPSC-CMs, elevated [Ca²⁺]out caused positive inotropic and lusitropic effects, while DMD iPSC-CMs were unresponsive. Because the inotropic responses to isoproterenol and elevated [Ca²⁺] were blunted in DMD cardiomyocytes, we tested whether this was due to depleted SR Ca²⁺ stores, by investigating: (a) caffeine-induced RyR-mediated SR Ca²⁺ release; (b) the inotropic effects of ryanodine and cyclopiazonic acid (CPA). While in healthy iPSC-CMs caffeine caused an abrupt increase in [Ca²⁺] followed by a gradual decline in [Ca²⁺] level, DMD iPSC-CMs exhibited a reduced caffeine-induced Ca²⁺ signal amplitude and recovery time. Compared to control, in DMD male cardiomyocytes, ryanodine and CPA induced a smaller inhibitory effect on the [Ca²⁺] transients and contractions. These results suggest that SR Ca²⁺ stores are depleted in DMD iPSC-CMs.

Conclusion: DMD iPSC-CMs exhibit irregular intracellular Ca²⁺ handling and depleted SR Ca²⁺ stores which contribute to the depressed β₁-adrenergic inotropic response.
**METABOLIC IMPAIRMENTS IN DUCHENNE MUSCULAR DYSTROPHY (DMD): SEARCHING FOR NOVEL THERAPEUTIC APPROACHES USING PATIENTS’ IPSC-DERIVED CARDIOMYOCYTES**

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**Introduction:** DMD, an X-linked muscle degenerative fatal disease is caused by dystrophin mutations. Dilated cardiomyopathy (DCM) is a major cause of morbidity and mortality in DMD patients. Treatments for DCM are still limited to standard adult heart failure medications and cardiac defibrillator implantation. To improve our understanding of DMD and discover novel therapeutic approaches, new strategies are needed.

**Hypothesis:** We hypothesized that dystrophin gene mutations in DMD cause bioenergetic/metabolic deficits, thereby causing cardiac dysfunction.

**Methods:** We generated induced Pluripotent Stem Cell-derived cardiomyocytes (iPSC-CMs) from male and female healthy volunteers and DMD patients. We investigated the bioenergetic and metabolic features of healthy and DMD iPSC-CMs using the Seahorse Flux analyzer and Liquid chromatography mass spectrometry (LC-MS) technologies.

**Results:** The bioenergetic profile demonstrated impairments in glycolysis and oxidative phosphorylation pathways in both male and female DMD iPSC-CMs compared to healthy iPSC-CMs. We found a significant decrease of 75% and 70% in ATP production in male and female DMD iPSC-CMs, respectively, compared to healthy iPSC-CMs. Accordingly, most Krebs cycle metabolite levels decreased in male and female DMD iPSC-CMs compared to healthy iPSC-CMs. For example, α-ketoglutarate, cis-aconitate and citrate levels were 85%, 60% and 50%, respectively, lower in female DMD iPSC-CMs compared to healthy iPSC-CMs. Furthermore, in male and female DMD iPSC-CMs, there was a dramatic fall to undetected levels in phosphocreatine, along with low levels of creatine (up to 20-fold) compared to healthy iPSC-CMs. These findings indicate a dysfunctional phosphocreatine energy system. Moreover, energy source levels such as fatty acids and amino acids significantly increased (P<0.01 and P<0.05, respectively) in male DMD iPSC-CMs compared to healthy iPSC-CMs.

**Summary and Conclusion:** DMD iPSC-CMs exhibit metabolic deficits and reduced ATP production. Dystrophin mutations in DMD adversely affect the biochemical pathways in iPSC-CMs and cause bioenergetic/metabolic imbalance.
PREOPERATIVE RIGHT HEART DYSFUNCTION IS ASSOCIATED WITH GASTROINTESTINAL BLEEDING DUE TO ARTERIOVENOUS MALFORMATIONS IN PATIENTS WITH LEFT VENTRICULAR ASSIST DEVICES

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Background: Gastrointestinal bleeding (GIB) is a common complication of left ventricular assist device (LVAD) support. We performed this study to determine whether preoperative right ventricular (RV) failure can predict an increased risk for GIB following LVAD implantation, and to further delineate whether this increase is driven by arteriovenous malformations (AVMs).

Methods: Of 398 patients implanted with LVADs between July 2008 and July 2016, 130 (33%) developed GIB following LVAD implantation. Arteriovenous malformations (AVMs) were found in 42 (34%) GIB patients.

Results: Patients with GIB were older and more likely to have hypertension, diabetes, and ischemic cardiomyopathy. On pre-LVAD echocardiography, GIB patients had increased RV diastolic dimension (RVDD; 4.7±0.8 vs 4.4±0.9 cm, p=0.02), a higher rate of greater than mild tricuspid valve (TV) regurgitation (73 [60%] vs. 120 [47%], p=0.006), and underwent concomitant TV repair more often (38 [30%] vs. 43 [16%], p=0.0006). After multivariable adjustment, preoperative greater than mild RV enlargement (HR 2.32, 95% CI 1.12-5.03; p=0.03), TV regurgitation (HR 1.83, CI 1.02-3.44; p=0.01), and TV repair (HR 3.76, CI 1.02-4.44; p=0.01) remained associated with GIB. These differences were driven by the AVM-GIB subgroup. AVM-GIB patients had larger RVDD (4.8±0.7 vs. 4.4±0.8; p=0.003) and a higher incidence of greater than mild RV enlargement (35 [83%] vs. 158 [60%], p=0.003) and greater than mild TR (31 [80%] vs. 120 [47%]; p=0.003). On right heart catheterization, the AVM-GIB subgroup had higher RA pressure compared to the no-GIB group (14.4±6.7 vs. 12.3±6.3 mmHg, p=0.04) and non-AVM GIB subgroup (11.0±5.9 mmHg, p=0.03). No other significant differences between groups existed on invasive hemodynamics.

Conclusions: Preoperative RV enlargement and greater than mild TR are associated with an increased incidence of GIB after LVAD implantation and are more predictive than other echocardiographic and invasive hemodynamic measures of RV dysfunction. This finding is driven by patients with AVMs.
OUTCOMES OF PATIENTS WITH ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY AFTER VENTRICULAR TACHYCARDIA ABLATION WITHOUT AN IMPLANTABLE CARdioverter-DEFibrillator: A MULTICENTER INTERNATIONAL STUDY

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Background: The respective places of implantable cardioverter-defibrillators (ICD) and radiofrequency catheter ablation (RCA) in patients with arrhythmogenic right ventricular cardiomyopathy (ARVC) and ventricular tachycardia (VT) are debated.

Purpose: To report the outcomes of selected patients with ARVC/D who underwent RCA of well-tolerated VT without a back-up ICD.

Methods: Patients with a definite ARVC diagnosis who underwent RCA of well-tolerated monomorphic VT at 9 tertiary centers across 5 countries, without an ICD prior to RCA and in the 3 following months were retrospectively included. Patients presenting syncope or electrical storm, and patients with left ventricular ejection fraction ≤ 50% were excluded.

Results: In total, 67 ARVC patients [median age 46.1 years, range (19.5–73.8), male sex 77%] underwent RCA of monomorphic VT between 2003 and 2016. Clinical presentation was palpitations in 81% of patients and presyncope in 14%. Prior to RCA, 83% of patients were on anti-arrhythmic therapy. Median VT rate was 180 (110–270). An epicardial approach was used in 20 (31%) patients. The clinical VT was inducible in 52 (84%) patients. The median number of targeted RV site was 1 (1–3) (RV outflow tract in 72%). Full acute success defined inability to induce any VT was achieved in 46 patients (72%). After a median follow-up of 51.1 months (range 1.4 – 161.5), there was no death or aborted cardiac arrest, and VT recurred in 20 patients. Survival without VT recurrence was estimated at 82%, 71% and 60%, 12-, 36- and 60-months after RCA, respectively.

Conclusions: Despite a significant rate of VT recurrence, selected patients with ARVC/D who underwent RCA for stable MVT without an ICD did not experience any arrhythmic death. Further prospective studies are mandatory to precise the respective places of ICD and RCA in the management of ARVC/D patients with well-tolerated monomorphic VT.
RAPID PACING: PRO OR AGAINST FIBRILLATION?

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Abstract: Until rather recently, rapid pacing (RP) was used to terminate heart fibrillation (either VF or AF). It was considered a much gentler approach for this task than single shocks. However, when it became clear that RP could cause a reawakening of the malfunction, also its beneficial function was stopped. Since a few years ago, RP is used merely to arouse AF in patients during hospital treatments.

We wanted to reexamine RP function to ascertain whether it can or cannot be of assistance in combatting fibrillation. To this end, we applied RP to a nonlinear mathematical model of a myocardial cell. The ability to reach the threshold of the model under the variation of the parameters of the pulses, including amplitudes, pulse-durations, frequencies and duty cycles was calculated. The main effort took place in very rapid pacing, very high frequencies, a region that has not been examined thoroughly in the past.

It turned out that, even with such a simple model, a multitude of possible results can emerge. Among those, a synergetic combination of small stimulating pulses leading to threshold crossings, and rapid small oscillations (jammed system) occurring at different polarizations.

