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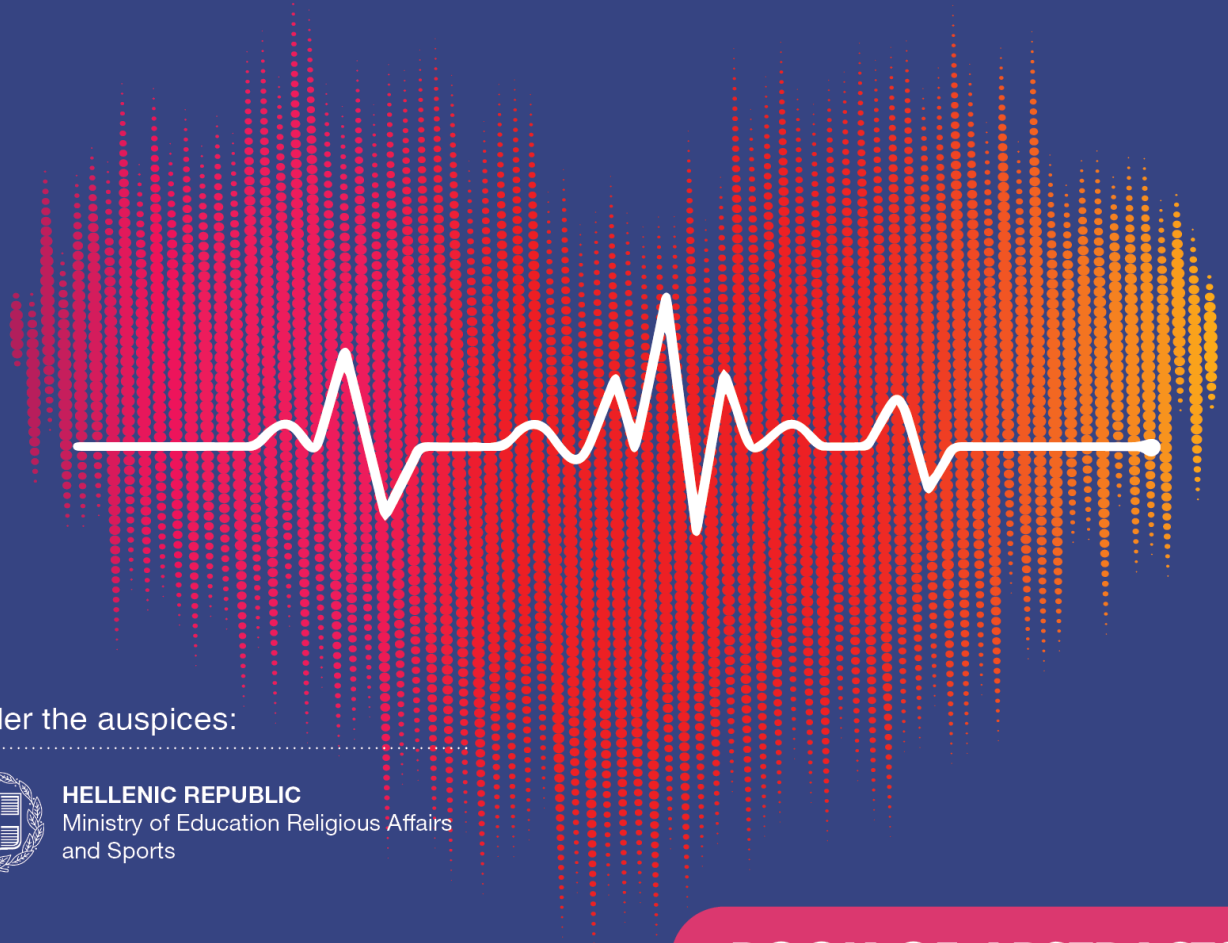

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HELLENIC REPUBLIC
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BOOK OF ABSTRACTS

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Oral Abstracts

4610 - Optimizing Atrial Fibrillation Detection Through Hybrid ECG-Based Feature Selection Using Extremely Randomized Trees And Non-Linear Correlation Measures

Georgios Petmezas[1], Vasileios E. Papageorgiou[2], Vassilios Vassilikos[1], John A. Rogers[3], Rod S. Passman[4], Leandros Stefanopoulos[1], Aggelos K. Katsaggelos[5], Nicos Maglaveras[1]
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Introduction: Atrial fibrillation (AFib) is the most prevalent abnormal heart rhythm, significantly increasing the risk of stroke and heart failure. Accurate and timely detection remains challenging, particularly due to the complexity of 12-lead electrocardiogram (ECG) interpretation. While machine learning (ML) and deep learning (DL) models have demonstrated high accuracy in AFib detection, selecting the optimal input features is often non-trivial.
Material & Methods: We propose a hybrid feature selection methodology that combines Extremely Randomized Trees (Extra-Trees) with non-linear correlation measures to identify the most discriminative ECG-based features distinguishing AFib from normal sinus rhythm (NSR). Our analysis evaluates time-based, entropy-based and spectral hand-crafted features extracted from 12-lead ECG recordings of patients who underwent catheter ablation for AFib. Two novel metrics, the feature importance score (FIS) and the overall feature importance score (OFIS), are introduced to quantify feature relevance.
Results: The proposed feature selection approach demonstrated strong consistency between features derived from single-lead and full 12-lead analyses. The identified feature subset retained high discriminative power while significantly reducing dimensionality, ensuring robustness across different ECG leads.
Conclusions: This methodology can serve as a preprocessing step for ML/DL models, aiding clinicians in real-time AFib detection during routine ECG screenings. By enhancing interpretability and reducing feature dimensionality, our approach offers a practical and reliable solution for improving diagnostic accuracy in electrophysiology.

4614 - PowerECG: A Portable And Versatile ECG Analysis Platform For Rapid Cardiac Screening

Mehrdad Shahmohammadi Beni[1], Derek Wu[2], Hamza Waraich[3], Quinncy Lee[4], John Kwok Tai Chui[5], Tong Liu[6], **Gary Tse[1]**

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Introduction: PowerECG offers a portable, easy-to-use graphical user interface (GUI) written in Python. It processes XML-based ECG data, identifies key waveform features, and applies machine learning to analyze scanned ECG images, enabling rapid screening, reporting, and prognostic insights.

Methods: PowerECG is a Python-based GUI tool built with Tkinter and specialized libraries for signal processing, data visualization, and YOLO-based deep learning (Fig. 1A). Its workflow involves reading ECG data from XML, detecting R-peaks for RR intervals, calculating parameters (QT, QRS, ST segments), and recognizing ECG leads or waveforms from scanned images. The system also generates vectorcardiograms (VCGs) via the Dower inverse matrix, offers screening for Brugada pattern, and includes a voice output feature. PowerECG identifies J-point elevations and ST/T changes, prolonged QT intervals, atrial fibrillation, sinus tachycardia or bradycardia, left ventricular hypertrophy and premature ventricular contractions.

Results: PowerECG can accurately identify R-peaks, measure interval durations (e.g., QT, QRS), and detect clinically relevant abnormalities such as ST-segment elevation and T-wave inversion. PowerECG can generate a sample ECG waveform plot (Fig. 1B) on standard ECG paper and a vectorcardiogram (VCG) overlaying on a 3D human heart model (Fig. 1C). Comprehensive diagnostic reports can be produced in English, traditional and simplified Chinese, Spanish and Japanese (Fig. 1D). Using a YOLO-based detection algorithm, distinct waveforms in each lead can be automatically identified (Fig. 1E).

Conclusion: PowerECG is a versatile and user-friendly ECG analysis tool that may improve clinical workflows by integrating automated screening and advanced visualisation, making cardiac assessments more efficient for healthcare providers.

4624 - A Novel Variational Autoencoder Framework For Explainable AI-ECG

Konstantinos Patlatzoglou[1], Libor Pastika[1], Joseph Barker[1], Ewa Sieliwonczyk[2], Gul Rukh Khattak[1], Boroumand Zeidaabadi[1], Antônio H. Ribeiro[3], James S. Ware[1], Nicholas S. Peters[1], Antonio Luiz P. Ribeiro[4], Daniel B. Kramer[5], Jonathan W. Waks[5], Arunashis Sau[1], Fu Siong Ng[1]

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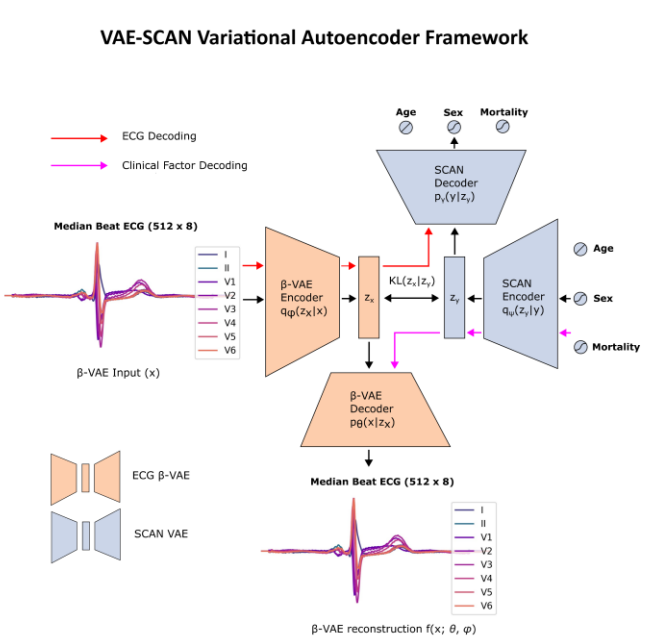
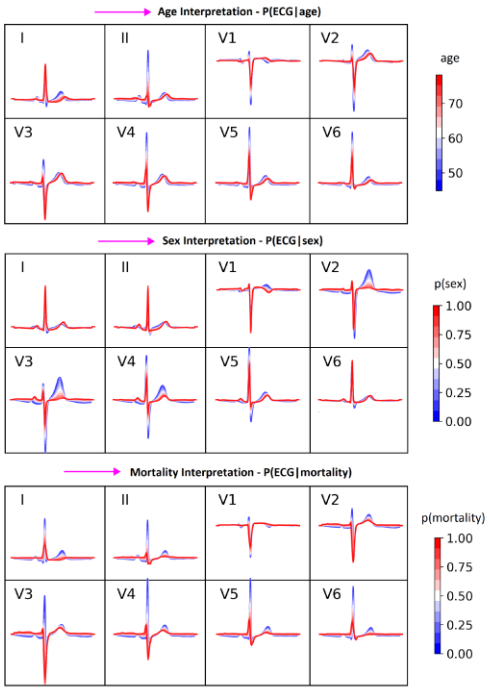
Introduction: Artificial intelligence-enhanced electrocardiogram (AI-ECG) models have shown outstanding performance in a vast range of diagnostic and prognostic tasks, yet their black-box nature hampers clinical adoption. Meanwhile, a growing demand for explainable AI (XAI) in medicine underscores the need for transparent, trust-worthy decision-making. Post-hoc explainability techniques have largely fallen short, yielding ambiguous, inconsistent, and biased interpretations of model behavior.
Methods: In this work, we propose an inherently explainable framework using variational autoencoders (VAEs) – a technique which enables the discovery of structured and continuous axes of clinically interpretable ECG features. Specifically, we trained a convolutional β-VAE model on over 3 million ECGs using primary and secondary care clinical datasets (BIDMC, TNMG). We next integrated a symbol-concept association network (SCAN), allowing us to model bi-directional associations between ECG features and clinical factors, while preserving the causal mechanisms used for decoding and explainability.
Results: The VAE model utilized up to 80 ECG features (latent factors) under maximal encoding capacity (Pearson's R=1, 0.006 mV per sample MAE). Based on these features, SCAN was able to learn sparse associations with a limited number of ECG-label pairs, when trained under clinical factors such as age, sex, and mortality risk. The model's decoding performance reached an MAE of 10.76 for age, an AUC of 0.81 for sex, and an AUC of 0.72 for 5-year mortality risk. Population-level interpretability was acquired by visualization of clinical factor traversals, which revealed both known and novel, nuanced ECG signatures – supporting the model's validity for sample- and model-level explainability.
Conclusions: Our results demonstrate a state-of-the-art VAE model and a novel framework (VAE-SCAN) for explainable AI-ECG. This approach has implications for biomarker discovery and the development of explainable, personalized, and population-level clinical tools.


VAE-SCAN Variational Autoencoder Framework
ECG Decoding
Clinical Factor Decoding
Age
Sex
Mortality
SCAN Decoder
Median Beat ECG (512 x 8)
β-VAE Encoder
KL(z_x|z_y)
SCAN Encoder
β-VAE Input (x)
β-VAE Decoder
ECG β-VAE
SCAN VAE
Median Beat ECG (512 x 8)
β-VAE reconstruction f(x; θ, φ)


Age Interpretation - P(ECG|age)
Sex Interpretation - P(ECG|sex)
Mortality Interpretation - P(ECG|mortality)
I
II
V1
V2
V3
V4
V5
V6
age
p(sex)
p(mortality)

4678 - Machine Learning -Guided Differentiation Of RVOT And LVOT Arrhythmias

Michail Botis[1], Dimitrios Tsiachris[1], Georgios Botis[2], Aristomenis Koumpanakis[2], Lamprini Iro Bartsioka[1], Ioannis Doundoulakis[1], Athanasios Kordalis[1], Christos Konstantinos Antoniou[1], Aikaterini-Eleftheria Karanikola[1], George K Matsopoulos[2], Konstantinos Tsioufis[1]
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Introduction: Idiopathic premature ventricular complexes (PVCs) commonly originate from the right and left ventricular outflow tracts (RVOT and LVOT, respectively). The surface 12-lead electrocardiogram (ECG) is commonly used to differentiate the anatomic site of origin, prior to catheter ablation. Machine learning methods can further enhance diagnostic accuracy.
Materials & Methods: In this study, ECG-derived features, along with demographic characteristics, were analyzed from 43 patients (65.1% males, mean age 56 ± 16.6 years), who underwent successful catheter ablation of outflow tract- originating idiopathic PVCs. The site of origin was depicted through 3-D electroanatomical mapping. Several ML models, including Random Forest, Support Vector Machines (SVM), K-Nearest Neighbors (KNN), and XGBoost, based on 65 ECG features, alongside patient age and gender, were trained to classify the site of origin as either RVOT or LVOT.
Results: XGBoost demonstrated the best classification performance, achieving a test accuracy of 0.90, with a sensitivity of 1.00 and a specificity of 0.80. The overall F1-score was 0.91, indicating strong predictive ability. Feature importance analysis revealed that PVC QRS axis (importance: 0.1604), PVC Lead II S-wave amplitude (0.1510), and PVC AVL Lead R-wave amplitude (0.1338) were the three most significant predictors in distinguishing the arrhythmia origin.
Conclusions: These findings suggest that machine learning, particularly XGBoost, can effectively classify OTVAs based on ECG parameters, supporting its potential use in automated differentiation and pre-procedural planning.