These results suggest that it may be possible to reuse RP for more gentle, low-energy defibrillation purposes in addition to its regular use of inducing speedy tachycardia (and fibrillation). For both purposes, the RP’s frequency, amplitude and duty cycle should carefully be selected.
INFLUENCE OF RIGHT VENTRICULAR PACING ON PROGRESSION OF TRICUSPID REGURGITATION AFTER IMPLANTATION OF TRANSVENOUS PERMANENT PACEMAKERS

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Introduction: Mechanical complications of endocardial pacing leads, primarily tricuspid regurgitation (TR), are well known. According to the literature, left-sided heart failure and right ventricular (RV) dyssynchrony are also important patophysiological causes of TR. There are limited data whether mode and amount of RV pacing have an impact on tricuspid valve function. The aim of the study was to determine whether mode and total amount of RV pacing has an impact on worsening of TR after cardiovascular implantable electronic device (CIED) implantation.

Methods: We conducted a single centre, non-randomized, prospective cohort study. Patients with indication for permanent pacemaker implantation, cardiac resynchronization or implantable cardioverter defibrillator implantation (CIED) according to current ESC guidelines were included. All patients underwent 2-dimensional echocardiography prior to implantation and 9-12 months after implantation. Standard parameters of CIEDs as well as proportion of ventricular pacing were followed 3 and 12 months after implantation. TR quantification was assessed by echocardiography and classified in 8 jet-angio grades. The primary outcome was one-grade increase in severity of TR.

Results: A total of 360 patients have undergone CIED implantation from April 2016 to March 2018, however only 135 have completed 12 month follow-up. Deterioration of TR grade was determined in 38 patients (28.1%). There was a progression of TR in 11/26 patients (42.3%) with VVI mode, 14/68 patients (20.5%) with DDD mode, 7/22 patients (31,8%) with ICD and 6/19 (31,5%) patients with CRT. There were no statistically significant difference between different pacing modes (p=0.19). Amount of RV pacing had no impact on progression of TR (median of pacing in group with worsening of TR 67%, IQR 4-100% vs. group without worsening of TR 73%, IQR 7.7-100%; p=0.952)

Conclusion: The incidence of TR progression after endocardial lead placement seems not to be influenced by the mode nor the amount of RV pacing.
BACHMANN’S-BUNDLE PACING COMBINED WITH HIS-BUNDLE PACING

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The treatment of patients with heart failure and concomitant atrioventricular conduction delay is difficult. The recommendations indicate the possibility to use the classic resynchronization but in the presence of narrow QRS-complex such approach could be even harmful. The therapeutic option for those patients to re-establish the physiological atrioventricular mechanical sequence is the permanent His-bundle pacing. The use of Bachmann’s-bundle pacing can additionally correct the prolonged interatrial conduction thus further contribute to the echocardiographic and clinical improvement.

The aim of the study is to assess the influence of Bachmann’s-bundle pacing and His-bundle pacing on the reversed remodeling of the heart in patients with heart failure and atrioventricular block. The study group included 20 patients (7 women and 13 men), aged 71.9±7.9 years undergoing cardiac resynchronization using Bachmann’s-bundle pacing and permanent His-bundle pacing from LV channel. All the patients had narrow QRS-complex which prevented us to use classic resynchronization. 13 CRT-D and 7 CRT-P devices were implanted according to the ejection fraction and ventricular arrhythmia risk assessment. In all patients the direct His-bundle pacing was successfully achieved, selective in 17 and non-selective in 3 patients. The mean follow-up period was 8 months (1-22 months).

The echocardiographic, clinical and ECG results are presented in the table: Table 1

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<th>PQ2</th>
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<td>Mean</td>
<td>337,1</td>
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<td>SD</td>
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Conclusions:
1. The correction of atrioventricular and interatrial conduction delay resulting in improvement of atrioventricular mechanical coupling can contribute to the reversed remodeling of the heart.
   • This also improves the patient’s functional status.
   • In some patients this approach could lead to the normalization of echocardiographic parameters of the left ventricle.
THE USE OF VIDEO ASSISTED THORACOSCOPY TO AID IN DETERMINATION OF VENOUS INJURY DURING LASER LEAD EXTRACTION

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Background: Transvenous lead extraction carries a major complication rate of 1-2%. Damage to the central veins can be fatal. Current techniques do not allow for direct venous visualization during extraction, which limits information regarding venous injury to post laceration and emergent intervention. We attempt to determine if video assisted thoracoscopy surgery (VATS) provides benefit to complex, high risk lead extraction and reduces major adverse events by providing real-time information regarding initial venous injury.

Methods: Patient was referred for extraction in order to upgrade device in the setting of occluded subclavian vein. We performed VATS during lead extraction in a patient deemed at significantly increased risk of venous laceration due to age of lead and prior open chest surgery. Cardiothoracic surgery provided real time video imagery during laser lead extraction which allowed for direct visualization of SVC throughout the extraction process.

Results: By performing VATS, we were able to visualize both SVC hematoma and venous dissection of the SVC during extraction. The patient’s hemodynamics and TEE imagery was unchanged throughout the procedure. In addition to noting the dissection, VATS allowed repositioning of the wire to prevent further venous injury and maintain venous access during the extraction procedure. This information allowed the operator to stop the advancement of laser sheath and prevent significant injury. As the laser sheath had advanced past the occlusion, the operator was able to obtain venous access despite stopping extraction. We were additionally able to monitor hematoma formation and ensure stability of venous injury before proceeding with upgrade.

Conclusion: VATS provides important visualization during lead extractions and may enhance safety and efficacy. Having direct visualization allows for identification of venous injury prior to patient injury and can potentially improve safety and efficacy of complex lead extraction.
SUPERFLUOUS LEAD: TO EXTRACT OR NOT TO EXTRACT IN OUR DAYS? DIFFERENT APPROACHES OF TRANSVENOUS LEAD EXTRACTION

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Introduction: Transvenous lead extraction (TLE) may be recommended in cases of infective and noninfective indications. We identified the lead-related complications after TLE in long-term period.

Methods: We included 126 patients who underwent TLE with noninfective indications. Total number of removed leads was 156. All patients were prospectively collected and divided into two groups: extracted leads group (n = 83) and abandoned leads group (n = 43). Contraindications to TLE of noninfected leads were mean age of the lead more than 10 years, low LVEF (left ventricular ejection fraction) (35%) and severe comorbidity in patients.

Results: In extracted leads group 112 leads underwent complete extraction. Thirty-seven (32.7%) atrial leads, 68 (60.8%) right ventricular leads, 3 (2.8%) left ventricular leads and 4 (3.7%) ICD leads were removed. TLE was performed by manual traction in 69 (67%) leads, by lead locking device (manual traction with the aid of a locking stylet) in 32 (29.9%) leads and 11 (9.4%) leads were removed using Tightrail Rotating dilator sheath. In 1 case we proceed a video-assisted thoracoscopic lead extraction at the time of venous occlusion recanalisation and electronic devise reimplantation to a patient of high-risk complications. In abandonment leads group 3 patients had abandonment lead-related complications in the period of 3-84 months. In 2 cases pocket infection developed and in 1 case we observed endocarditis of the tricuspid valve.

Conclusions: TLE with the mean age of the lead less then 10 years is an effective and safe strategy. The choice of one or the other strategy in TLE depends on risk factors connected with lead, patient on the operator experience with a specific technique. The video-assisted thoracoscopic approach is implemented to provide more safety with patient of high-risk complications. Preventive TLE of noninfected leads allows to avoid lead-related complications in long-term period (p 0.03).
REAL WORLD EXPERIENCE OF BOTH RECENT AND LONGSTANDING PERSISTENT AF ABLATION IN A UK NON-SURGICAL CENTRE

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Background: Trials report approximately 50-60% success rates in patients undergoing catheter ablation for persistent AF with incremental benefit accrued with further procedures.

Objectives: To review the efficacy and safety of catheter ablation for recurrent persistent AF in a non-surgical centre.

Methods: Consecutive cases over 12 months were included. The end point was absence of symptoms and sinus rhythm on ECG at 3 months.

Results: 69 procedures were performed for persistent AF (out of a total of 253 AF ablations). Patients’ mean age was 63.2 years (s.d 1.1). 75% of patients were male. Mean left atrial AP diameter on CT was 4.77cm (s.d +/-0.08) and 4.18cm (s.d +/-0.08) measured in the parasternal long axis on echo. Mean procedure time was 178.8 minutes with a mean fluoroscopy time of 28.8 minutes. Ablations were performed on uninterrupted DOAC in 80.6% of cases and warfarin in 19.4% cases. 79.2% of patients were on betablockers with 26.7% of patients on either class 1 or 3 AADs. 42 patients underwent first time ablation (22 persistent AF for 1 year). 70% of patients in AF 1 year were in sinus rhythm at 3 months without reported symptoms of AF compared with 36.3% of patients with AF 1 year. 9 patients had WACA + roof and mitral lines performed of whom 4 were in sinus rhythm at 3 months compared with 18/33 with WACA alone. 27 patients had second/ third ablation procedures. 70% of these were in sinus rhythm at 3 months. 2 pericardial effusions occurred requiring drainage and 1 patient suffered oesophageal ulceration settling with PPI therapy.