4682 - Artificial Intelligence-Enabled Sinus Electrocardiograms For The Detection Of Paroxysmal Atrial Fibrillation Benchmarked Against The CHARGE-AF Score

Constantine Tarabanis[1], Vidya Koesmahargyo[2], Robert Ronan[2], Dimitrios Tachmatzidis[3], **Constantinos Bakogiannis[3]**, Vassilis Sousonis[4], Stylianos Tzeis[4], Vassilios Vassilikos[4], Lior Jankelson [2]

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Introduction: Atrial fibrillation (AF) is often underdiagnosed due to its episodic and asymptomatic nature. Early identification of at-risk patients enables timely preventive strategies, such as anticoagulation, to reduce AF-related complications. Artificial intelligence (AI) algorithms applied to sinus rhythm electrocardiograms (ECGs) show potential for latent AF detection, yet their added value over established scores like CHARGE-AF remains unclear. This study aimed to develop and validate a convolutional neural network (CNN)-based AI-ECG model for paroxysmal AF detection and benchmark it against CHARGE-AF.

Methods: We curated 157,192 sinus ECGs from 76,986 patients across the NYU Langone Health system, splitting them into training, validation, and test sets. External validation cohorts were drawn from two Greek hospitals: Ippokrateio (Thessaloniki) and Hygeia (Athens). A CNN using ECG time series data—alone and combined with CHARGE-AF features—was trained to predict incident AF. Model performance was evaluated using AUC, AUPRC, sensitivity, specificity, and F1 score.

Results: In the NYU test cohort (n=15,343), the ECG + CHARGE-AF model achieved the highest performance: AUC 0.89 (95% CI: 0.88–0.89), AUPRC 0.69 (0.67–0.70). All AI-ECG models outperformed CHARGE-AF. In the Greek external cohort (n=306), the same model achieved AUC 0.85 (0.81–0.88), AUPRC 0.78 (0.71–0.84), performing comparably to CHARGE-AF. This reduced incremental gain in the external cohort was explainable through observed differences in CHARGE-AF score distributions between positive and negative classes.

Conclusions: AI-ECG can improve paroxysmal AF detection beyond CHARGE-AF, though gains are influenced by the relative risk profile of positive and negative cases in the target population.

4565 - Pre-Implant AI-ECG Age As A Predictor Of Survival Following Cardiac Resynchronization Therapy

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Introduction: Cardiac resynchronization therapy (CRT) selection criteria are well-defined, yet there is an ongoing need for refined predictors of post-implant outcomes to identify responders. The advent of artificial intelligence-enabled electrocardiography (AI-ECG) offers a novel opportunity to evaluate biological age, potentially outperforming chronologic age in assessing physiological health. We aimed to determine whether pre-implant AI-ECG-derived age, as a surrogate for biological age, can independently predict survival following CRT.
Methods: We conducted a retrospective review of patients receiving a de-novo CRT-D at Mayo Clinic (January 2001–September 2022). Inclusion criteria were left ventricular ejection fraction (LVEF) ≤ 35%, QRS duration ≥ 120 ms, and CRT-D implantation. AI-ECG age was extracted from the most recent pre-implant ECG, and the delta age (ECG age minus chronologic age) was calculated. Survival analyses were performed using accelerated failure time models with a log-logistic distribution. Time ratios (TR) were calculated to represent survival changes per unit increment of each variable. Multivariable analyses incorporated forward and backward selection of key variables including chronologic age, delta age, LVEF, QRS duration, QRS morphology, cardiomyopathy type, gender, and comorbidities such as type 2 diabetes mellitus, hypertension, and CKD stage ≥3.
Results: 464 patients were included in the analysis. The final multivariable model retained variables such as chronologic age, cardiomyopathy etiology, delta age, and the presence of type 2 diabetes mellitus, hypertension, and CKD stage ≥3. Multivariable analysis demonstrated a 37% survival decrease per ten-year increase in the delta age (TR 0.963, p = 0.007). A lower ECG age compared to the chronological age thus portended increased survival.155 patients had follow-up ECGs 3-6 months post implant. A multivariable analysis with stepwise selection of variables in this cohort demonstrated no correlation between change in the delta age pre-and post-implant with post-implant survival.
Conclusion: Pre-implant AI-ECG derived delta age emerges as a robust, independent predictor of survival post-CRT. Lower AI-ECG age compared to chronologic age may reflect a lower burden of cardiac disease and enhanced physiological reserve. These findings underscore the potential of AI-driven tools to optimize CRT patient selection and personalize therapeutic strategies.

4579 - Deep Learning ECG Image Platform For Cardiac Diagnosis And Risk Stratification

Boroumand Zeidaabadi[1], Konstantinos Patlatzoglou[1], Libor Pastika[1], Joseph Barker[1], Nicholas S. Peters[1], Daniel B. Kramer[2], Jonathan W. Waks[3], Fu Siong Ng[1], Arunashis Sau[1]
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Introduction: Early detection of cardiovascular disease and accurate risk prediction are critical for improving patient outcomes. While AI-enhanced ECG (AI-ECG) tools show great promise, many depend on digital signal input, limiting their clinical utility in environments lacking. This study introduces an image-based AI-ECG platform for cardiac screening and risk prediction.
Methods: We developed deep learning models using over 1.1 million ECG images from 189,538 patients in a secondary care dataset. Model performance was validated internally and externally across multiple cohorts: CODE (n=645,380), SaMi-Trop (n=1,022), and UK Biobank (n=42,386). Robustness was tested using photographed ECGs, lead position variation, simulated artefacts, and incomplete leads.
Results: The platform demonstrated strong diagnostic capabilities, including detection of reduced ejection fraction (AUC 0.896) and valvular heart diseases: aortic stenosis (AUC 0.869), tricuspid regurgitation (0.850), mitral regurgitation (0.826), and aortic regurgitation (0.775). Mortality prediction showed strong performance across all cohorts (c-statistic 0.818 [0.814-0.821] in BIDMC, 0.832 [0.814-0.850] in photographed images, 0.764 [0.761-0.768] in CODE and 0.770 [0.725-0.816] in SaMi-Trop). Future cardiac conditions were accurately predicted in internal validation: atrial fibrillation (0.770 [0.764-0.776]), heart failure (0.809 [0.805-0.814]), ventricular arrhythmia (0.800 [0.788-0.814]), atherosclerotic cardiovascular disease (0.758 [0.752-0.765]), and complete heart block (0.855 [0.840-0.870]). High-risk quartiles consistently showed significantly elevated event risks. Saliency mapping revealed interpretable and condition-specific activation patterns.
Conclusion: This image-based AI-ECG platform offers robust, scalable, and interpretable cardiac risk prediction using standard ECG images. Its generalisability across diverse cohorts and image types makes it suitable for global clinical deployment, particularly in low-resource settings.

4598 - Detection Of Paroxysmal Atrial Fibrillation During Sinus Rhythm Using P-Wave Loop Vectorcardiographic Indices

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Background: The P-loop of the vectorcardiogram (VCG) reflects atrial electrical activity, where changes in vector direction and loop shape can be conceived as descriptors of the spatiotemporal characteristics of the atrial electrical cycle. The purpose of this study was to identify patients with paroxysmal atrial fibrillation (PAF) analyzing their sinus rhythm VCGs, specifically the geometry of their P-wave loops. Detecting PAF from sinus rhythm recordings is especially relevant in particular clinical scenarios, such as cryptogenic stroke.
Methods: We compared patients with known PAF to healthy subjects. Cluster pair matching was used to ensure group similarity. We recorded 3 orthogonal VCG leads at 1000 Hz for 10 minutes during SR. We extracted P-waves from each lead to construct per-beat 3D P-wave loops. For each loop, we computed the mean±SD of three eigenvalues and a flatness index for each subject's loops. To calculate those indices, we applied singular value decomposition (SVD) to the 3D coordinates of each loop samples. SVD produces orthogonal vectors ranked by variance, with $\lambda_1 > \lambda_2 > \lambda_3$. Flatness index was calculated as 1 minus the ratio of λ3 to the sum of all eigenvalues (1 corresponding to a completely flat loop).
Results: We analyzed 69 patients with known PAF and 59 healthy subjects. The two groups did not differ significantly in terms of age, sex, left ventricular ejection fraction, history of coronary heart disease or heart failure and use of relevant medication (antiarrhythmics, beta-blockers etc). We observed higher values in λ1,λ2, and λ3 in healthy subjects as compared to PAF patients (see Table for specific values and p values for between-groups comparisons), as well as a significantly lower flatness index (p=0.022).
Conclusion: Our results suggest that the electrical propagation pattern in the atria differs in individuals with PAF who are in sinus rhythm. In particular, they exhibit lower vector amplitudes in all 3 dimensions and somewhat flatter 3-dimensional loops, as compared to healthy subjects. These features could be utilized by statistical or machine learning predictive models to identify PAF from sinus rhythm electrocardiograms.

4600 - Deep Learning Predicts Myocardial Infarction Incidence from Multiple ECG Features

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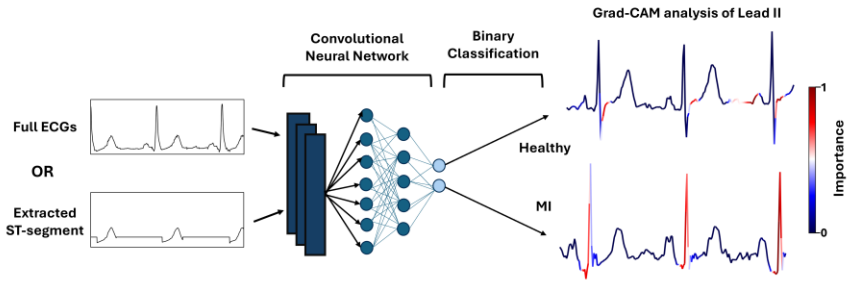
Introduction: Myocardial infarction (MI) is a leading cause of cardiovascular mortality, with increasing global prevalence. The 12-lead ECG is crucial for diagnosis, but manual interpretation is error-prone and time-consuming. Clinicians rely on the ST-segment elevation to make a diagnosis, but this approach misses over one third of all MI cases. Recent studies suggest additional ECG features may enhance diagnostic accuracy.
Methods: This study evaluates whether deep learning (DL) models trained on full ECG features outperform models utilising solely the ST-segment during automated prediction of MI incidence. Gradient-weighted class activation mapping (Grad-CAM) is employed to identify key ECG regions influencing model predictions (see Figure). A residual network (ResNet) was trained to classify MI and healthy patients from 12-lead ECG signals using a dataset comprising 2,050 healthy individuals and 2,043 MI patients (PTB-XL database). An automated pipeline extracted ST segments from each lead. The dataset was split into 80% for training, 10% for validation, and 10% for testing.
Results: For the full ECG, ResNet achieved an accuracy of 90.00%, F1 score of 0.88, and AUC of 0.88. In contrast, when trained only on the ST-segment, Resnet performance decreased (accuracy: 85.85%, F1 score: 0.82, AUC: 0.84). Grad-CAM analysis revealed that the full-ECG model leveraged additional ECG features beyond the ST-segment, namely the QRS complex. Further analysis on the latter showed a statistically higher entropy and increased QRS duration for MI subjects compared to healthy subjects.
Conclusion: Thus, our study highlights the importance of the QRS complex for MI detection by DL.



4607 - AI-ECG for Normal ECG Detection in a Large-Scale Telehealth Network

Antonio Luiz Ribeiro[1], Petrus Abreu[1], Antonio Horta Ribeiro[2], Gabriela Paixão[1], Gomes Paulo[1]

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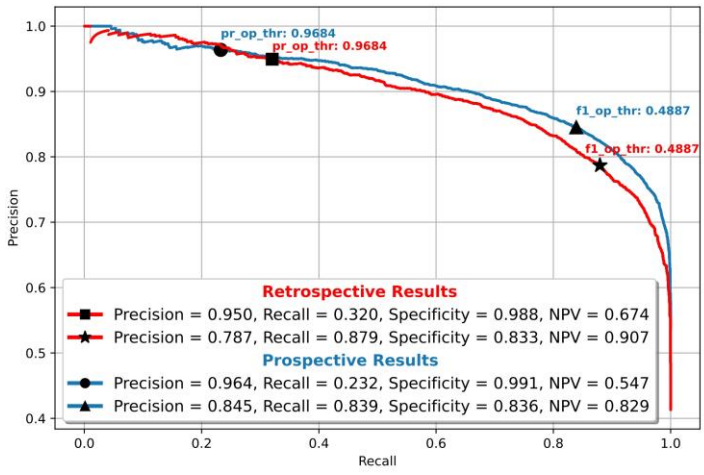
Introduction: The Telehealth Network of Minas Gerais (TNMG) provides tele-electrocardiogram (tele-ECG) services to Brazil's public health system (SUS), analyzing approximately 7,000 ECGs daily. Since most ECGs are normal, an automated system for identifying them could optimize cardiologist workload and improve efficiency. This study aimed to develop and evaluate an artificial intelligence (AI) model for high-precision classification of normal ECGs.