Conclusions: Catheter ablation of recurrent persistent AF ablation on warfarin and uninterrupted DOAC can be safely performed in a non-surgical centre with similar outcomes to trial populations. Outcomes were better if AF duration was 1 year before ablation.
DIFFERENT CLINICAL RISK SCORES IN PREDICTION OF ATRIAL FIBRILLATION RECURRENCE AFTER REPEATED PULMONARY VEIN ISOLATION

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Introduction: Atrial fibrillation recurrence (AFR) is fairly common after pulmonary vein isolation (PVI), but is lower after repeated procedures. The aim of this study was to assess prediction value of different clinical risk-scores (developed to predict AFR after initial PVI) to predict AFR after the repeated PVI procedure.

Methods: Consecutive patients with paroxysmal and persistent AF undergoing repeat PVI were included in this dual-centre, observational, registry-based study. AFR was defined as episode/s of AF or left atrial tachycardia lasting 30 seconds occurring after a blanking period of 3 months. Thirteen different clinical risk-scores (ALARMEc, APPLE, ATLAS, BASE-AF, CAAP-AF, CHADS², CHA2DS²-VASc, DR-FLASH, HAS BLED, HATCH, MB-LATER, PLAAF, R²CHADS²) predictive value for AFR was evaluated.

Results: A total of 221 AF patients undergoing repeated PVI were analysed (median age 60 (IQR 53-66) years, 23% female, 72% paroxysmal AF, LVEF 58±8%). After a median follow-up of 363 (IQR 162-605) days, AF recurred in 76 (34%) patients. The area under ROC curve was 0.61 (95% confidence interval [CI] 0.52-0.62, p=0.017) for ALARMEc, 0.63 (95% CI 0.55-0.72, p=0.004) for the CHA2DS2-VASc, 0.66 (95% CI 0.58-0.74, p=0.001) for DR-FLASH and 0.62 (95% CI 0.53-0.72, p=0.007) for PLAAF score, while other risk-scores (APPLE, ATLAS, BASE-AF, CAAP-AF, CHA2DS, HAS BLED, HATCH, MB-LATER, R²CHADS²) did not reach values over 0.60 nor statistical significance (p=NS). In multivariate Cox-regression analysis including all evaluated 13 risk-scores, only DR-FLASH was significantly correlated to AFR (HR 1.383, 95% CI 1.166-1.642, P<0.001).

Conclusion: This was the first study evaluating the prognostic power of different clinical risk-scores in predicting AFR after repeated PVI. Thirteen evaluated risk-scores showed no or poor prognostic accuracy in predicting AFR in patients with paroxysmal and persistent AF. DR-FLASH score was found to have significantly better predictive performance than other evaluated 12 risk-scores, yielding overall predictive value of 0.66.
PULMONARY VEIN FOCAL ACTIVITY AS A TRIGGER OF ATRIAL FIBRILLATION: MAPPING AND ABLATION

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Aim: The pulmonary vein (PV) focal activity (FA) as a trigger of atrial fibrillation (AF) well recognized in paroxysmal AF (PaAF), however FA could not be obviously recorded during mapping in persistent AF (PeAF) making difficult recognizing trigger mechanism of AF. The aim of the study was to estimate effectiveness of PV FA mapping and radiofrequency ablation (RFA) in AF.

Material and methods: Three hundred thirty-eight consecutive patients with AF were underwent to mapping and ablation of AF. Spontaneous AF recurrence or AF persistence was in 181 pts admitted to EP lab. Focal activity was identified in 91 (50%) patients (39 PV FA and 52 non-PV FA). From 39 PV FA (all group) pts PaAF was in 28 and PeAF in 11 patients. Twenty-four pts had first PVI procedure and 15 repeat RFA. Focal activity was diagnosed as a focus in PV area, if found localized behind the design line surrounding antrum of ipsilateral PVs.

Results: Pulmonary vein FA were more often recognized by activation mapping - in 30 patients, than entrainment mapping – in 2 patients (p<0.001) or local electrograms (LE) in start of AF and episodes of high frequency regular pulmonary local activity and spatiotemporal dispersion (HF and STd) – in 7 patients (p<0.001) in all group. Entrainment was a diagnostic maneuver only in patients who revealed PV reconnection after PVI. Only 6 patients in PaAF group and 1 patient in PeAF group presented LE in start of AF or HF and STd for diagnosis of PV FA (p=0.66). Localized FA RFA terminated AF in 79% patients (82% in PaAF and 73% in PeAF, p=0.51).

Conclusion. Activation mapping is a basic tool for diagnosis of PV FA in patients presented spontaneous recurrence or persistence AF. Effect of RFA on AF termination indicate on PV FA as a trigger of arrhythmia.
RADIATION DOSE DURING PULMONARY VEIN ISOLATION DEPENDING OF ABLATION MODALITY AND BODY MASS INDEX

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Background: Patient’s high body mass index (BMI) increases the radiation dose during pulmonary vein isolation (PVI) procedure, but this impact has not been studied in terms of different ablation modalities. This study sought to evaluate the impact of patient’s BMI on fluoroscopy exposure during index PVI depending on different ablation modalities.

Methods: We conducted a multi-centre, observational, registry-based study. Consecutive patients with paroxysmal and persistent atrial fibrillation (AF) who underwent index PVI under fluoroscopic guidance, either using radiofrequency (RF) or 2nd-generation cryoballoon (CB) modalities, were analyzed. Demographic and PVI procedural data were recorded.

Results: A total of 712 patients were included (median age 60 (IQR 53-66) years; female 31%; BMI 28.5±4.4 kg/m2, LVEF 60%). Median skin entrance exposure (SEE) rate for the entire study population was 87.5 (IQR 42.4-175.2) mGy/min for PVI procedures with a median duration of 115 (90-140) minutes and 780 (510-1196) sec of fluoroscopy time. In comparison to patients undergoing RF PVI ablation, patients undergoing CB ablation were significantly younger (56 vs. 59 years, p<0.001) and more exposed to fluoroscopy (1392 vs. 851 sec, p<0.05) with higher SEE rate (178 vs. 129 mGy/min, p=0.03) during a shorter procedure time (85 vs. 127 min, p<0.001), however no significant differences regarding sex or BMI. BMI was more important determinant of SEE rate than total fluoroscopy time (r 0.777 vs. 0.031, p<0.001) in the entire study group, and according to ablation modality (RF: r 0.776 vs. 0.637, p<0.001; CB: r 0.526 vs. 0.06, p<0.001).

Conclusion: PVI using CB modality lasts shorter with higher exposure to fluoroscopy. BMI significantly impacts the SEE rate during PVI with higher correlation in comparison to fluoroscopy time, regardless of the ablation modality used. Moreover, this correlation difference is more pronounced during CB modality is used.
ACUTE TERMINATION OF PERSISTENT FIBRILLATION IS MORE COMMON WITH ABLATION OF AREAS DISPLAYING ELECTROGRAM DISPERSION THAN COMPLEX FRACTIONATED ELECTROGRAMS

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Cardiac Rhythm Management, Royal Papworth Hospital, UK

Introduction: Despite ongoing debate over long term clinical outcomes, persistent AF termination rates have increased since the advent of AF driver mapping, but recent trials have cast doubt on the efficacy of complex fractionated atrial electrograms (CFAE) based mapping strategies. We set out to study a consecutive single centre series pre-and post-use of spatio-temporal dispersion (STD) to identify termination rates between the two approaches.

Methods: We recruited consecutive patients over 18 months at a single tertiary centre undergoing first redo ablation for persistent AF. Patients were all mapped using Pentarray to mark areas of substrate using the spatio-temporal dispersion (STD) method described by Seitz et al. (JACC 2017). Ablation was performed by a single operator using Biosense Webster STSF catheter to standardise equipment and workflow, to enable true comparison of a consecutive series.

Results: In total 38 patients were studied at redo ablation for persistent AF (age 69, 87% male, LA diameter 4.5cm). Termination of persistent AF to SR (30%) or AT (70%) was obtained in 30/38 (79%) of the group with STD based substrate ablation vs. 1/38 (3%) in patients mapped with CFAE targeting using identical equipment and operator (p<0.001). Procedure time was no different between STD and CFAE based approaches (263 vs. 248 mins, p=ns). Figure shows STD patterns (red arrows) on Pentarray in a 67 year old man anterior to left inferior pulmonary vein (A), where ablation terminated AF to sinus rhythm. Electrogram features of termination sites are currently being analysed, and long term outcome data collected.

Conclusions: In this single centre series of persistent AF ablations, the use of STD mapping significantly increased rates of termination compared to a fractionation based mapping strategy, without increasing procedure time. Whether this translates to a better long term clinical outcome should be the subject of future randomised clinical trials.
RADIOFREQUENCY CATHETER ABLATION OF FOCAL ACTIVITY IN ATRIAL FIBRILLATION PATIENTS WITH HEART FAILURE

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¹Department of Electrophysiology and Cardiac Pacing, Central Clinical Hospital with Polyclinic of the President Administration of Russian Federation, Russia
²Department of Therapy, Cardiology and Functional Diagnostics with a Course of Nephrology, Central State Medical Academy, Russia

Background: The aim of the study was to evaluate the efficacy of radiofrequency ablation (RFA) of focal activity (FA) in atrial fibrillation patients with reduced left ventricular ejection fraction (LVEF).