Methods: We trained a deep neural network (DNN) using 2,933,600 ECGs labeled by TNMG cardiologists (81% training, 19% validation). The model used 8 leads (I, II, V1–V6), resampled to 400 Hz and standardized to 4096 samples per lead. The architecture included five residual blocks and a sigmoid-activated output layer to produce a probability score for normal ECG classification. Retrospective evaluation was performed on 8,933 ECGs with ≥2 concordant cardiologist interpretations. Prospective testing used 10,369 ECGs integrated into TNMG's live workflow, with cardiologists blinded to model output. Two thresholds were tested: one optimized for ≥95% precision (precision-optimized), and one for the best F1 score (F1-optimized).

Results: The DNN achieved an AUC of 0.933 in retrospective and 0.918 in prospective analysis. At the precision-optimized threshold, precision reached 0.968. The F1-optimized threshold yielded an F1 score of 0.483, with overall metrics remaining stable in both phases.

Conclusion: The DNN accurately detects normal ECGs with high precision, enabling its integration into TNMG's tele-ECG platform. This system has the potential to reduce workload, improve access to care, and support national and international scaling.



Poster Abstracts

4608 - Harnessing Machine Learning for Accurate Ejection Fraction Classification in Echocardiographic Imaging

Dimitris Filos[1], Eleftheria Vorgiazidou[1], Ioanna Chouvarda[1]
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Introduction: Heart failure (HF) remains a major global health burden, driven by demographic shifts and cardiovascular risk factors. Ejection fraction (EF) is central to HF classification and treatment decisions, though echocardiographic assessment remains time-intensive. Utilizing portable devices for bi/quadri-chamber monitoring would benefit accurate EF estimation. This study introduces a machine learning (ML) approach employing radiomic features from echo imaging to classify patients into preserved (≥60%) and reduced EF (<60%).
Material & Methods: Echo imaging four-chamber planes from the CAMUS dataset, at end-diastole (ED) and end-systole (ES), were analyzed. Radiomic features were extracted from pericardial contours using predefined ultrasound-optimized parameters. A multi-stage, iterative feature selection process was applied utilizing different patient subsets, including statistical significance testing, correlation filtering, and Boruta analysis. Discriminative power was assessed via a composite score incorporating effect size, AUC, and overlap range across EF categories, selecting the top 10 features. An XGBoost classifier was trained with the top features in a 10-fold partitioning strategy, using cross-validation and grid search optimization, for robust evaluation across diverse test sets.
Results: Feature selection identified 115 systematically selected features across 50 partitions, with 70% consistency. The top 10 features included wavelet-, log-sigma-, and first-order-based texture metrics, primarily ES-derived. The best-performing XGBoost model achieved 93% accuracy on an independent cohort of 150 patients, correctly classifying 131/140 patients with preserved, and 8/10 patients with reduced EF.
Conclusion: This radiomics-based ML approach enables accurate EF classification via portable echocardiography, supporting timely HF diagnosis and management. Further advancement will involve ECG and clinical data integration.

4609 - Detection Of Myocardial Infarction Using Beat-to-Beat Analysis Of 12-Lead ECG

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Introduction: Myocardial Infarction (MI), a life-threatening consequence of severe coronary artery disease, can be diagnosed using ECG. Rapid diagnosis and treatment are crucial, but interpretation requires expertise since some MIs show non-specific findings. This work aims to develop a classification model to detect MI in ECG signals and distinguish them from healthy cases.
Material & Methods: A sample dataset of 415 patients (MI:56, Healthy:359) from PhysioNet's PTB-XL database was used. Preprocessing reduced noise and detected ECG fiducial points. Time and time-frequency domain features were extracted, followed by feature selection: low variance removal, statistical significance testing (t-test with Bonferroni correction), elimination of highly correlated features (c>0.8), and Recursive Feature Elimination. PCA reduced dimensionality, and features were normalized to [0,1] using min-max scaling. A Random Forest (RF) classifier (1000 trees, 10-fold cross-validation) was trained, with SMOTE applied to address class imbalance.
Results: Among the 37 significant features, the top-6 included lower T-wave and higher S-wave amplitudes in aVF, correlating with ST elevation in IMI, and higher T-wave in aVL, associated with AMI. A higher synchronized QRS duration indicates severe ischemia and increased risk of fatal arrhythmias. Regarding model performance, the RF classifier achieved a balanced accuracy of 0.99, an F1 score of 0.95 and an AUC of 0.992.
Conclusions: Beat-to-beat analysis of the 12-lead ECG led to development of a classification model that accurately distinguishes MI patients from healthy subjects. Further analysis for different MI types can improve the model's explainability.

4611 - Stochastic Time Series Analysis Of Atrial Fibrillatory Electrograms In Paroxysmal Atrial Fibrillation

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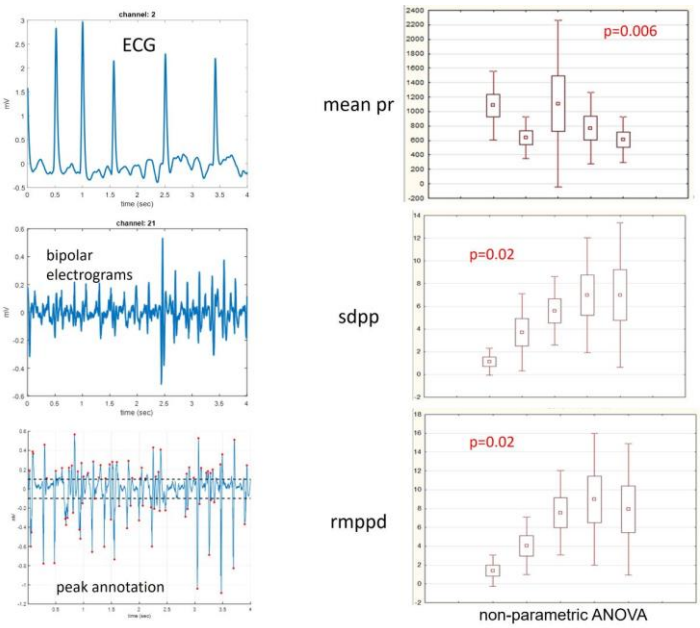
Background/Introduction: Regional dominant frequency and instantaneous frequency modulation of short fractionated atrial electrograms have been associated with ablation targets and the prognosis of atrial fibrillation (AF). However, inconsistent and not fully comprehensible results have been reported.
Purpose: To construct a simple computational algorithm for the analysis of continuous fibrillatory atrial electrograms and evaluate it in clinical practice, among patients with paroxysmal AF.
Methods: Before the first cryo-balloon ablation, 3-minute continuous local electrogram recordings during pace-induced AF were obtained by the circumferential catheter from the left atrial appendage (LAA) and each pulmonary vein: left superior (LSPV), left inferior (LIPV), right superior (RSPV) and right inferior (RIPV). Following time- and frequency-domain analysis, non-linear detrended fluctuation analysis (DFA α) with analysis for short-term (DFA α1) and long-term fluctuations (DFA α2) was performed. The signals were detrended by subtracting time series polynomial fit and bandpass filtered in the MATLAB environment (cut-off voltage 0.1 mV to avoid scar and artifacts).
Results: Fifteen patients were studied. Among different atrial areas, higher mean peak rate (pr) along with lower standard deviation of between peaks intervals (sdpp) and root square of peak-to-peak differences (rmppd) were observed in the LAA and left veins (Fig. 1). In patients with longer AF history (> 2 yrs), lower α, α1 and α2 exponents of DFA were observed (Fig. 2).
Conclusions: This algorithm depicted dissimilar impact on atrial electrical activity between different atrial areas. Patients with longer AF history had less self-similarity in local LAA electrograms. This might indicate possible ablation targets and reveal patients with greater AF burden and worse arrhythmic prognosis.


channel: 2
ECG
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bipolar
electrograms
peak annotation
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p=0.006
sdpp
p=0.02
rmppd
p=0.02
non-parametric ANOVA

Fig. 1

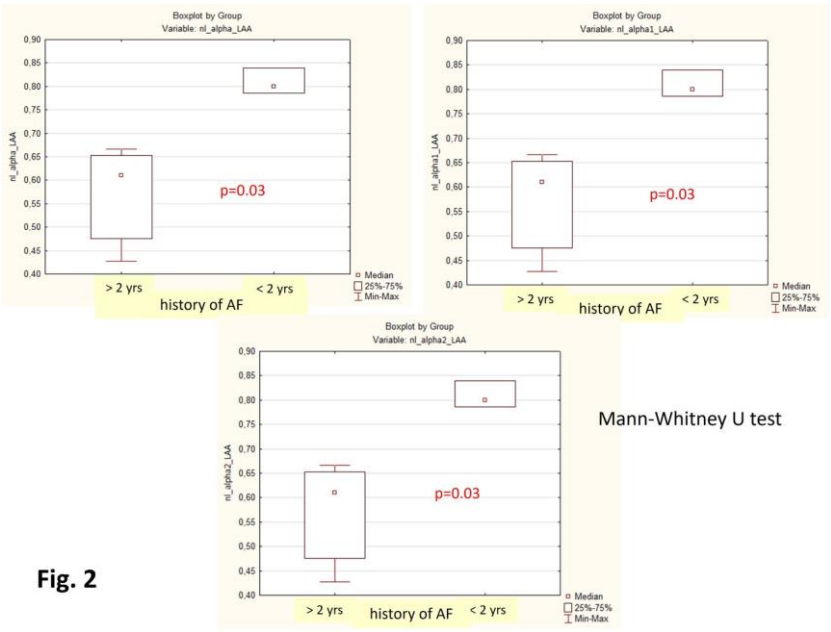
Boxplot by Group
Variable: nl_alpha_LAA
p=0.03
> 2 yrs
< 2 yrs
history of AF
Median
25%-75%
Min-Max
Boxplot by Group
Variable: nl_alpha1_LAA
p=0.03
Boxplot by Group
Variable: nl_alpha2_LAA
p=0.03
Mann-Whitney U test

Fig. 2

4613 - The Recognition And Utilisation Of ECG Signals From Clinical Reports As PDF files

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Introduction: The electrocardiogram (ECG) is a fundamental tool for patient evaluation. Hospitals maintain large repositories of ECG records; however, these are often stored in PDF-based reports, limiting their potential for analysis. Extracting ECG signals from such files for quantitative analysis is challenging due to the complexity of retrieving graphical data from documents. This study aims to develop an end-to-end pipeline for the automated extraction of ECG signals from PDF files.
Materials & Methods: Data from patients with heart failure attending an exercise-based cardiac rehabilitation (CR) program, collected at the Sports Medicine Laboratory of Aristotle University of Thessaloniki, were used. All data were anonymized and received ethical approval for research purposes. The data were stored in PDF files containing 12-lead ECG of ten seconds, before the start of the CR program and after its completion. Additional clinical information is located in the file header. An open-source software was used as a starting point for the development, followed by the identification and digitization of regions corresponding to individual ECG leads.
Results: The extracted signals were exported in structured formats (TXT/CSV). The signal was resampled at 1000Hz, and the amplitude was normalized to match the values described in the ECG paper. Clinical metadata were also exported in a structured format and could be utilized to enhance ECG analysis.
Conclusions: This study demonstrates the feasibility and clinical relevance of automated ECG extraction from PDF reports. The preliminary results highlight its potential to support ECG research, ultimately contributing to improvements in patient monitoring strategies.