Materials and methods: One hundred eighty-one consecutive patients referred for RFA with AF at the beginning of the procedure were enrolled. In 91 patients with documented FA, 70 patients (77%) had preserved LVEF (50%, age: 69±18,75 years, 32 men) and 21 patients (23%) had reduced LVEF (≤50%, age: 68±12 years, 16 men). Within the group with documented FA and EF≤50% 10 patients suffered from paroxysmal and 11 from persistent AF. Antral pulmonary vein isolation was done as a first step of AF treatment in 18 patients, 15 of them were undergone additional linear lesions. In 3 patients multiple localized FA was only target for ablation. A non-fluoroscopic mapping system CARTO-3 (Biosense Webster, USA) was used for mapping and RFA. Activation and entrainment mapping, endocardial electrogram analysis were used for diagnosis of FA. Echocardiographic parameters were studied before and after RFA.

Results: In 15 from 21 patients (71%) with documented FA and LVEF≤50% sinus rhythm (SR) was restored: during localized FA ablation only (n=11) and additional creation of linear lesions (n=4); electrical cardioversion was required in 6 patients (29%). Within patients with verified FA and preserved EF, AF termination and conversion to SR during RFA was seen in 53 patients (76%), indicating on comparable effectiveness of FA RFA in two groups (p=0.69). RFA of FA resulted in improvement of LV function: LVEF before RVA 45% ±10,0, after – 50% ±7,5 (p<0.001).

Conclusion: Radiofrequency catheter ablation of AF in patients with reduced EF as effective as in patients with preserved LV function. Local focal activity should be taken in attention in RFA of AF in HF patients.
TIA 6 MONTHS AFTER WATCHMAN PROCEDURE

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The Valley Hospital/Cleveland Clinic Heart and Vascular
Ridgewood, New Jersey USA

Case #1: 84 yo M w Permanent AFib
  • Prior intracranial hemorrhage, unsteady gait, relative contraindications to anti-coagulation
  • Referred for Watchman implant. Procedure cancelled after TEE revealed LAA thrombus
  • Anticoagulated for 2 months, LAA thrombus resolved on followup TEE
  • Watchman 30mm first-generation device implanted March 2019
  • “No Leak” on 6 week post-procedure TEE
  • Hospitalized September 2019 with TIA
  • TEE showed mobile thrombus in Watchman. Device was tilted, exposing area beneath edge of fabric dome which allowed flow into the device
  • Leak was corrected—see slides

Case #2: 92 yo F w Permanent AFib
  • 92F s/p CABG + LAAL 2013. LAA was ligated with suture.
  • Permanent AF on NOAC since 2014
  • Major GI bleed Summer 2019, NOAC discontinued
  • Cardiac CT done after 10 days without anticoagulation, for evaluation of LAA. CT showed possible thrombus in LAA, so anticoagulation was initiated
  • TEE after 1 month anticoagulation showed defect in LAA suture line which allowed flow into distal segment of LAA. No thrombus seen
  • Leak was corrected—see slides
BETTER IDENTIFICATION OF ABLATION LOCATIONS

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¹Physics, Ben-Gurion University, Israel
²Physics, SCE College, Israel

Abstract: Ablation is an established method to treat atrial fibrillation (AF). The exact locations of the ablation procedure is however still debatable. Pulmonary veins isolation (PVI) is the procedure most used in general practice, but other strategies of additional ablations have been tried based on identifying driving sources of the malfunction. We propose a new, more accurate a method, to detect such sources in the heart tissue during atrial fibrillation.

Our analysis consists of the following steps: 1. Application of a "singular value decomposition" which finds the most important modes of the phenomenon. 2. Reconstruction of the dynamics based only on the highest modes, thus hugely enhancing its resolution, sharpness and accuracy. 3. Application of Hilbert transformation to obtain the phases of the phenomena. 4. Pinpointing the locations around which these phases had maximum changes as a function of time (singular points). Finally, 5. Averaging these positions to find the ridge that this singularity has visited.

In order to check this analysis, we applied it to a mathematical model of a moving rotor and the results verified the ridge that the rotor center traversed. We then applied it to "basket" results obtained from http://narayanlab.stanford.edu.

Results show that the sources-ridges become clear even for original videos having very poor resolution (see Fig. 1). Fig. 1a describes one frame of the original data. Fig 1b gives one frame following our analysis. Fig. 1c marks the rotor ridges of the original, while in Fig. 1d marks the ridges by the same analysis applied to the "Kuklik filter" of the original. Note that we can use our analysis on both original and filtered videos, and obtain the rotor ridges even without filtering.

We therefore reason that cutting perpendicular to these ridges might be a better way (additional to PVI) for treating atrial fibrillation.
AV NODAL REENTRANT TACHYCARDIA IN PATIENTS WITH TWIN AV NODES

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Pediatric Cardiology, Children's Mercy Hospital, USA

Introduction/Background: Although twin AV nodal reentrant tachycardia (TAVNT) has been well described in patients with heterotaxy, AV nodal reentrant tachycardia (AVNRT) in the individual AV nodes has not been reported. We report 3 cases of ablation for both TAVNT and AVNRT to demonstrate the need for a high index of suspicion for AVNRT in patients with twin AV nodes.

Methods: Retrospective chart review

Results: All patients had right atrial isomerism, common AV canal defect with double outlet right ventricle and anomalous systemic and pulmonary venous return. Patient #1 was a 17-year-old male with \{I,L,L\} segmental anatomy after extracardiac Fontan. Patient #2 was a 3-year-old female and patient #3 an 8-year-old male, both with \{I,D,D\} segmental anatomy after bidirectional Glenn operations. Twin AV nodes were demonstrated by the presence of two different non-preexcited QRS morphologies and/or two different His potentials located at the superior and inferior aspect of the common AV valves. All patients had VA block with adenosine. All patients had inducible TAVNT. Both typical and atypical AVNRT were seen. Typical AVNRT had short VA intervals (~20 to 50 msec). In cases with long VA intervals, TAVNT was diagnosed when post-pacing interval-tachycardia cycle length (PPI-TCL) was 110 msec, and AVNRT was diagnosed when PPI-TCL was 110 msec. RF ablation alone was used in the first and both RF and cryoablation was used in the other two patients. Transient first degree AV block occurred in 2 patients. There were no other complications. During follow-up from 10-39 months, there have been no recurrences of tachycardia.

Conclusion: In patients with complex CHD, there is a possibility of macroreentrant tachycardia between twin AV nodes, but also intra-AV nodal reentrant tachycardia. Use of all standard electrophysiology criteria to diagnose each tachycardia individually is important.
SPECIFICITY OF VENTRICULAR TACHYCARDIA SUBSTRATES IN ISCHEMIC AND DILATIVE CARDIOMYOPATHIES: PATTERNS OF CARDIAC FIBROSIS AND VENTRICULAR REPOLARIZATION

Nikolay Shlevkov¹, Azamat Zhambeev¹, Maria Chaikovskaya², Sergey Sokolov¹, Olga Stukalova¹
¹Clinical Electrophysiology, National Medical Research Cardiology Center, Russia
²Cardiology, Treatment and Reabilitation Center, Russia

Background: A detailed analysis of structural and electrophysiological features of VTs substrates in ischemic (ICM) and non-ischemic dilated (DCM) cardiomyopathies is of interest.

Methods: Fifty seven patients (41 males /9 females, mean age = 60 ± 13 years) with ICM (n=30) and DCM (n=20) with implanted ICDs were included into the prospective study. All pts underwent contrast magnetic resonance imaging (contrast-MRI) as well as the evaluation of endocardial and epicardial depolarization and repolarization features by 224-electrode body surface non-invasive activation mapping (NIAM). During 32 (26-43) months of follow-up 20/30 (67%) ICM pts and 5/20 (25%) DCM pts exhibit VTs. Multiple contrast-MRI and NIAM parameters were compared between pts with and without VTs in each etiological pts group.

Results: Unifactorial analysis identified parameters associated with VTs for both ICM and DCM pts, see table. Further Roc- and multifactorial analyses showed that volume of “gray zone” in LV 27% was the only predictor of VTs in ICM. As for DCM pts the combination of LV scar volume 4.5% and duration of endocardial repolarization of right ventricle 100 ms were two independent predictors of VTs.

Conclusion: Pts with ischemic and dilated cardiomyopathies need different approaches for identification of VTs substrate.