4616 - Comparative ECG Signal Dominant Frequency Changes And ECG Fractal Dimension In Patients With Systolic Heart Failure And Complex Ventricular Arrhythmias

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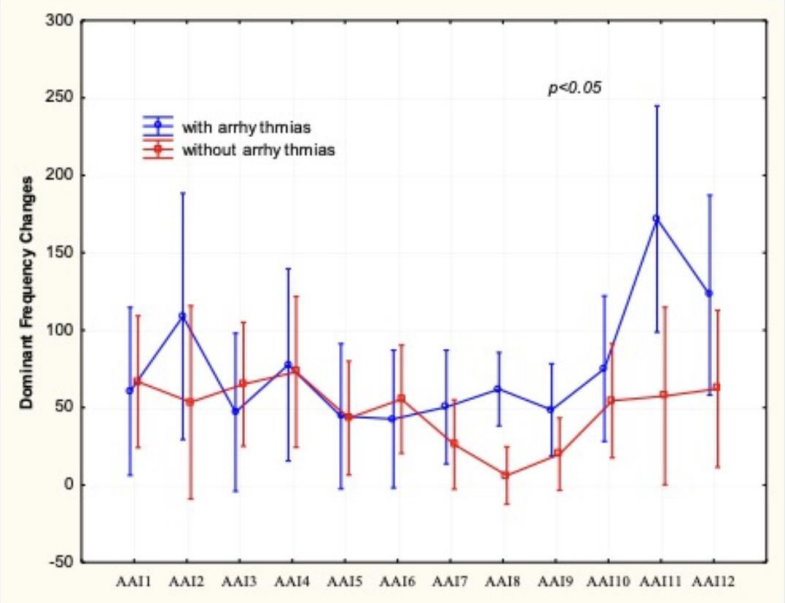
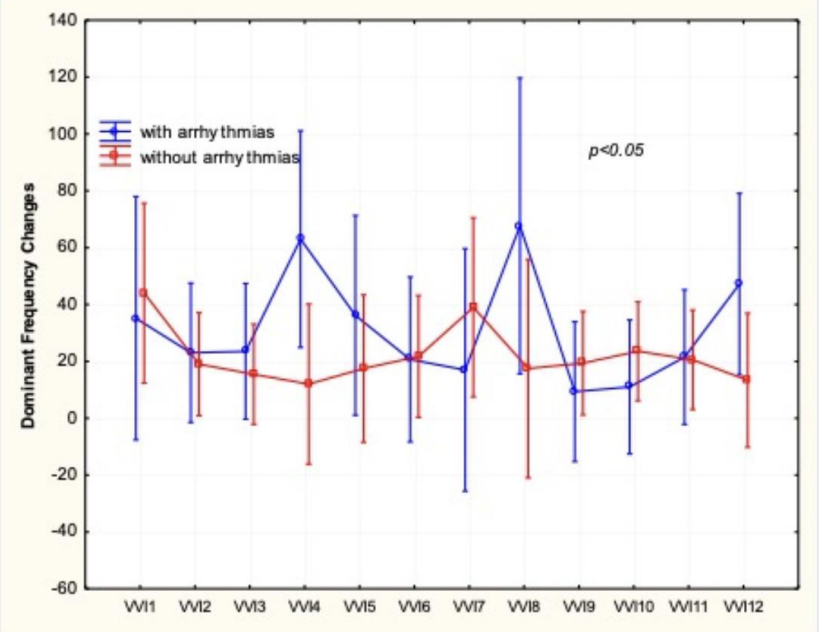
Background/Introduction: Although electrocardiographic (ECG) signal analysis has provided a lot of prognostic indexes regarding sudden cardiac death among patients with systolic heart failure, their clinical value remains suboptimal. It would be interesting to know whether further analysis of the ECG signal and its changes over time can provide new indicators of arrhythmic risk. For example, there are parameters from signal analysis methods, such as short-time Fourier transform and non-linear analysis of the12-lead ECG that have not been evaluated for their predictive ability.
Purpose: In an attempt to see whether dominant frequency changes and fractal dimension ECG signal characteristics might constitute predictive parameters of sustained ventricular tachyarrhythmias, we assessed whether these parameters differ between patients with heart failure and sustained ventricular tachyarrhythmias vs similar patients without life-threatening arrhythmogenicity.
Methods: Twenty-two patients with systolic heart failure and a recently implanted cardioverter-defibrillator (ICD) were studied. Their mean (±1 SE) age was 71±3 years, mean EF 30±2%. Group A (n=11) consisted of patients with sustained ventricular tachyarrhythmias prior to ICD implantation or during the first year thereafter, while Group B (n=11) comprised primary prevention patients with an ICD, without sustained ventricular arrhythmias during the 1-year follow-up period. We analyzed 60-sec 12 lead ECG recordings by the short-time Fourier transform, to assess the Fourier spectrum, signal dominant frequency (DF)and DF changes over time. In addition, we applied phase-space reconstruction and fractal dimension calculation of the same recordings. ECGs were in paced mode, AAI and VVI 100 bpm, in order not to be affected by heart rate variability and be as comparable as possible between groups. Custom-made programs were applied in Octave 8.2.0 (open-source alternative forMATLAB), while for statistical analysis non-parametric analysis of variance (Kruskal-Wallis ANOVA) and median test were used, as appropriate.
Results: Dominant frequency changes in paced ECGs differed significantly between heart failure patients with sustained ventricular arrhythmias and those without (ANOVA $p<0.05$; Figures 1 and 2). Additionally, during VVI pacing,12-lead ECG fractal dimension was higher in Group A compared to Group B (median 5.8 vs 4.7, $p<0.05$).
Conclusions: Different patterns of changes in ECG signal dominant frequency characteristics are observed in patients with heart failure and sustained ventricular tachyarrhythmias vs patients with heart failure and no sustained arrhythmias. Differences

also exist in the fractal ECG dimension between the 2 Groups. These findings may have significant pathophysiologic and clinical implications.



AAI pacing, 12-lead ECG data



VVI pacing, 12-lead ECG data

4617 - Do Slight Changes In PVC Stimulation Site Affect The Body Surface Potentials?

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Computational modeling of cardiac electrophysiology provides insights into the propagation of electrical activity under normal and pathological conditions [1]. It is particularly useful for studying premature ventricular contractions (PVCs). Accurate positioning of the stimulation site is crucial, as even small inaccuracies can impact results. This study evaluates how closely located PVCs sites affect body surface potential (BSP) patterns and compares them to a patient BSP.
In this study, we simulated PVCs originating from the true ablation site and four nearby sites (Figure, panel A) in the right ventricular septum, using a patient-specific heart-torso model derived from a CT scan. Ventricular coordinates defined tissue properties, and the pseudo-bidomain model in openCARP simulated activation spread [2]. We compared simulated and measured BSPs from 128 torso electrodes recorded before RFA to identify the PVC origin that best matches the patient data. Our results (Figure, panel B, C) show the highest correlation (0.79) in BSPs when the PVC origin was site 3, while the lowest (0.15) was observed from site 4. BSPs from the PVCs at the ablation site had a slightly lower correlation (0.76) compared to site 3. These results suggest that even small shifts in the stimulation site can significantly influence BSP patterns. Further studies are required to evaluate the impact of such shifts on simulation results, incorporating additional sites and a larger patient cohort. Despite this, our findings suggest a pseudo-bidomain model can accurately reproduce BSP from patient measurements.
[1] Trayanova, N.A., Lyon, A., Shade, J., Heijman, J. (2024). Computational modeling of cardiac electrophysiology and arrhythmogenesis: toward clinical translation. In Physiological Reviews, 104(3), 1265-1333. https://doi.org/10.1152/physrev.00017.2023
[2] Plank, G., Loewe, A., Neic, A. et al. (2021). The openCARP simulation environment for cardiac electrophysiology. Computer Methods and Programs in Biomedicine, 208, p. 106223. https://doi.org/10.1016/j.cmpb.2021.106223

4618 - Conformal Prediction Improves Acute Myocardial Infarction Identification From 12-Lead ECGs: A Practical Deep Learning Application

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Introduction: Early detection of acute myocardial infarction (AMI) is essential for timely reperfusion therapy and improved outcomes. Deep learning (DL) models applied to pre-hospital electrocardiograms (ECGs) show promise by mapping ECG data to AMI risk probabilities. However, using fixed thresholds to classify risk may be insufficient in clinical settings with diagnostic uncertainty. Conformal prediction addresses this by assigning each prediction to one of three categories—high-risk, low-risk, or uncertain—based on probability bounds.
Methods: We implemented conformal prediction on a pre-trained DL model developed using the PTB-XL dataset (21,799 12-lead ECGs with expert AMI labels). Three conformal methods—split conformal prediction (CP), class-conditional conformal prediction (CCCP), and learn-then-test (LTT)—were applied. Thresholds were calibrated to ensure prediction error rates below 10%. The area under the receiver operating characteristic curve (AUC) was used to assess model performance. A non-conformal prediction (NCP) version served as a baseline.
Results: AUCs were 0.923 (NCP), 0.932 (CP), 0.943 (CCCP), and 0.861 (LTT). Conformal methods improved discrimination but reduced sample coverage to 84.8% (CP), 86.7% (CCCP), and 77.3% (LTT), indicating that 13.3–22.7% of predictions were flagged as uncertain.
Discussion: Conformal prediction enhances AMI detection by prioritizing confident predictions while deferring uncertain cases for further evaluation. This approach supports more reliable clinical decision-making. Future work will refine uncertainty classification and explore deployment in pre-hospital care settings.

4620 - Challenges In AI-Based Methods For De-Identification And Information Retrieval From Clinical Reports Of Heart Failure Patients

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In the field of medical data management, unstructured clinical reports pose significant challenges due to their lack of predefined formats, making them difficult to analyze and utilize effectively. The need for de-identification arises to protect sensitive information, ensuring compliance with privacy regulations while maintaining the utility of the data. Structuring the information in these reports is essential for enhancing data accessibility and data processing capabilities. This work highlights the critical considerations and evolving strategies in addressing the complexities of unstructured clinical data management of heart failure (HF) patients.
In this research, the focus is on hospitalization discharge letters of HF patients, successfully deidentifying them using both non-AI and Large Language Model (LLM) solutions. Given privacy concerns for sensitive health data, and the constraints around their use only for the intended research, there is caution regarding the exposure of data to cloud-based large language model (LLM) options. Consequently, while cloud LLMs can provide high accuracy, the uncertainty surrounding data handling is a significant drawback. Conversely, local LLMs are utilized that require robust hardware setups due to their substantial computational demands. This approach ensures that all processing occurs locally, safeguarding sensitive data from exposure. However, the accuracy of local models tends to be lower than that of cloud services, as it depends on the computational resources available. Notably, open LLMs, such as DeepSeek 32B, have demonstrated the potential to achieve up to 100% de-identification and effective information extraction into structured formats. Nevertheless, the processing time for these analyses is considerable, making this option unsuitable for real-time applications. Currently, efforts are focused on building a retrieval-augmented generation (RAG) system that retrieves documents and employs agents to facilitate information extraction. By integrating advanced natural language processing with robust deidentification protocols, the goal is to enhance the structuring of hospitalization discharge letters, ultimately leading to improved data governance and actionable insights.
**** this work was partly funded by the EU R&I program under grant agreement #101137278

4622 - A Rare Case Of A Patient With Two Accessory Pathways And A QRS Complex Resembling Left Bundle Branch Block

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This is the case of a 40 year old female with manifest pre-excitation and recurrent episodes of supraventricular tachycardia. She was referred for an electrophysiological (EP) study where a left lateral accessory pathway was detected and successfully ablated. Post ablation ECG revealed a wide QRS complex resembling left bundle branch block (LBBB). After approximately 12 months, the tachycardia recurred. She underwent a repeat EP study where a second accessory pathway was uncovered, this time located at the right antero-septal area, in close proximity with the bundle of His. Due to increased risk of causing permanent damage to cardiac conduction system, a decision was made not to proceed to an ablation procedure. The patient was put on flecainide which led to QRS normalization while the patient experienced no episodes of tachycardia during follow-up. In this patient, two accessory pathways were simultaneously competing for ventricular depolarization, a left lateral and a para-Hisian one. The QRS morphology was predominately driven by the latter due to its close proximity to cardiac conduction system. After the elimination of the left lateral accessory pathway, the QRS complex became wider as the ventricles were pre-excited only from the right side, giving the impression of LBBB. Merging of the intracardiac signals (A and V) registered at the His catheter during the EP study and the fact that QRS complex was normalized following flecainide treatment, favor the diagnosis of a second, right sided accessory pathway instead of a LBBB.

4625 - Oral Anticoagulation Choice And Dosage In Very Elderly Patients With Atrial Fibrillation

Melina Kyriakou[1], Martha Zergioti[1], Andreas S Papazoglou[1], Anastasios Kartas[1], Dimitrios V Moysidis[2], Athanasios Samaras[3], Efstratios Karagiannidis[2], Vasileios Kamperidis[4], Antonios Ziakas[4], George Giannakoulas[4]

[1]Medical School, Aristotle University of Thessaloniki, Thessaloniki, Greece, [2]424 General Hospital of Thessaloniki, Thessaloniki, Greece, [3]Second Department of Cardiology, Hippokration Hospital of Thessaloniki, Thessaloniki, Greece, [4]First Department of Cardiology, AHEPA University Hospital of Thessaloniki, Thessaloniki, Greece

Background: Selecting the optimal oral anticoagulation (OAC) therapy for elderly patients with atrial fibrillation (AF) remains challenging. Our real-world study investigates clinical factors guiding OAC prescription patterns and compares outcomes between full- and reduced-dose direct-acting oral anticoagulants (DOACs) and vitamin-K antagonists (VKAs) in this demographic.
Methods: This post-hoc analysis of the MISOAC-AF trial focused on hospitalized AF patients aged ≥75 years prescribed OAC at discharge. Predictors of VKA and reduced DOAC dosing were identified using adjusted odds ratios (aORs). Cox regression models calculated adjusted hazard ratios (aHRs) for primary (all-cause mortality) and secondary outcomes (stroke, bleeding, AF or heart failure hospitalization, cardiovascular death).
Results: Among 450 elderly patients, 63.6% received DOACs and 36.4% received VKAs. Higher CHA2DS2-VASc, HAS-BLED scores and antiplatelet use predicted VKA prescription. Hypertension, prior stroke, and bleeding history favored DOAC use. Advanced age and chronic kidney disease correlated with reduced DOAC dosing. Over a 3.7-year follow-up period, there was no significant difference in all-cause mortality between the DOAC and VKA groups (aHR 0.79, 95% CI 0.58–1.06) or between the full-dose and reduced-dose DOAC groups (aHR 3.53, 95% CI 1.92–6.49). Secondary analyses also did not yield statistically significant results in either comparison.
Conclusions: Clinical profile parameters in elderly AF patients predict VKA or DOAC use. Clinical outcomes were similar between different OAC therapies.

4626 - Impact Of Catheter Ablation Timing On Age-Stratified Atrial Fibrillation Recurrence And Clinical Outcomes: A Meta-Analysis

Karakasis Paschalis[1], Paschalis Karakasis[1], Stylianos Tzeis[2], Konstantinos Pamporis[3], Panagiotis Theofilis[3], Nikias Milaras[3], Dimitrios Tsiachris[3], Efremidis Michael[4], Antoniadis Antonios[1], Fragakis Nikolaos[1]

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Introduction: Catheter ablation is a well-established treatment for symptomatic paroxysmal (PAF) or persistent atrial fibrillation (PsAF) refractory to antiarrhythmic agents, and current guidelines have also upgraded its role as a first-line option for recurrent PAF. However, the optimal timing to maximize rhythm outcomes remains uncertain. To address this gap, the present study sought to investigate the association between diagnosis-to-ablation time (DAT) and age-stratified atrial fibrillation (AF) recurrence and clinical outcomes.

Method and Results: Medline, the Cochrane Library, and Scopus were searched through February 18, 2025. Triple-independent selection, extraction, and quality assessment were conducted, with evidence pooled via random-effects meta-analyses. Among 28 studies (41,431 participants) with a median 24-month follow-up, early ablation (DAT ≤1 year) significantly reduced AF recurrence compared to delayed ablation (hazard ratio [HR] 0.65, 95% CI 0.59–0.73). The benefit of early ablation was consistent for both PAF (HR 0.72, 95% CI 0.67–0.77) and PsAF (HR 0.70, 95% CI 0.61–0.81). Age-stratified analysis revealed that this effect was significant regardless of age, with the greatest risk reduction observed in individuals ≤55 years (HR 0.49, 95% CI 0.34–0.71). Early ablation was also associated with a reduced risk of repeat ablation, new cardioversion, and cardiovascular hospitalization compared to delayed ablation. Higher CHA_2DS_2-VASc scores, heart failure prevalence, and lower mean left ventricular ejection fraction were associated with greater benefits from early ablation.

Conclusion: Early catheter ablation within one year of AF diagnosis is associated with a lower risk of recurrence in both paroxysmal and persistent AF, with the strongest association observed in patients ≤55 years.

4627 - Clonal Hematopoiesis Of Indeterminate Potential And Risk Of Atrial Fibrillation: A Meta-Analysis

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Background and Aims: Clonal hematopoiesis of indeterminate potential (CHIP) has recently been recognized as a significant risk factor for various non-hematologic conditions, particularly cardiovascular diseases. However, the relationship between CHIP and atrial fibrillation (AF) remains underexplored to date. Given the conflicting findings in recent studies, the present meta-analysis aimed to assess the association between CHIP and the incidence or recurrence of AF.
Methods: Medline, Cochrane Library and Scopus were searched until October 27, 2024. Triple-independent study selection, data extraction and quality assessment were performed. Evidence was pooled using restricted maximum likelihood random-effects meta-analysis.
Results: Four studies comprising a total of 801,085 participants were included. Over a median follow-up period of 9 years, participants with any CHIP [variant allele fraction (VAF) ≥ 2%] exhibited a significantly elevated risk of developing incident or recurrent AF compared to those in the non-CHIP group (hazard ratio [HR] = 1.12; 95% confidence interval [CI] = [0.07 to 1.17], P < 0.0001; I^2 = 3%, heterogeneity P = 0.38). The presence of any CHIP was associated with a markedly increased risk for both incident and recurrent AF when these outcomes were analyzed separately. Furthermore, large CHIP (VAF ≥ 10%) was correlated with a heightened risk of incident AF, suggesting a potential dose-response relationship. Leave-one-out sensitivity analyses identified no evidence of outliers.
Conclusions: CHIP is associated with increased risk of incident or recurrent AF. Further research is required to clarify the mechanisms underlying the observed association and to explore interventions aimed at mitigating this risk.

4628 - Thermal- Versus Nonthermal-Based Pulmonary Vein Isolation In Young Adults With Paroxysmal Atrial Fibrillation: 1-Year Results Of A Multicenter Registry

Ioannis Doundoulakis[1], Kazutaka Nakasone[1], Domenico Giovanni Della Rocca[1], Giampaolo Vetta[1], Luigi Pannone[1], Roberto Scacciavillani[2], Cinzia Monaco[3], Gezim Bala[1], Erwin Ströker[1], Serge Boveda[4], Andrea Sarkozy[1], Carlo De Asmundis[1], Gian Battista Chierchia[1]

[1]Heart Rhythm Management Centre, Postgraduate Program in Cardiac Electrophysiology and Pacing, University Hospital Brussels-Free University Brussels, European Reference Networks Guard-Heart, Brussels, Belgium, [2]Department of Cardiovascular and Thoracic Sciences, Catholic University of the Sacred Heart, L.go A. Gemelli, 1, 00168 Rome, Italy, [3]Institut Hospitalo-Universitaire Institut des Maladies du Rythme Cardiaque, Electrophysiology and Heart Modeling Institute, Bordeaux, France; Haut-Lévêque University Hospital, Bordeaux, France, [4]Département de Rythmologie, Clinique Pasteur, Toulouse, France

Introduction: Pulmonary vein isolation (PVI) is the cornerstone of atrial fibrillation (AF) ablation. When performed with thermal energy sources (cryoballoon, radiofrequency), PVI leads to collateral damage to major ganglionated plexi (GP); GP are a conglomeration of autonomic ganglia on the epicardial surface of the heart, which have been reported to play a critical role in initiation and maintenance of AF. The role of GP is considered particularly important in younger AF patients. Pulsed field ablation is a novel non-thermal energy source for PVI with only transient effects and no collateral damage to GP. The aim of this study was to compare the outcomes of pulsed field ablation (PFA) and cryoballoon ablation (CBA) in paroxysmal AF (PAF) patients under 50 years of age across four high-volume centers in Europe.

Methods: We prospectively enrolled consecutive PAF patients who underwent first-time PVI via a pentaspline PFA catheter between January 2022 and May 2024 or a second-generation CBA between January 2017 and May 2024. Patients under 20 years of age were excluded. For the purpose of the study, a cut-off of 1-year of follow-up was adopted.

Results: A total of 242 patients were included (PFA group: 81; CBA group: 161). Baseline characteristics were comparable between the two groups. The PFA group was associated with shorter procedure times compared to the CBA group (64.6 ± 20.1 min vs. 80.1 ± 34.3 min, p=0.002). Complications were more frequent in the CBA group (1.2% with PFA vs. 8.1% with CBA, p=0.032), primarily due to transient phrenic nerve injury. One-year freedom from AF/AT recurrence rates were similar between the groups (91.6% for PFA vs. 93.6% for CBA; p=0.72).

Conclusion: In PAF patients under 50 years of age, PFA offers a safe, efficient alternative to CBA, with comparable recurrence rates, shorter procedure times, and fewer complications.

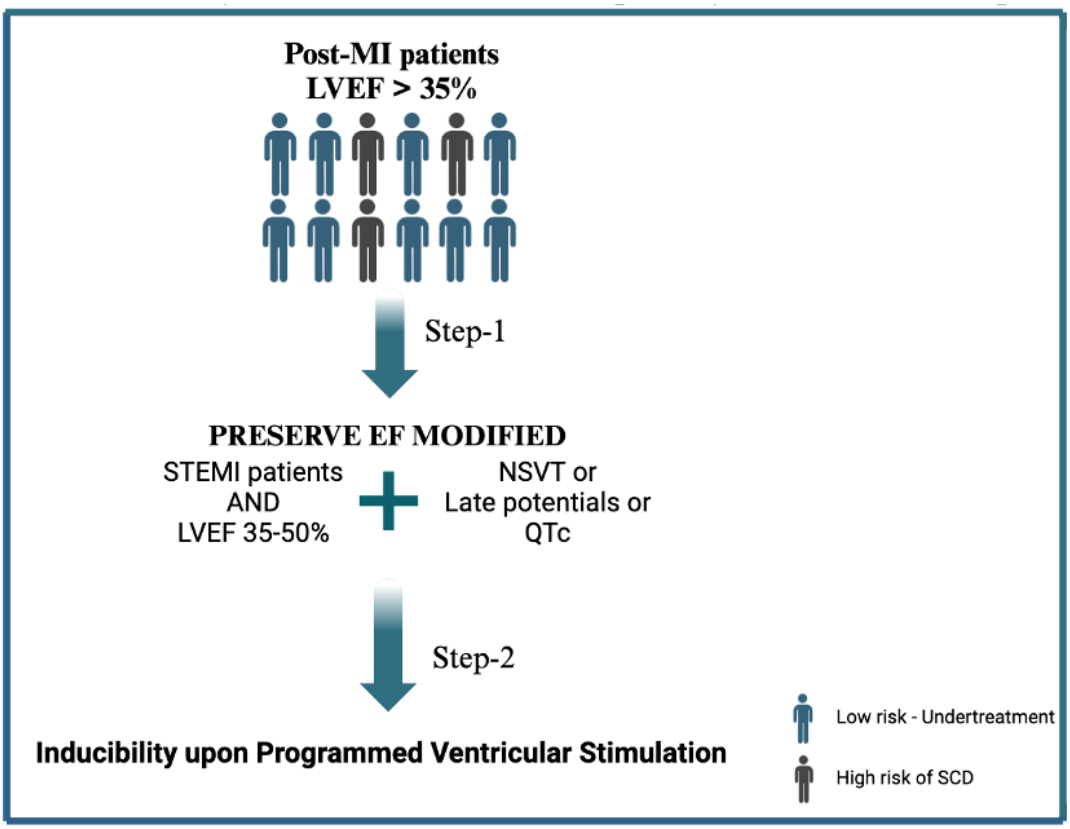
4629 - Arrhythmic Risk Stratification In Post-Myocardial Infarction Patients With Preserved Ejection Fraction: Long-Term Outcomes From The PRESERVE EF Study

Ioannis Doundoulakis[1], Dimitris Tsiachris[2], Petros Arsenos[2], Athanasios Kordalis[2], Christos-Konstantinos Antoniou[2], Konstantinos Vlachos[3], Stergios Soulaidopoulos[2], Aggeliki Laina[2], Emmanuel Kanoupakis[4], Polychronis Dilaveris[2], Theofilos M Kolettis[5], Konstantinos Trachanas[6], Iosif Xenogiannis[7], Panagiotis Korantzopoulos[5], Skevos Sideris[6], Nikolaos Fragakis[8], Vassilios P Vassilikos[9], Konstantinos Tsioufis[2], Konstantinos A Gatzoulis[2]

[1]Heart Rhythm Management Centre, Postgraduate Program in Cardiac Electrophysiology and Pacing, University Hospital Brussels-Free University Brussels, European Reference Networks Guard-Heart, Brussels, Belgium, [2]First Department of Cardiology, National and Kapodistrian University, "Hippokration" Hospital, Athens, Greece, [3]Institut Hospitalo-Universitaire Institut des Maladies du Rythme Cardiaque, Electrophysiology and Heart Modeling Institute, Bordeaux, France; Haut-Lévêque University Hospital, Bordeaux, France, [4]Department of Cardiology, University Hospital of Heraklion, University of Crete, Heraklion, Crete, Greece, [5]First Cardiology Division, University Hospital of Ioannina, University of Ioannina, Ioannina, Epirus, Greece, [6]State Department of Cardiology, "Hippokration" General Hospital of Athens, Athens, Greece, [7]Second Cardiology Department, National and Kapodistrian University of Athens, Attikon Hospital, Athens, Greece, [8]Second Department of Cardiology, Hippokration General Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece, [9]Third Cardiology Department, School of Medicine, Aristotle University of Thessaloniki, Hippokration General Hospital, Thessaloniki, Greece

Introduction: The PRESERVE EF study proposed a two-step algorithm for risk stratification in post-myocardial infarction patients with mid-range and preserved left ventricular ejection fraction (LVEF). In the first step, patients with at least one non-invasive risk factor (NIRF) were referred for electrophysiology study (second step) and were then considered for implantable cardioverter-defibrillator (ICD) in case of inducible malignant arrhythmia. This report presents the 8-year follow-up findings of the trial.
Methods: The primary endpoint was the occurrence of a major arrhythmic event (MAE), namely sustained ventricular tachycardia/fibrillation, appropriate ICD activation or sudden cardiac death (SCD). We screened and included 575 consecutive patients (mean age 57 years, LVEF 50.8%). Of them, 204 (35.5%) had at least one positive NIRF. Forty-one of 152 patients undergoing programmed ventricular stimulation (PVS) were inducible. Thirty seven (90.2%) of them received an ICD.
Results: Over a mean follow-up of 106 ± 14.5 months, no SCDs were observed, while 12 ICDs (the major arrhythmic events prevalence in patients with ICD implantation reaching 29.3%) were appropriately activated. The updated (8.8-year follow-up) performance metrics of the proposed approach (included both steps with NIRFs and PVS) were as follows: Sensitivity= 100%, specificity= 94.8%, positive predictive value= 29.3%, and negative predictive value= 100%. Notably, no events occurred in patients with an LVEF>% who had not experienced STEMI.
Conclusions: Until a randomized trial provides a survival benefit in post-myocardial

infraction patients with preserved LVEF, the PRESERVE EF study remains the only evidence based risk assessment approach, despite its observational structure.