<table>
<thead>
<tr>
<th>No</th>
<th>Evaluated parameters</th>
<th>ICM pts</th>
<th>DCM pts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VTs (n=20)</td>
<td>No VTs (n=10)</td>
<td>VTs (n=5)</td>
</tr>
<tr>
<td>1</td>
<td>Total volume of LV scar, %</td>
<td>13(11-16)</td>
<td>11(7-12)</td>
</tr>
<tr>
<td>2</td>
<td>Volume of “gray zone”, %</td>
<td>29(27-29)*</td>
<td>23(22-25)</td>
</tr>
<tr>
<td>3</td>
<td>Presence of transmural scar in middle segments of inferior LV wall</td>
<td>50%*</td>
<td>0%</td>
</tr>
<tr>
<td>4</td>
<td>Number of LV segments with non-transmural fibrosis</td>
<td>4(3-7)</td>
<td>6(5-7)</td>
</tr>
<tr>
<td>5</td>
<td>Number of LV segments with transmural scar</td>
<td>3(1-4)*</td>
<td>1(0-2)</td>
</tr>
<tr>
<td>6</td>
<td>Duration of endocardial repolarization of right ventricle, ms</td>
<td>100(89-120)**</td>
<td>129(111-138)</td>
</tr>
<tr>
<td>7</td>
<td>Duration of epicardial depolarization of right ventricle, m</td>
<td></td>
<td></td>
</tr>
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</table>

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Guided Posters Session

Abstract Number 187:

A HIGH SPECIFICITY WEARABLE WITH PHOTOPLETISMOGRAPHY AND 6 LEAD ELECTROCARDIOGRAPHY FOR ATRIAL FIBRILLATION DETECTION: PRELIMINARY RESULTS OF A NEW DEVICE


Introduction/ Background: Emerging e-health technologies for atrial fibrillation detection suggest in-hospital recognition of atrial fibrillation (AF) to be just the tip of the iceberg. We created a wearable dedicated to provide both long-term heart rhythm monitoring and a 6-lead ECG. Authors measured its ability to differentiate between AF and sinus rhythm (SR).

Methods/ Materials: The wrist-worn device works as an integrated diagnostic system of two components: a photopletismography-based (PPG) AF detection algorithm and a wireless modified ECG of 6 limb leads. In a single-center prospective study we recruited subjects with AF and control groups of SR with/ without frequent premature atrial/ ventricular complexes (PACs/ PVCs). In addition, a validated external ECG device recorded a nearly simultaneous 3-lead continuous ECG to monitor the heart rhythm. Once the PPG algorithm detected AF it triggered a vibration alarm. Two independent diagnosis-blinded cardiologists assessed the ECG tracings as “AF”, “SR” or “Cannot be concluded”.

Results: In total we included 346 participants (AF: n=122, SR: n=92, SR with frequent PACs/PVCs: n=132). The PPG algorithm yielded sensitivity of 94.3%, specificity of 96.4% and accuracy of 95.7%. Two independent cardiologists examined a total amount of 692 ECGs recorded by the wrist-worn device. Minority (n=11; 1.6%) were classified as “Cannot be concluded”. The rest of ECG tracings (n=681) yielded sensitivity of 98.3%, specificity of 98.0 % and accuracy of 98.1%. When both PPG and ECG methods of the device were tested together as an integrated system (n=681) AF was diagnosed with sensitivity of 92.4%, specificity of 99.6% and accuracy of 97.1%. In majority of false positive PPG algorithm cases (14/16) independent cardiologists were able to correct the diagnosis to SR with the help of ECG of the device.

Conclusions: An integrated system comprising of PPG and wireless 6-lead-ECG allowed high specificity AF detection despite significant amount of SR with frequent PACs/PVCs.
Abstract Number 127:

A SINGLE CENTRE EXPERIENCE OF FIRST TIME ABLATION AND FOLLOW UP FOR PATIENTS WITH PAROXYSMAL ATRIAL FIBRILLATION – REAL WORLD EXPERIENCE AND COMPARISON OF MODALITIES

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Introduction: Atrial Fibrillation (AF) is the most common sustained arrhythmia encountered by patients in England, prevalent in around 2.5% of the population. Pulmonary vein isolation (PVI) is an effective treatment and a recommended approach for patients with drug-refractory symptomatic paroxysmal AF. The 2 most common methods to achieve this are through radiofrequency (RF) or Cryoablation. Our results over 6 months with 1 year follow up are presented.

Methods: Consecutive patients undergoing first time PVI were included over a period of 6 months and followed up for 1 year. Patients with prior ablation for AF were excluded as were those with any other ablation performed at the time of PVI. RF ablation using wide area circumferential ablation using the CLOSE protocol with the Biosense Webster SmartTouch ablation catheter and CARTO mapping system, or cryoablation using the 28mm Medtronic Arctic Front Cryoballoon were performed. Cardiac monitoring and clinic follow up was performed in all.

Results: No statistic differences were seen in age, left atrial size and left ventricular function between the 2 groups of patients. Acute PVI success was seen in all patients undergoing RF and 22/23 patients undergoing cryoablation (NS). At one year, overall 31 out of 39 (79%) patients were free of AF and off antiarrhythmic drugs. Relatively more patients (15/16) who underwent RF ablation were free of AF at one year in comparison to patients who underwent cryoablation (16/23)(p0.05).

Conclusions: In this small sample of consecutive patients over 6 months undergoing first time PVI in our centre, acute success was achieved in nearly all patients undergoing PVI with either RF or cryoablation. Overall, at one year, freedom from AF was comparable to large published studies but arrhythmia recurrence and redo rates appear greater in patients who had undergone cryoablation in comparison to RF ablation using the CLOSE protocol.
Abstract Number 185:

INTERACTION OF GENETIC VARIANTS AND ATRIAL FIBRILLATION RISK FACTORS

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2Internal Medicine Department, Riga Stradins University, Latvia
3Latvian Cardiology Center, Pauls Stradins Clinical University Hospital, Latvia

Introduction: Older age, lifestyle factors (excessive alcohol consumption, obesity, smoking, habitual vigorous exercise) and comorbidities (hypertension, heart failure, coronary heart disease, thyroid dysfunction, diabetes, chronic obstructive pulmonary disease, chronic kidney disease, obstructive sleep apnoe) independently increase risk of atrial fibrillation (AF). One of the most significantly associated locus with AF is 4q25. Previously it was shown that effect size of genetic variant could vary between different risk profile of particular disease.

Purpose: The aim of this study was to investigate whether the association between genetic variants in 4q25 locus and risk of AF is modified by other AF related risk factors.

Materials and methods: We included 241 patient with persistent AF and 128 control individuals. The presence of AF related risk factors was assessed by interviewing participants and by reviewing available medical records. Five genetic variants located in 4q25 locus (rs6825911, rs1126483, rs10004516, rs6838973, rs2200733) were selected for the study.

Results: Two genetic variants rs6836973 (OR=2.069; 95%CI 1.126-3.803, p=0.019) and rs2200733 (OR= 1.688; 95% CI=1.136-2.510, p=0.010) were significantly associated with greater risk of AF. After adjustment for probable confounders, statistical significance remained. Regardless of lack of the association between genetic variant and AF interaction analysis was performed (Table 1). A statistically significant interaction with heart failure was observed across all included genetic variants. We also observed significant interaction with gender for all genetic variants except for rs6838973. Furthermore, variant rs2200733 showed a significant interaction with all included AF risk factors except for diabetes.

Table 1. Interaction between 4q25 genetic variants, AF and AF related risk factors.

<table>
<thead>
<tr>
<th>Genetic variant</th>
<th>rs682591</th>
<th>rs1126483</th>
<th>rs10004516</th>
<th>rs6838973</th>
<th>rs2200733</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>1.005 (0.997-1.009), 0.538</td>
<td>1.001 (0.997-1.005), 0.587</td>
<td>1.002 (0.996-1.008), 0.551</td>
<td>0.999 (0.994-1.003), 0.577</td>
<td>1.011 (1.005-1.017), 0.001</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>1.006 (0.994-1.018), 0.508</td>
<td>1.004 (0.995-1.012), 0.422</td>
<td>1.004 (0.992-1.007), 0.529</td>
<td>0.986 (0.993-1.005), 0.415</td>
<td>1.019 (1.006-1.031), 0.004</td>
</tr>
<tr>
<td>Hypertension</td>
<td>0.983 (0.893-1.083), 0.735</td>
<td>0.972 (0.903-1.046), 0.444</td>
<td>0.976 (0.877-1.072), 0.547</td>
<td>0.927 (0.835-1.019), 0.051</td>
<td>1.146 (1.032-1.275), 0.011</td>
</tr>
<tr>
<td>Heart failure</td>
<td>1.380 (1.169-1.626), &lt;0.001</td>
<td>1.221 (1.094-1.364), &lt;0.001</td>
<td>1.375 (1.135-1.640), &lt;0.001</td>
<td>1.155 (1.034-1.296), 0.011</td>
<td>1.695 (1.400-2.046), &lt;0.001</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>1.097 (0.924-1.306), 0.590</td>
<td>1.043 (0.922-1.181), 0.500</td>
<td>1.075 (0.901-1.286), 0.423</td>
<td>0.921 (0.664-1.276), 0.628</td>
<td>1.457 (1.186-1.742), &lt;0.001</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>1.003 (0.827-1.215), 0.980</td>
<td>0.976 (0.649-1.423), 0.738</td>
<td>0.948 (0.615-1.416), 0.898</td>
<td>0.883 (0.767-1.017), 0.094</td>
<td>1.344 (1.106-1.633), 0.003</td>
</tr>
<tr>
<td>Thyroid dysfunction</td>
<td>1.355 (0.842-2.179), 0.211</td>
<td>1.241 (0.881-1.753), 0.216</td>
<td>1.540 (0.879-2.605), 0.132</td>
<td>0.921 (0.664-1.276), 0.620</td>
<td>1.715 (1.011-2.900), 0.045</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.922 (0.774-1.097), 0.360</td>
<td>0.917 (0.808-1.041), 0.179</td>
<td>0.878 (0.737-1.046), 0.145</td>
<td>0.807 (0.707-0.931), 0.002</td>
<td>1.162 (0.981-1.377), 0.092</td>
</tr>
</tbody>
</table>