4630 - Non-Invasive Electrocardiographic Risk Factors For Sudden Cardiac Death In Patients With ND-LVC

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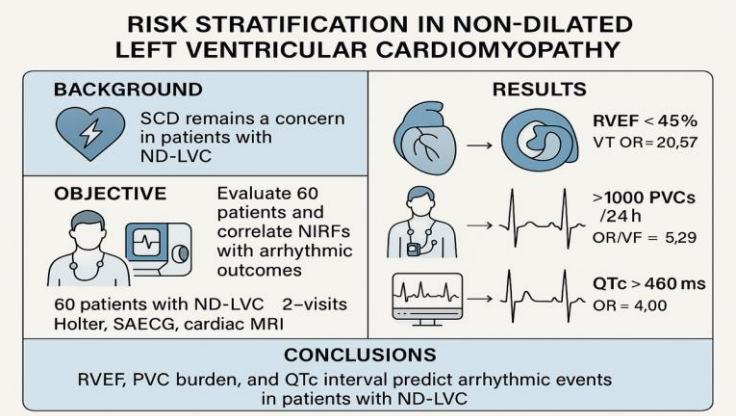
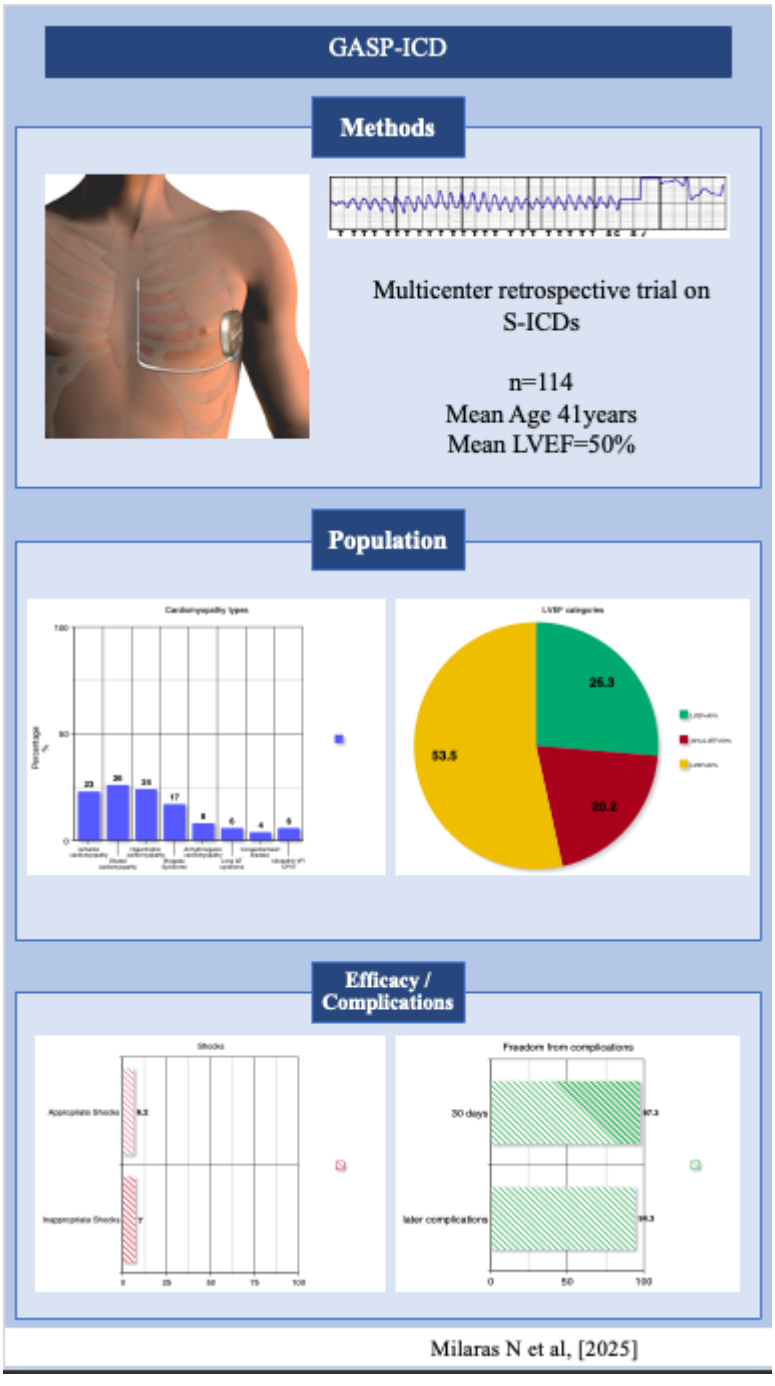
Background: Sudden cardiac death (SCD) remains a significant concern in patients with Non Dilated Left ventricular Cardiomyopathy (ND-LVC). Risk stratification for major arrhythmic events remains largely unknown for this population, whose entity was recently conceived.
Objective: This prospective study aimed to evaluate 60 ND LVC patients through cardiac MRI, Late potentials and several electrocardiographic risk factors deducted from an 24h Holter monitor, and correlate them with adverse arrhythmic outcomes(VT/VF), with the goal of informing strategies for continuous risk stratification.
Methods: In this study 60 patients with ND-LVC were enrolled. Each participant underwent NIRF assessment via Holter monitoring and signal-averaged ECG (SAECG) during two separate visits and a baseline cardiac MRI while receiving at least 6 months of proper medical therapy. Inclusion and exclusion criteria were rigorously applied to ensure the selection of stable, optimally managed patients. Statistical analysis was conducted with a power of 80% and significance level a = 0.05.
Results: Key findings included that right ventricular ejection fraction (RVEF) <5% was a strong predictor of ventricular tachycardia (VT) (OR = 20.57, p = 0.014). Additionally, the presence of> premature ventricular contractions (PVCs)/24h was associated with a significantly higher risk of hospitalization for VT or VF (OR = 5.29, p = 0.028). QTc> ms was also a statistically significant predictor of arrhythmia-related hospitalization (OR = 4.00). In contrast, left ventricular late gadolinium enhancement (LGE) and LVEF were not independently predictive in this cohort.
Conclusions: RVEF, PVC burden, and QTc interval emerged as significant non-invasive predictors of arrhythmic events in patients with ND LVC. These findings underscore the importance of evaluation of NIRFs in this population to enable dynamic risk stratification and potentially guide the implementation of preventive strategies for SCD.



4631 - Multicenter Analysis Of The Subcutaneous ICD Clinical Practice GASP-ICD (Greek Analysis Of Subcutaneous-Icd Practice)

Nikias Milaras[1], Konstantinos Letsas[2], Sotirios Xydonas[3], Panagiotis Korantzopoulos[4], Georgios Leventopoulos[5], Michael Efremidis[2], Skevos Sideris[1]
[1]Hippokration" General Hospital of Athens, Athens, Greece, [2]Onasseio Cardiac Surgery Center, Athens, Greece, [3]Evaggelismos General Hospital, Athens, Greece, [4]General University Hospital of Ioannina, Ioannina, Greece, [5]General University Hospital of Patras, Patra, Greece

Abstract: The advent of subcutaneous implantable cardioverter defibrillators (S-ICDs) marked a significant milestone in the course of cardiac rhythm devices, particularly for patients that are deemed high risk for ventricular arrhythmias and sudden cardiac death. This extracardiac approach makes the S-ICD an especially valuable option for young patients, those with difficult venous access, or those at high risk of infection. Although the S-ICD does not provide pacing for bradycardia or heart failure, it has shown efficacy in treating ventricular arrhythmias while minimizing complications associated with transvenous systems.
Methods: The purpose of this multicenter retrospective analysis was to assess the real-world efficacy and safety of the S-ICD in a heterogenous population. The GASP registry consisted of 114 patients, 68% male, aged 41± 15 years with a mean LVEF of 50%. In the follow up of 35 months, inappropriate shocks occurred in 7% while appropriate shocks occurred in 6.2%. The most common reason for inappropriate shocks were myopotentials and atrial tachyarrhythmias (Graphical Abstract). 30 day complication free rates were 97,3% with the majority of patients requiring device extraction due to infection. Over the longer term, 4 patients required re-intervention due to local discomfort, while 1 device was extracted for infection. In a multivariate analysis, complications were not significantly higher in the sicker population such as those with Diabetes, kidney disease requiring dialysis or heart failure.
Conclusions: Overall, the S-ICD proved to be a worthy alternative to transvenous ICDs in subjects at risk of sudden cardiac death, even in this population of younger patients without significant systolic dysfunction.


GASP-ICD
Methods
Multicenter retrospective trial on
S-ICDs
n=114
Mean Age 41years
Mean LVEF=50%
Population
Efficacy /
Complications
26.3
53.5
20.2
Milaras N et al, [2025]

4633 - Feasibility And Early Outcomes Of Conduction System Pacing In Heart Failure Patients With Left Bundle Branch Block

Polychronis Dilaveris[1], Vasiliki-Chara Mystakidi[1], Panteleimon Pantelidis[1], Michael Spartalis[1], Nektarios Souvaliotis[1], Evangelos Oikonomou[1], Gerasimos Siasos[1]
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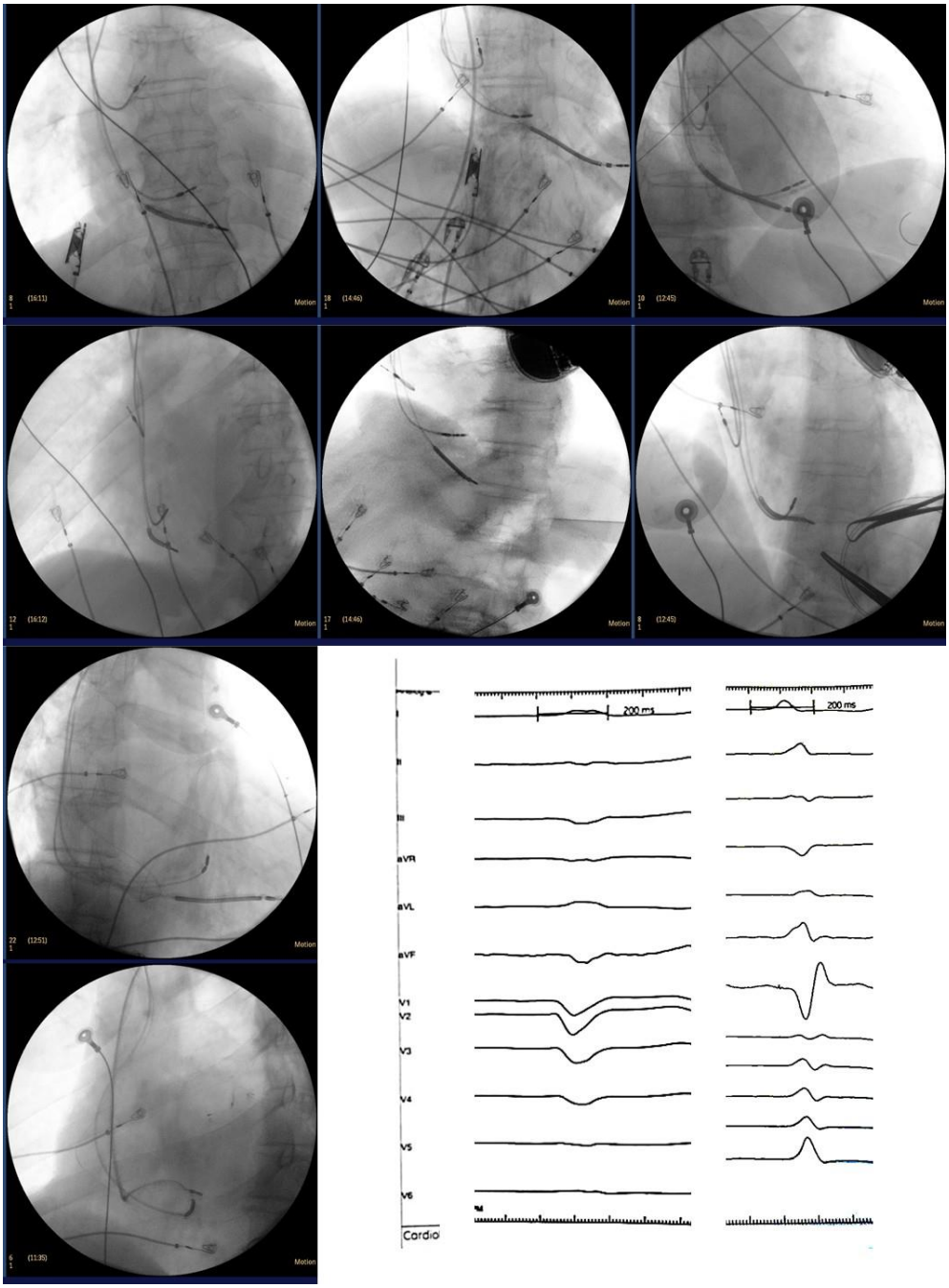
Background: Conduction system pacing (CSP), particularly left bundle branch [area] pacing (LBB[A]P), is emerging as a physiological alternative to biventricular pacing in patients with heart failure and left bundle branch block (LBBB). In this study, we evaluated the feasibility, and early electrical outcomes of CSP in a real-world sample of heart failure patients.
Case series: We evaluated 15 consecutive patients (mean age: 68 ± 9 years; 47% female) who underwent CSP using a stylet-driven system (Selectra 3D sheath, Biotronik, Berlin, Germany). Indications included low ejection fraction (EF) with intrinsic or pacing-induced LBBB (n=13) or failed conventional CRT (n=2). An atrial lead was implanted in 13 patients; 2 had permanent atrial fibrillation. All received a right ventricular ICD lead if not previously present. Pacing mode was set to LBB or LBBAP for all patients. Pre-implantation QRS duration averaged 162 ± 24 ms, which narrowed significantly post-implantation to 108 ± 20 ms. Procedural success was 100% with no immediate complications. CSP resulted in improved electrical resynchronization. Device parameters were stable at early follow-up.
Conclusion: CSP using a stylet-driven system is feasible, safe, and results in significant QRS narrowing in heart failure patients with LBBB. It represents a promising alternative in cases of failed CRT or when LBBAP is preferred over traditional biventricular pacing.


200 ms
200 ms
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
Cardiol

4634 - Supraventricular Extrasystolic Beats As The Effect Of Mitral Insufficiency In Postmenopausal Females With Osteoporosis

Anna Kawińska[1], Ewa Sewerynek[2], Jan Krekora[3], Małgorzata Kurpesa[1], Jarosław D. Kasprzak[1], Jerzy K. Wranicz[4]
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Introduction: Osteoporosis (OP) is chronic disease characterized by a reduced bone mass density (BMD), which occurs in Poland in 30% women over 50 y.o. The estimated mortality rate in the first year after femur fracture is 12-30%. Correlation between low BMD and aorta, other arteries and aortic valve calcification was described. Mitral insufficiency (IM) is the second most common valvular heart disease (VHD) in adults, mainly caused by degenerative valve changes. Literature about pathogenetic role of OP is rare.
Material and Methods: 103 patients (NYHA class I and II, left ventricular ejection fraction >=36%, no advanced VHD), matched for sex and age, consulted by endocrinologist, divided into 2 groups due to BMD (T-score /T-sc/): study group with OP (T-sc <= -2.5; 51 pts), control group without OP (T-sc > -2.5; 52 pts), assessed in femur neck (T-sc Neck), total hip (T-sc TH) and/or spine (L2-4). Diagnostics: echocardiogram, 24-hour Holter-ECG monitoring (HM), NTproBNP. Major osteoporotic (MOFR), hip fracture risk (HFR) was calculated with FRAX algorithm.
Results: IM higher than a trace (>trace) was significantly more frequent in study group (66.7 vs 44.2%; p 0.04). T-sc L2-4 was significantly lower when MR was >trace vs no MR/MR trace (-2.01 vs -1.53; p 0.04). Significant correlations also appeared between other echocardiographic parameters: MV E or A and BMD, as well as with fracture risk. One of the potential causes of cardiac arrhythmias in patients with osteoporosis is left atrium overload due to IM. NTproBNP was higher in patients with OP than without (324 vs 165pg/mL). More SVA was observed in study group. In all pts significant correlations between amount of supraventricular extrasystolic beats (SVEBs) in HM appeared with: T-sc Neck (p 0.03), T-sc TH (p 0.02), MOFR (p 0.04).
Conclusions: Osteoporosis is connected with significantly higher IM degree. Bone mass density assessed in spine (T-sc L2-4) was significantly lower when IM was upper than a trace. In postmenapausal women with osteoporosis, more supraventricular arrhythmias appeared (e.g. significant correlations between SVEBs amount and T-sc Neck, T-sc TH, MOFR), probably due to left atrial overload.

4636 - Short-Coupled Premature Ventricular Beats Leading To Polymorphic Ventricular Tachycardia And Syncope

Konstantinos Polymeropoulos[1], George Sidiropoulos[1], Alexia Stavrati[1], Michael Siarkos[1], Sofia Xanthopoulou[1], Nikolaos Tsianakas[1], Orestis Grammenos[1], Ioannis Zarifis[1]
[1]*G. Papanikolaou General Hospital, Thessaloniki, Greece*

Introduction: Short-coupled Ventricular Fibrillation (SC-VF) is an entity with increasing interest as a primary electrical disorder, with a premature ventricular complex (PVC) coupling interval of <350 ms acting as a trigger for VF. The diagnosis of idiopathic ventricular fibrillation (IVF) is made, preferably with documented VF, after exclusion of structural, channelopathic, metabolic, or toxicological aetiologies.
Case Study: A 42-year-old female was referred due to recurrent syncopal attacks, resulting to head trauma and multiple runs of non-sustained, polymorphic ventricular tachycardia-ventricular fibrillation. Full diagnostic work-out performed, including blood chemistry, ECG (also high precordial leads), coronary angiography, telemetry/Holter, exercise stress test, echocardiogram, sodium-channel blocker testing, epinephrine test and CMR. No abnormalities concerning structural, metabolic or channelopathic aetiology was documented. She revealed no past medical history or drug/substances consumption. Genetic testing was sent for analysis. During her admission, she experienced multiple runs of short-coupled (R-on-T) polymorphic ventricular tachycardia, with a distinct morphology PVC trigger, with a coupling interval of 320 msec and possible, left ventricular posteromedial papillary muscle origin. Verapamil initiated and she subsequently underwent an implantable cardioverter-defibrillator (ICD) implantation. The next day, device interrogation revealed another short run of polymorphic ventricular tachycardia, during the patient`s sleep. Hydroquinidine added and the patient discharged uneventfully, with plan for radiofrequency ablation, to suppress the short-coupled ectopic activity.
Conclusions: This case report emphasizes the importance of recognizing premature ventricular beats as a cause for syncope and sudden cardiac death, by triggering ventricular fibrillation, in case of a short coupling interval and distinct morphology.

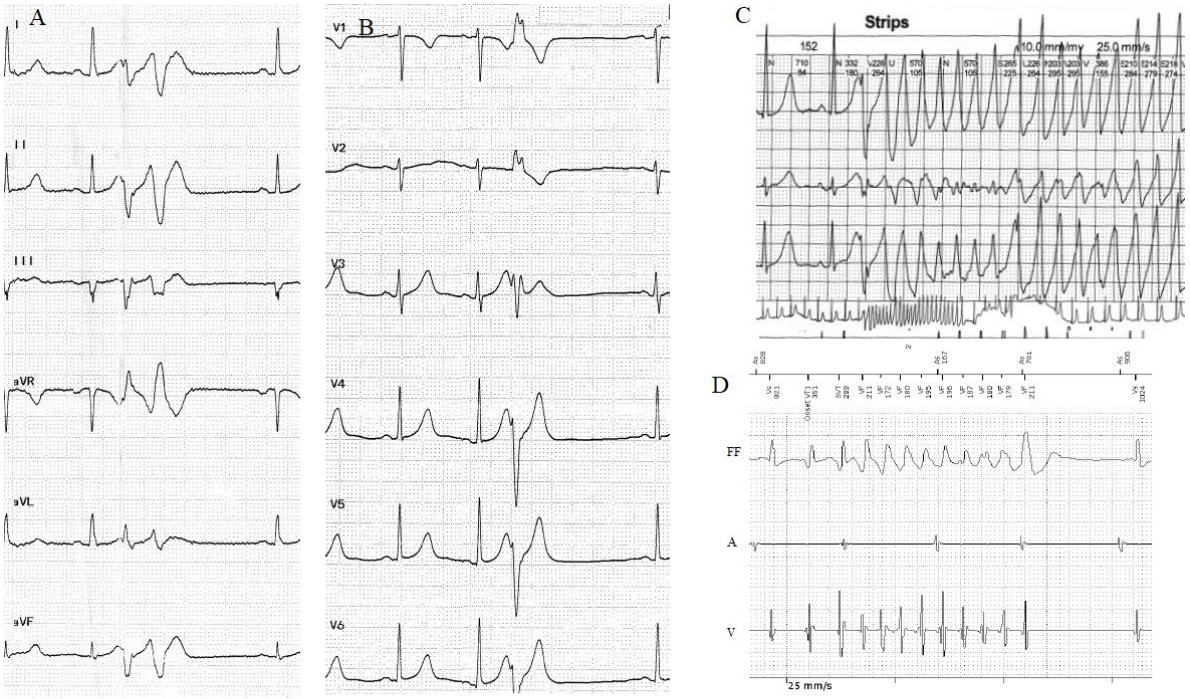


Fig. (A and B) 12-lead ECG with short-coupled ventricular premature beat (VPB), on admission, (C) Holter recording with short-coupled VPB initiated polymorphic ventricular tachycardia and (D) Event of spontaneous non-susatined polymorphic ventricular tachycardia as recorded by the implanted defibrillator (FF, far-field electrogram; A, atrial electrogram; V, ventricular electrogram of the event)

4639 - Permanent Pacemaker Implant (PPI) In Trancatheter Aortic Valve Implantation (TAVI)- A Single Center Experience

Georgios-Eleftherios Boursoukis[1], Georgios Papagoras[1], Belkis Malkots[1], Marios-Vasileios Koutroulos[1], Choulia Nalmpant[1], Anargyros Tsalgkidis[1], Georgios Chalikias[1], Konstantinos Lampropoulos[1], Adina Thomaidis[1], Dimitrios Tziakas[1], Dimitrios Stakos[1]
[1]*University Hospital of Alexandroupolis, Alexandroupolis, Greece*

Introduction: One of the most known complications of transcatheter aortic valve implantation (TAVI), is the high grade atrioventricular block followed by permanent pacemaker implantation (PPI). The aim of the study was to report our center experience regarding incidence of PPI post TAVI.
Methods: In our center, 119 patients underwent TAVI from 11/2021 to 03/2025. We analyzed the incidence of PPI within the aforementioned study cohort. The different types of valves implanted, were also captured (Edwards Sapien 3, Edwards Sapien 3 Ultra, Edwards Sapien Ultra Resilia, Medtronic EVOLUT R, Medtronic EVOLUT PRO and Vital Flow Liberty TAV).
Results: Only 4 patients out of the 119 of the study cohort needed PPI (3.4%). All patients need permanent pacemaker implantation after developing complete atrioventricular block within the first days post procedure. All PPI post-TAVI patients had the Medtronic EVOLUT PRO valve implanted. In our center, in 32 patients the Medtronic EVOLUTE PRO valve was implanted (PPI incidence in this subgroup was 12.5%).
Conclusion: The present study showed a relatively low incidence rate of PPI post TAVI procedure. The most common prosthetic valve associated with PPI in our center experience is the Medtronic Evolut R PRO. The lower incidence rates of PPI in this type of valve compared to the rate reported in current literature (approximately 10 to 12%) probably lies on the current trend for higher implantation depths in clinical practice.

4641 - Safe Selection Of Antiarrhythmic Drugs In Patients With Ventricular Arrhythmias Using Ambulatory ECG Telemetry

Tatiana Ivanova[1], Ekaterina Zhabina[1]
[1]*Almazov National Medical Research Center, St. Petersburg, Russia*

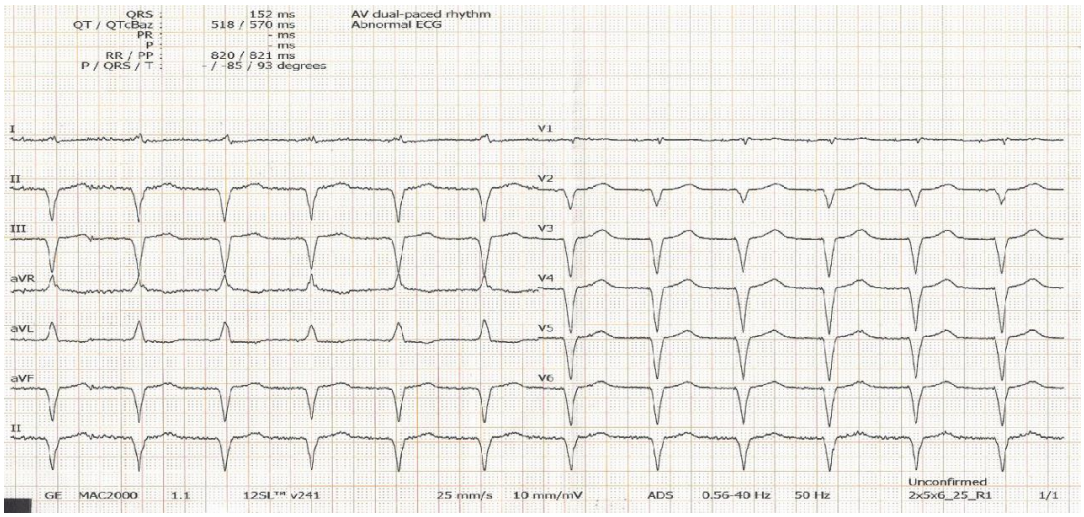
Introduction: Despite the widespread use of radiofrequency ablation (RFA) for ventricular arrhythmias (VA), there is still a need for safe antiarrhythmic (AA) therapy.
Aim: To select AA drugs (AADs) in patients with VAs under the control of continuous ambulatory electrocardiogram monitoring with telemetry (AECG-TM).
Materials and methods: Our study included 73 patients (44 women), with an average age of 56.6 ± 28.3 years. All these patients had frequent symptomatic single premature ventricular complexes (PVCs) burden < 7% of all QRS per day. RFA was not indicated or the patients refused this procedure. AECG-TM was performed in 12 leads for the purpose of individualized selection and early detection of side effects of AADs. We evaluated the relationship between the VA and the autonomic nervous system and identified the triggering factor.
Results: In 14 (19%) patients, the prescription of AAD was not necessary as it was associated with psycho-emotional factors. In 46 (63%), the AECG-TM allowed the selection of the optimal AAD at minimally effective doses. However, 12 patients had to be discontinued due to lack of effect and/or the development of adverse and arrhythmogenic effects (second-degree sinoatrial or atrioventricular block, QTc >500 ms). The duration of AECG-TM was 11±4 days. In 13 cases (18%), AAD proved to be useless due to resistance, arrhythmia and side effects, and RFA was recommended.
Conclusions: The AECG-TM makes it possible to quickly confirm the efficacy of the drug and to detect adverse and arrhythmogenic effects in time, which increases patient safety and adherence to therapy.