Conclusions: Variants rs2200733 and rs6836973 are associated with risk of atrial fibrillation. Variants rs6825911, rs1126483, rs10004516, rs6838973, rs2200733 are associated with a different risk of atrial fibrillation according to the presence of heart failure. Effect size of rs2200733 also varies depending on presence of other risk factors. Our findings suggest that the pathogenesis and influence of genetic variants on atrial fibrillation may differ in patients with different risk factor profile.
Abstract Number 199:

**LOOP RECORDING MONITORING IN PATIENTS WITH CRYPTOGENIC STROKE: ONE-YEAR FOLLOW-UP**

Oleg Sapelnikov, Olga Nikolaeva, Igor Grishin, Dmitrii Cherkashin, Darin Ardus, Kalima Bogatireva, Alexey Kulikov, Tatiana Uskach, Renat Akchurin

Cardio-vascular surgery, Russian Cardiology Research Center, Russia

Introduction: Cryptogenic stroke accounts for a huge part of ischemic strokes worldwide. Subclinical atrial fibrillation (AF) remains one of the causes of cryptogenic stroke, however it is not always registered with prolonged heart-rhythm monitoring. Our clinical research demonstrates the use of implantable loop recorders (ILR) in patients with cryptogenic stroke for early detection and treatment of arrhythmias.

Materials and methods: Twenty-nine (29) patients with stroke (19) or transient ischemic attack (10) within the prior 6 months were included in study. All patients were implanted with ILR. The mean time of follow-up was one year.

Results: 513 Transmissions were detected during the whole follow-up period, including 348 planned transmissions and 165 symptomatic episodes. 146 Cases from all symptomatic episodes were registered as normal ECG. 19 “Symptomatic episodes” included 2 cases of bradycardia/asystole and 17 cases of AF/atrial tachycardia (AT) (2 patients). Different episodes accounting bradycardia and asystole (16), AF and AT (79) and ventricular tachycardia (3) were registered in 98 cases among 348 planned transmissions. However, 70 cases were false positive because of ILR over-sensing according to further analysis. By one year, arrhythmias were detected in 5 patients, including sick sinus syndrome (1), supraventricular tachycardia (1), ventricular tachycardia (1) and atrial fibrillation (3). One patient with AF was asymptomatic.

Conclusion: Implantable loop recorders help in detection of arrhythmias and appear to be an effective strategy in patients with cryptogenic stroke to timely diagnose and treat the arrhythmia.
Abstract Number 119:

ATRIAL APPENDAGES’ MECHANICS ASSESSED BY 3D TRANSOESOPHAGEAL ECHOCARDIOGRAPHY AS PREDICTORS OF ATRIAL FIBRILLATION RECURRENTCE AFTER PULMONARY VEIN ISOLATION

Ivan Zeljkovic¹, Kresimir Kordic¹, Nikola Pavlovic¹, Ivica Benko¹, Karlo Golubic¹, Ines Zadro Kordic², Nikola Kos¹, Kristijan Dula¹, Diana Delic Brkljacic¹, Vjekoslav Radeljic¹, Sime Manola¹, Nikola Bulj¹
¹Cardiology, Sestre milosrdnice University Hospital, Croatia
²Cardiology, County Hospital Dr. Ivo Pedisic, Croatia

Background: Pulmonary vein isolation (PVI) is an established therapy for patients with paroxysmal atrial fibrillation (PAF). However, atrial fibrillation recurrence (AFR) is common after the initial PVI. Although there are numerous studies reflecting AFR predictors, data on appendages’ mechanics is scarce. This study aimed to assess left (LAA) and right atrial appendage (RAA) mechanics by 3D transoesophageal echocardiography (3D-TEE) and explore its value as predictors of AFR after PVI.

Methods: We conducted a single-centre, non-randomized, cohort study. Consecutive patients with paroxysmal AF, undergoing PVI in the period January 2016 - June 2017, were analysed. Transthoracic echocardiogram (TTE) and 3D-TEE were obtained prior to the PVI procedure including: LAA strain, LAA strain rate imaging, LAA tissue Doppler imaging (TDI) tissue velocity, LAA peak emptying velocity, LAA surface area and RAA TDI tissue velocity. The primary end-point was freedom from any documented recurrence of atrial arrhythmia lasting 30 seconds.

Results: A total of 74 patients with PAF, in whom TTE and 3D-TEE prior to index PVI was done, were included (median age 59 years; 36% female; BMI 27.4 ±4.1 kg/m2, LVEF 60%, LA volume index 32 ±11 mL/m2). After a median follow-up of 14 (IQR 11-22) months, 21 patients (28%) had AFR (R-group) and 53 patients had no recurrence (NR-group). Baseline characteristics did not differ between the patients with and without AFR. Compared to NR-group, patients in R-group had lower LAA TDI (10.79 ±1.60 vs. 8.92 ±1.12 cm/sec, p=0.001) and LAA surface area (2.6 ±0.67 vs. 2.27 ±0.65 cm², p=0.043). The rest of the LAA’s parameters and RAA TDI tissue velocity (p=0.73) were not different between the patients.

Conclusion: LAA TDI emptying velocity and LAA surface area could be useful in follow-up of PAF patients after index PVI in clinical settings, unlike other LAA mechanics’ parameters and RAA TDI velocity.
Abstract Number 131:

DIFFERENCES IN ACTIVATED CLOTTING TIME AND TOTAL UNFRACTIONATED HEPARIN DOSAGE DURING PULMONARY VEIN ISOLATION PROCEDURE IN PATIENTS ON DIFFERENT ANTICOAGULATION THERAPY

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Introduction: Periprocedural pulmonary vein isolation (PVI) anticoagulation strategy represents a balance between the risk of bleeding and thromboembolic incidents. Effective intraprocedural anticoagulation is monitored by activated clotting time (ACT). International guidelines do not specify an initial unfractionated heparin (UFH) bolus dose. This study aimed to assess differences in ACT values and UFH dosage during PVI in patients on different anticoagulants.

Methods: We conducted a multi-centre, observational, registry-based study. Consecutive patients with atrial fibrillation undergoing PVI, on uninterrupted anticoagulation therapy, were analysed. Before transseptal puncture, initial UFH bolus of 100 U/kg was administered intravenously regardless of the anticoagulation drug. The ACT values and UFH dosage during the PVI procedure were recorded.

Results: A total of 873 AF patients, on uninterrupted anticoagulation therapy, in whom ACT measurement during PVI was done, were included (median age 61 years; IQR 53-66; female 30%; BMI 28.5±4.1 kg/m2, LVEF 60%, LA volume index 32 mL/m2). There were 248, 248, 189, 188 patients on warfarin, dabigatran, rivaroxaban, and apixaban, respectively. Mean initial ACT (15 min after UFH bolus) was 257 ±50 sec, overall ACT 295 ±45 sec and total UFH dose 158 ±60 IU/kg. Patients who were on warfarin and dabigatran in comparison to patients on rivaroxaban and apixaban had: (i) significantly higher initial ACT values (262±57 and 270±48 vs. 248±42 and 241±44 sec, p0.001), (ii) significantly higher ACT throughout PVI (309±46 and 306±44 vs. 282±37 and 272±42 sec, p0.001), and (iii) needed lower total UFH dose during PVI (140±39 vs. 157±71 vs. 171±52 and 172±70 IU/kg).

Conclusion: There are significant differences in ACT values and UFH dosage during PVI in patients on different anticoagulants. Patients on warfarin and dabigatran had higher initial and overall ACT values and needed lower UFH dose to achieve adequate intraprocedural anticoagulation during PVI in comparison to patients on rivaroxaban and apixaban.
**Posters List**

Abstract Number 133:

**ACUTE AND LONG-TERM OUTCOME OF CATHETER ABLATION FOR FOCALLY-TRIGGERED VENTRICULAR FIBRILLATION**

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**Introduction:** Catheter ablation (CA) has been used successfully to manage focally triggered ventricular fibrillation (VF). Long term efficacy is less known.

**Aim:** To evaluate the outcome of CA of focally triggered idiopathic VF and VF in structural heart disease in a tertiary specialized center.

**Methods:** A total of 36 pts (11 females, mean age 56.1 ± 16.3 years) were ablated for electrical storm between 1998-2018 (7 idiopathic, 17 early after infarction, 5 remotely, 2 early and 4 late after coronary artery bypass surgery, 1 after mitral valve surgery). All patients were on beta-blockers and antiarrhythmics, sedated, and 15 were artificially ventilated. CA was performed urgently in all cases, using predominantly activation mapping and support of electroanatomical mapping system. All survivors underwent implantation of an ICD.

**Results:** CA was successful in suppressing electrical storm completely in 33 out of 36 patients (92 %). Triggering focus was in 35 cases in the left ventricle and in 29 cases originated in Purkinje fibers. One idiopathic VF patient had 2 foci in the right ventricle. The follow-up reached 68 ± 59.9 months. All but 1 idiopathic VF patients are alive with no recurrences. Among 29 patients with structural heart disease, 16 died (55%) – 3 early (for postresuscitation brain damage or multiorgan failure) and 13 during 39.8±54.9 months of follow-up, mostly due progression of heart failure.

**Conclusions:** CA is an efficacious strategy for intractable cases of electrical storm due to focally triggered VF. The survival of the patients is determined by underlying heart disease.
Abstract Number 144:

TRANSCUTANEOUS ELECTRICAL SPINAL CORD STIMULATION CHANGES ATRIOVENTRICULAR CONDUCTION AND BLOOD PRESSURE IN HUMANS

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Background: Epidural spinal cord stimulation (SCS) has been shown to influence cardiovascular autonomic regulation. Transcutaneous electrical SCS (te-SCS) has been developed recently and is actively studied in rehabilitation.

Purpose: To determine if te-SCS is associated with acute changes in systemic and pulmonary hemodynamic and cardiac electrophysiology at rest.

Methods: Nine subjects without structural heart disease referred for catheter ablation of cardiac arrhythmia and signed an informed consent to participate in this exploratory protocol were included.

TE-SCS was performed at vertebral levels T1, T7, T11 in a random order. Invasive systemic and pulmonary hemodynamics, atrial, atrioventricular nodal (AVN) and ventricular effective refractory periods (ERP), systemic (SVR) and pulmonary vascular resistance (PVR) were assessed before, during and after periods of te-SCS.

Results: Higher systolic BP (BPs) was noted during T1 te-SCS as compared with baseline values (147.88±22.52 vs 135.44±17.38 mmHg; p=0.02). A delta in averaged systolic (avBPs) and diastolic blood pressure (avBPd) was higher during T1 stimulation when compared with other stimulation levels (Figure 1A and B; p=0.04). There was a trend towards higher SVR and lower PVR during T1 stimulation.

AVN ERP was shortened during stimulation at the T1 and T7 levels, when compared with baseline values (baseline 303.3±15.0 vs 272.0±19.2 for T1 vs. 278.0±8.3 ms for T7; p=0.05; Figure 1C). There was a trend towards residual effect on AVN ERP after 3 minutes of te-SCS cessation. No effect on atrial and ventricular ERP was found.

Conclusion: Non-invasive te-SCS impacts cardiac electrophysiology and hemodynamics. TE-SCS at the T1 level is associated with an elevation of BPs. TE-SCS at the T1 and T7 levels shortens AVN ERP. Further studies are needed for the evaluation of te-SCS in patients with impaired AV conduction and hypotensive episodes.
Abstract Number 145:

THE COMBINING EFFECTS OF GLP1 ANALOGUE AND SGLT2 INHIBITORS FOR BMI30kg/m² PATIENTS WITH HEART FAILURE AND DIABETES MELLITUS TYPE 2

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Background: The effect of combining GLP1 analogue and SGLT2 inhibitors in heart failure and HbA1c in patients with BMI 30 with non-insulin-treated diabetes mellitus type 2 (the paradoxical phenomenon of obesity in diabetic patients with heart failure).

Purpose: The aim of this study is to show improvement of heart failure in patients with BMI 30 with the corresponding medication.

Methods: The study involved 51 non-insulin-treated diabetic patients with heart failure and BMI 30, of whom 12 (23.5%) were men with an average age 80.2 years and 39 (76.5%) were women with an average age of 79.9 years. Heart failure was assessed with cardiac ultrasound. The patients studied were given tablets (metformin +/- DPP4 inhibitor +/- sulfonylureas +/- glitazones). The duration of the study was one year and the antidiabetic medication of all patients was changed to metformin plus GLP1 analogue plus SGLT2 inhibitor. HbA1c, BMI were measured and the course of the heart failure was assessed at 3-6 and 9-12 months.

Results: A decrease in HbA1c and BMI values was observed as well as an improvement in heart failure compared to the second measurement. In 3-6 months and in 9-12 months the values were the following: HbA1c: 7.58% ± 0.32, HbA1c: 7.05% +/- 0.25 (p=0.005), BMI: 32.03 ±0.48, BMI: 30.68 +/- 0.44 (p 0.0001), 30% EF 45%, 45% EF 60%, (p 0.0001).

Conclusion: The combination of metformin plus GLP1 analogue plus SGLT2 inhibitors has multiple benefits in improving the glycemic profile of patients, BMI and heart failure in non-insulin-treated patients with diabetes mellitus and BMI 30.
Abstract Number 146:

THE COMBINING EFFECTS OF GLP1 ANALOGUE AND SGLT2 INHIBITORS FOR BMI26 PATIENTS WITH HEART FAILURE AND DIABETES MELLITUS TYPE 2

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Background: The effect of combining GLP1 analogue and SGLT2 inhibitors in heart failure and HbA1c in patients with BMI 26 and with non-insulin-treated diabetes mellitus type 2 (the paradoxical phenomenon of obesity in diabetic patients with heart failure).

Purpose: The aim of the study is to investigate the effect of the combination of GLP1 analogue and SGLT2 inhibitor on HbA1c and ejection fraction in non-insulin-treated diabetic patients with BMI

Methods: The study involved 47 non-insulin-treated diabetic patients with heart failure and BMI26, of whom 32 were men with an average age 71.6 years and 15 were women with an average age of 73.86 years. Heart failure was assessed with cardiac ultrasound. The patients studied were given tablets (metformin +/- DPP4 inhibitor +/- sulfonylureas +/- glitazones). The duration of the study was one year and the antidiabetic medication of all patients was changed to metformin plus GLP1 analogue plus SGLT2 inhibitor. HbA1c, BMI was measured and the course of the heart failure was assessed at 3-6 and 9-12 months.

Results: A decrease in HbA1c and BMI values was observed as well as an improvement in heart failure compared to the second measurement in 3-6 months and in 9-12 months and the values were the following: HbA1c: 7.63% ± 0.55, HbA1c: 6.9 +/- 0.022 (p=0.0004), BMI: 25.05 ±3.5, BMI: 21.87 +/- 0.13 (p0.001), 25%EF45% , 35%

Conclusion: The combination of metformin plus GLP1 analogue and SGLT2 inhibitor has multiple benefits in improving the glycemic profile and BMI patients, but without significant change regarding the ejection fraction in non-insulin-treated diabetic patients with heart failure and BMI 35 have low BNP and decreased activation of the renin-angiotensin system compared to underweight and normal-weight patients. Further larger population studies are needed to confirm findings.
Abstract Number 152:

HOT-CRT IS OPTIMAL IN NON-CLASSIC LBBB

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Cardiac resynchronization therapy is the standard procedure for all patients with cardiomyopathy, left thigh blockage (LBBB) and advanced heart failure. However, in this conventional procedure, up to one-third of CRT patients are non-responders.

Recent studies showed that permanent His-bundle stimulation (pHBP) in combination with classical resynchronization (known as HOT-CRT) can lead to a remarkable QRS narrowing or normalization of LBBB morphology.

In patients with progressive cardiomyopathy, additional intraventricular conduction disorders (IVCD) may co-exist with LBBB, which could not be remedied by the sole pHBP. In this case, we think it makes sense to optimize the CRT with both His-Bundle and sequential left ventricular pacing.

We evaluate the efficacy of the HOT-CRT on the basis of clinical, electro- and echocardiographic results of two patients.

Patient 1)

Male, 59 years old

Ischemic cardiomyopathy, 2010 impl. ICD VR, in 2016 ICD replacement by new ICD and III 2019 extension to HOT-CRT. Before the HOT-CRT, the patient came with: NYHA III(EF 30%), LVDD(6.9cm), LA(5.9cm) and mitral insufficiency. The patient has a tendency to bradycardia, with a ventricular rhythm of about 50-55/min. In the past several VF episodes and effective defibrillation. Implantation with Compia Quad CRT-D, His-Bundle stimulation is selective. VI 2019 control showed: NYHA II EF(43%), LVDD(6,3cm), LA(5,3cm), mitral insufficiency and 100% stimulation.
Patient 2)
Male, 60 years old. Ischemic cardiomyopathy, myocardial infarction and PCI LAD and III 2019
HOT-CRT implantation. Before the HOT-CRT: NYHA III (EF 21%), LVDD (6,2cm), LA (4,5cm) and mitral insufficiency. Implantation with Compia Quad CRT-D, His-Bundle stimulation is selective. VI 2019 control showed: NYHA II EF (31%), LVDD (6,2cm), LA (4,9cm), Mitral regurgitation and 100% stimulation.
Results: Both ECGs, 25 mm/s
Pat1-initial 150, BiV 140, HOT-CRT 120 ms
Pat2-initial 160, Biv 140, HOT-CRT 120 ms
Conclusion:
1) HOT-CRT led to improved electrical resynchronization.
2) HOT-CRT can improve clinical and echocardiographic outcomes in advanced HF patients with coexisting conduction disorders.
Abstract Number 164:

**HIS PACING – A FEASIBLE OPTION IN A PATIENT WITH L-TGA AND COMPLETE AV BLOCK**

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Introduction: Levo-Transposition of the Great Arteries (L-TGA), also known as “congenitally corrected transposition of the great arteries,” is a congenital cardiac anomaly in which the embryological looping of the ventricles is reversed. This malformation is often accompanied by conduction abnormalities, most commonly AV node dysfunction. His pacing is often chosen as an alternative to cardiac resynchronization therapy (CRT) when CRT is not achieved, or in patients with complete AV block.

Materials - case presentation: We present a 41-year old male patient with Levo-Transposition of the Great Arteries (L-TGA) and implanted pacemaker (PM) at the age of 15 due to complete AV block. Because of worsening of his functional capacity (NYHA class III) and severely decreased function of the systemic right ventricle, and with 100% of ventricular pacing, upgrade of the device for cardiac resynchronization therapy (CRT) was considered. Cardiac computer tomography (CT) demonstrated a rudimentary coronary sinus (CS). Thus, resynchronization therapy was not applicable. Instead transvenous His bundle pacing lead was implanted, using 3D system for mapping of the His region (EnSite Precision™, St. Jude Medical). ECG post procedure was compatible with His pacing compared to LBBB 180 ms at baseline. At 3 months’ follow-up, there was an improvement of his complaints. On 6-minute walk test he was able to increase the walking distance from 330m to 440m. Echocardiography demonstrated mild improvement of the function of systemic RV.

Discussion and conclusion: Given the limitations of CS cannulation in patients with L-TGA His pacing seems a feasible option for those who have preserved infra-Hisian conduction system.
Abstract Number 168:

PERMANENT CARDIAC PACING – ATTEMPT TO CONNECTION BETWEEN NUMBER OF IMPLANTED DEVICES AND AIR POLLUTION

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Introduction: First permanent cardiac pacemaker was implanted in Sweden by prof. Ake Sening. Cardiac Pacemaker Implantation Centre in Swietokrzyskie Cardiac Centre is also recently launched.

Methods: The aim of the study is to present a brief of cardiac pacing in author’s implantation centre, Poland and in the world. Because of increasing environment and food pollution in these days, attention is drawn to the impact of this pollution on circulatory system and cardiac diseases. The aim of the study is the attempt to give an answer to the question: Does environment pollution has impact on higher frequency of cardiac pacemaker implantation in Poland.

Results: The study shows a data of patients qualified to permanent cardiac pacing in 1993–2009. In this time 7482 cardiac pacemakers were implantated in general. DDD, VVI, AAA, VDD pacemakers were implanted most often. Data were acquired from casebooks of patients admitted to Swietokrzyskie Cardiac Centre and Pacemaker Control Workshop in Voivodship Hospital in Kielce. 7482 permanent cardiac pacemakers were implanted in 1993–2009 in general. This group consisted of 787 AAI, 4031 VVI, 465 VDD and 2199 DDD pacemakers.

Conclusion: After comparison of these data with national data we observed that the highest number of implantation of a cardiac pacemakers were performed in mazowieckie, lubuskie, dolnoslaskie, opolskie voivodship. The lowest number numer of implantation were performed in warminsko-mazurskie and lubelskie voivodship. After consideration the fact that results of environment and food pollution has a similar distribution, a cautiously thesis was suggest that environment pollution has impact on frequency of pacemakers implantation. Presented data suggest that further studies of this problem are desirable.
Abstract Number 172:

PREVALENCE, TYPES AND PREDICTORS OF CARDIAC ARRHYTHMIAS IN HEART FAILURE PATIENTS IN JOS, NIGERIA

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Background: arrhythmias are the major cause of sudden death in heart failure patients, as well as periodic decompensation and worsening outcome. Not much is known about arrhythmias in heart failure locally. Such knowledge will assist in reducing sudden death and decompensation in heart failure; hence the study.

Methods: 150 patients 18 years and above with heart failure and attending our service at jos university teaching hospital were studied. They all had static 12 lead electrocardiogram while 1 out of 2 in the order of recruitment had 24 hour holter monitoring. Relevant history, physical examination and laboratory investigations were done.

Results: there were 68 males and 82 females with a mean age of 47.11+/− 15.97 years.arrhythmias were less prevalent using static electrocardiogram compared to 24 hour holter monitoring (78% versus 98.7%. P = 0.002). Sinus tachycardia was the highest type and complete heart block was the lowest by static electrocardiogram while ventricular ectopics and sinus bradycardia were the highest and lowest respectively with 24 hour holter monitoring. There was no signofocant difference in arrhythmias based on aetiology of heart failure. Arrhythmia prevalence increased with new york heart association classification status. With static ecg, female gender, abnormal blood pressure, high fasting blood glucose, hyponatraemia, hypokalemia; elevation in serum creatinine, erythrocyte sedimentation rate, low density lipoprotein cholesterol, atherogenic index, left atrial dimension, left ventricular internal dimension indiastole as well as low ejection fraction were associated with development of arrhythmias in heart failure.

Conclusion: arrhythmia is common in heart failure in our environment. Severity of heart failure, deranged biochemical and echocardiographic parameters as well as female gender predispose to development of arrhythmias in heart failure. Attention should be paid to them inorder to ameliorate morbi-mortality.
CASE REPORT OF AN ENDOCARDIAL LEFT VENTRICULAR LEAD EXTRACTION DUE TO ENDOCARDITIS

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Introduction: Cardiac stimulation therapies have enhanced both in quantity and complexity. Life expectancy is higher, access to better medical therapy and to new techniques of cardiac stimulation, are responsible to multiple procedures on cardiac insufficiency patients, lately there has been some reports of endocardial left ventricular stimulation. It still remains a challenge, treating complications in this situation, especially lead endocarditis.

Methods: We report a case of an endocardial left ventricular lead extraction that had been inserted ten years ago, through the right internal jugular vein (rijv) and through an inter atrial septum puncture.

Case Report: Female, 75 y.o., was transferred from another hospital to our service, with positive blood cultures, transesophageal echocardiogram (tee) suggesting a 2.2 cm vegetation on the ventricular lead. After assessment of the patient, upon x-ray image, we observed that the patient had been submitted to cardiac resynchronization therapy (crt-p) but what was unique was that the left ventricular lead (lvl) had been inserted directly into the left ventricle instead via the coronary sinus. We performed the lead extraction of the right atrial lead and the right ventricular lead in the usual way, but the lvl had been inserted through the rijv. We approached the lvl through the right femoral vein with a snare and pulled it towards the femoral vein. The lead was still adherent on its proximal portion, so we exposed the jugular vein and cut the lead. The entire lead was removed through the femoral vein. The patient was discharged from the hospital successfully.

Conclusion: There are few studies regarding either implant or extraction of endocardial lvl. It is a complex procedure and requires great operator experience. We recognize this is a unique case, and further studies are needed.
Abstract Number 188:

**USAGE OF ORAL ANTICOAGULANTS AND THEIR INFLUENCE ON HEALTH-RELATED QUALITY OF LIFE OVER 6- AND 12-MONTH PERIOD**

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Introduction: Atrial fibrillation (AFib) is the most common sustained arrhythmia, that’s prevalence increases with age and can complicate with stroke. For its prevention daily oral anticoagulant (AC) usage is recommended. The aim of the study was to determine AC influence on the health-related quality of life (HRQoL).

Methods: Prospective analytic study October 2016 - July 2019 was held, selecting high-risk non-valvular AFib patients and interviewing them about medical history, therapy, demographic data and HRQoL using a modified SF-36 form. Follow-up was on 6- and 12-months. Acquired data were analyzed with SPSS.

Results: Total 376 AFib patients, 56.5% (n=218) female, 43.3% (n=167) male, were enrolled, mean age 71.4 years (SD 8.4). On starting study (0m) – AC non-users: 110 (28.5%), warfarin users (W): 135 (35.0%), NOAC’s users: 141 (36.5%). On 0m a statistically significant difference (p=0.001; 95% CI) between AC user groups was found in physical functioning (AC non-users-62.6%, W–53.4%, NOAC–69.9%), energy/fatigue section (p=0.032;AC non-users-49.5%, W–46.6%; NOACs–53.9%), emotional well-being (p=0.024; AC non-users–70.3%, W-70.8%, NOACs–75.9%). Comparing HRQoL on follow-ups, improvement was found in role limitation due to physical health for W(p=0.001; 0m–34.8%, 6m–78.3%, 12m–65.2%), and NOAC (p=0.029; 0m–38.5%, 6m-65.4%, 12m–57.7%); in energy/fatigue levels for NOAC users (p= 0.016; 0m–48.5%, 6m–54.8%, 12m–47.0%); emotional well – being for AC non-user group (p=0.036; 0m–72.4%, 6m–78.6%, 12m–69.8%) and in W group ( p=0.005; 0m–68.7%, 6m–76.5%, 12m–74.3%), general health for W user group (p=0.026; 0m–29.4%, 6m–42.4%, 12m–45.7%).

Conclusion: NOACs users has statistically significant better physical functioning, emotional well -being and energy/fatigue level compared to non-users and W users at enrolment. Usage of AC correlate with improvement of HRQoL.