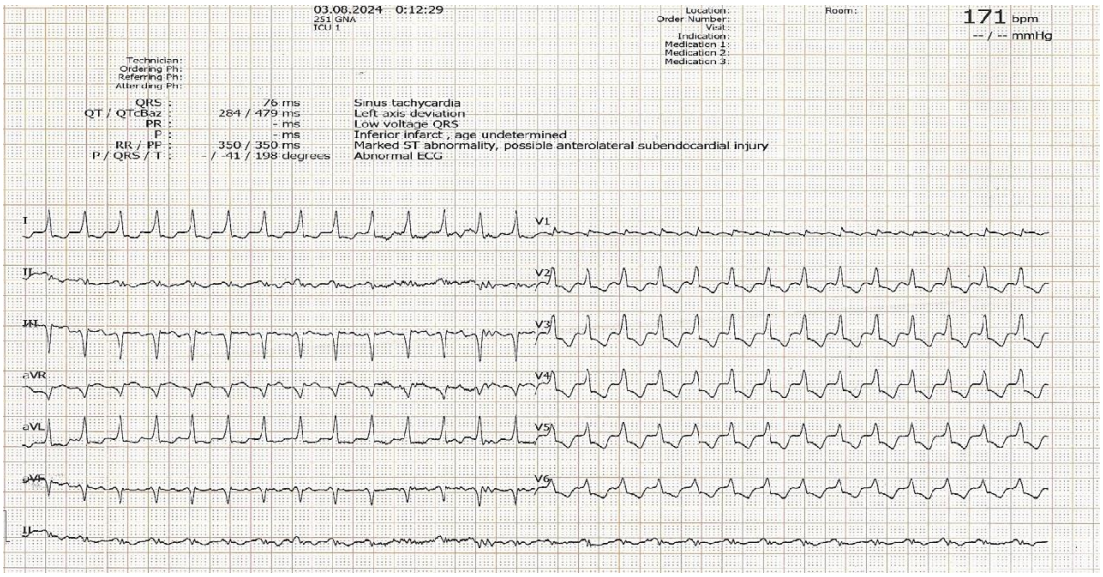
4643 - Just Another Tachycardia...

Alexandra Sakka[1], Michail Mpotis[2], Konstantinos Sofroniou[1], Vasileios Doulamis[1], Nikolaos Parzakonis[1], Georgios Kourgiannidis[1]
[1]251 Hellenic Airforce Hospital, Athens, Greece, [2]Ippokrateion General Hospital of Athens, Athens, Greece

Introduction: Narrow QRS complex tachycardias are typically of supraventricular origin; however, rarely, ventricular tachycardia (VT) may also present with narrow complexes when originating near or within the conduction system. . Diagnosing such arrhythmias is especially challenging in some cases.
Case Study: We present the case of an 84-year-old female with a history of paroxysmal atrial fibrillation, hypertension, and dual-chamber pacemaker who presented with a hemodynamically stable narrow QRS tachycardia. The arrhythmia did not respond to vagal maneuvers, adenosine, or intravenous amiodarone. Synchronized cardioversion was ultimately required. Following cardioversion, the ECG demonstrated third-degree atrioventricular (AV) block and paced rythm. Pacemaker interrogation suggested ventricular origin.
Results: An EPS revealed two distinct forms of tachycardia: one hemodynamically stable clinical tachycardia originating from the specialized conduction system and another non-clinical from the high septal region of the left ventricle which resulted always in hemodynamic collapse. Due to hemodynamic instability and the potential for recurrent malignant arrhythmias, an ICD was placed (IIB). The patient was discharged in good condition under supplementary verapamil orally.
Conclusions: This case highlights the diagnostic and therapeutic challenges of narrow QRS ventricular tachycardias in some patients. Lack of response to vagal maneuvers, adenosine, discordant T waves as well as a different morphology from the baseline ECG, should prompt consideration of a ventricular origin. Noteworthy verapamil is not helpful in differentiating tachycardia's origin because of its effect on both. High septal VTs, while rare, can present with deceptively narrow QRS complexes and correct diagnosis may be missed. Accurate diagnosis may require invasive electrophysiologic evaluation.


Collected: 14-Aug-2024 14:18:47
25.0 mm/sec
1 mV
Lead I
VEGM
AEGM
Lead II
25.0 mm/sec


QRS 152 ms
QT / QTcBaz 518 / 570 ms
PR - ms
P - ms
RR / PP 820 / 821 ms
P / QRS / T / -85 / 93 degrees
AV dual-paced rhythm
Abnormal ECG
I
II
III
aVR
aVL
aVF
II
V1
V2
V3
V4
V5
V6
Unconfirmed
GE MAC2000 1.1 12SL™ v241 25 mm/s 10 mm/mV ADS 0.56-40 Hz 50 Hz 2x5x6_25_R1 1/1


03.08.2024 0:12:29
251 GNA
TCU 1
Location:
Order Number:
Visit:
Indication:
Medication 1:
Medication 2:
Medication 3:
Room:
171 bpm
-- / -- mmHg
Technician:
Ordering Ph:
Referring Ph:
Attending Ph:
QRS : 76 ms
QT / QTcBaz : 284 / 479 ms
PR : - ms
P : - ms
RR / PP : 350 / 350 ms
P / QRS / T : / -41 / 198 degrees
Sinus tachycardia
Left axis deviation
Low voltage QRS
Inferior infarct , age undetermined
Marked ST abnormality, possible anterolateral subendocardial injury
Abnormal ECG
I
II
III
aVR
aVL
aVF
II
V1
V2
V3
V4
V5
V6

4647 - Pre-Existing And New-Onset AF On All-Cause Mortality In Patients Undergoing TAVI-Metanalysis Study

Athanasios Saplaouras[1], George Bazoukis[2], Panagiotis Mililis[1], Ourania Kariki[1], Stylianos Dragasis[1], Stavroula Koskina[1], Theodoros Efremidis[1], Athanasios Makris[1], Konstantinos Letsas[1], Michael Efremidis[1]

[1]Arrhythmia Unit, Onassis Cardiac Surgery Center, Athens, Greece, *[2]Department of Cardiology, Larnaca General Hospital, Larnaca, Cyprus*

Introduction: Atrial fibrillation (AF) is a common comorbidity in patients with severe AS who are planning to undergo TAVI, while new-onset AF can complicate the clinical course of these patients. This meta-analysis aims to evaluate the impact of pre-existing and new-onset AF on all-cause mortality in patients undergoing TAVI.
Methods: This meta-analysis has been prepared in adherence to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines.
Results: Finally, 30 studies provided data regarding the association between pre-existing (18 studies) and/or new-onset AF (12 studies) with all-cause mortality and were therefore included in the quantitative analysis. Patients with new-onset AF had a 67% higher risk of all-cause mortality compared to patients without new-onset AF [HR: 1.67, 95% CI (1.39-2.00), p<0.001, I2 72%]. Similarly, patients with pre-existing AF had a 67% higher risk of all-cause mortality compared to patients without pre-existing AF [HR: 1.64, 95% CI (1.53-1.77), p<0.001, I2 28%].
Conclusions: Pre-existing and new-onset AF is associated with an increased risk of all-cause mortality in patients undergoing TAVI procedures. Further research is needed to evaluate the beneficial role of sinus rhythm maintenance and antiarrhythmic medication, especially in patients who develop new-onset AF.

4648 - RV1SI ECG Pattern After CRT And Correlation To CRT Response

Athanasios Saplaouras[1], Panagiotis Mililis[1], Athena Batsouli[2], Stavroula Koskina[1], Ourania Kariki[1], Stylianos Dragasis[1], Theodoros Efremidis[1], Michael Efremidis[1], Konstantinos Letsas[1]
[1]Arrhythmia Unit, Onassis Cardiac Surgery Center, Athens, Greece, [2]Department of Cardiology, Evangelismos General Hospital, Athens, Greece

Introduction: Cardiac resynchronization therapy (CRT) is one of the treatment options for patients with heart failure, left bundle branch block (LBBB), and left ventricular ejection fraction (LVEF) <35%. However, only 30-40% of patients show a response to CRT. Our study aimed to investigate the correlation between the electrocardiographic pattern RV1SI and the response to CRT.
Materials and Methods: The study included 48 patients with heart failure due to ischemic or non-ischemic cardiomyopathy who were referred to our hospital for CRT implantation from January 2021 to November 2023. The 12-lead ECG after implantation showing a high R wave in lead V1 ≥4 mm and a dominant negative wave (S wave) in lead I (RV1SI pattern) has been considered an indicator of optimal resynchronization after CRT. The response to CRT was defined as an increase in LVEF ≥10% or a reduction in left ventricular end-systolic volume (LVESV) ≥15% at six months of follow-up. The 48 study patients were divided based on the 12-lead ECG into two groups based on the positive RV1SI pattern (Group I) or negative RV1SI (Group II).
Results: At six months of follow-up, 37 patients (77.1%) had responded to CRT. The ECG assessment after CRT of 48 patients revealed 19 (39.58%) in Group I and 29 (60.42%) in Group II. Among the 29 patients in Group II, 19 (65.51%) were responders, and among the 19 patients in Group I, 18 (94.73%) were responders (p = 0.0185). It was found that patients in Group I showed better response to CRT compared to Group II regarding the improvement of echocardiographic parameters.
Conclusion: Patients with a positive RV1SI pattern on the 12-lead ECG after implantation showed better response to cardiac resynchronization therapy compared to patients with a negative pattern at six months.

4649 - Prognostic Factors For CRT Response-A Cohort Study

Athanasios Saplaouras[1], Konstantinos Pamporis[2], Stavroula Koskina[1], Panagiotis Mililis[1], Ourania Kariki[1], Athina Mpatsouli[3], Stylianos Dragasis[1], Theodoros Efremidis[1], George Bazoukis[4], Athanasios Makris[1], Michael Efremidis[1], Konstantinos Letsas[1]
[1]Arrhythmia Unit, Onassis Cardiac Surgery Center, Athens, Greece, [2]Department of Hygiene, Social-Preventive Medicine & Medical Statistics, School of Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, University Campus, 54124 Thessaloniki, Greece, [3]Department of Cardiology, Evangelismos General Hospital, Athens, Greece, [4]Department of Cardiology, Larnaca General Hospital, Larnaca, Cyprus

Introduction: Although left bundle branch block (LBBB) is a strong predictive factor of response to cardiac resynchronization therapy (CRT), a significant proportion of patients remain non-responders. The aim of this study was to investigate the independent predictive factors associated with CRT response, regardless the LBBB morphology.
Methods: This was a retrospective cohort study of patients with heart failure (HF) and LBBB who underwent CRT device implantation. Patients were analyzed based on whether they fulfilled the following LBBB criteria: Strauss, Marriott, Perrin, the European Society of Cardiology (ESC) 2013, ESC 2021, the World Health Organization (WHO), and a group fulfilling all of the above simultaneously. Response to CRT was defined as an increase in left ventricular ejection fraction (LVEF) ≥10% or a reduction in left ventricular end-systolic volume (LVESV) ≥15% at six-month follow-up. Analyses were performed using R software. Logistic regression was used to assess the association between predictors and CRT response. For each LBBB morphology, a separate model was created, and the odds ratio (OR) with 95% confidence interval (CI) was calculated. Strong predictive factors were defined as those consistently associated with CRT response across LBBB morphologies.
Results: A total of 109 patients were analyzed (87/109 [80%] male, 95/109 [87%] in sinus rhythm) with ischemic (32/109 [29%]) and non-ischemic HF (77/109 [71%]). The mean (standard deviation) age and LVEF of participants were 66 (11) years and 29% (4.5), respectively. Sixty-eight patients (68/109 [62%]) fulfilled the Strauss criteria, 42/109 (39%) the Marriott, 43/109 (39%) the Perrin, 85/109 (78%) the ESC 2013, 42/109 (39%) the ESC 2021, 42/109 (39%) the WHO, while 37/109 (34%) met all the above criteria simultaneously. Among all LBBB definitions, the Strauss morphology was most strongly associated with CRT response (OR=7.47, 95% CI [2.52, 25]; p<0.001). The strongest independent predictors of positive CRT response were female sex (OR=4.17–4.55; p=0.036–0.047), non-ischemic cardiomyopathy (OR=3.98–4.70; p=0.004–0.012) and the absence of atrial fibrillation (OR=2.56–2.94; p=0.028–0.049).
Conclusions: Patients who fulfill the Strauss criteria for LBBB derive the greatest benefit from CRT. Additionally, female sex, non-ischemic cardiomyopathy and the absence of atrial fibrillation were strong predictive factors of CRT response.

Variable	LBBB Strauss OR (95%CI); p-value	LBBB Marriott OR (95%CI); p-value	LBBB Perinn OR (95%CI); p-value	LBBB ESC 2013 OR (95%CI); p-value	LBBB ESC 2021 OR (95%CI); p-value	LBBB WHO/AHA OR (95%CI); p-value
LBBB	7.47 (2.52, 25.0); p<0.001	1.46 (0.54, 4.01); p=0.454	2.14 (0.78, 6.09); p=0.141	2.33 (0.75, 7.56); p=0.149	2.00 (0.74, 5.66); p=0.179	2.25 (0.82, 6.49); p=0.122
Sex (Female vs Male)	4.35 (1.10, 20.0); p=0.047	4.55 (1.25, 20.0); p=0.031	4.55 (1.19, 20.0); p=0.035	4.17 (1.12, 20.0); p=0.043	4.55 (1.19, 20.0); p=0.036	4.35 (1.16, 20.0); p=0.039
Age (years)	1.00 (0.95, 1.05); p=>0.9	1.01 (0.96, 1.06); p=0.8	1.01 (0.96, 1.06); p=0.7	1.01 (0.96, 1.06); p=0.7	1.01 (0.96, 1.06); p=0.7	1.01 (0.96, 1.06); p=0.7
LVEF (%)	0.98 (0.87, 1.10); p=0.7	1.02 (0.92, 1.14); p=0.7	1.02 (0.91, 1.13); p=0.7	1.01 (0.90, 1.12); p=0.9	1.02 (0.91, 1.13); p=0.8	1.02 (0.91, 1.13); p=0.8
LVESV (ml)	1.00 (0.99, 1.01); p=0.9	1.00 (0.99, 1.01); p=>0.9	1.00 (0.99, 1.01); p=>0.9	1.00 (0.99, 1.01); p=>0.9	1.00 (0.99, 1.01); p=>0.9	1.00 (0.99, 1.01); p=>0.9
HF type (Non-ischemic vs Ischemic)	3.98 (1.39, 12.3); p=0.012	4.53 (1.69, 13.1); p=0.004	4.65 (1.72, 13.6); p=0.003	4.43 (1.65, 12.8); p=0.004	4.70 (1.74, 13.8); p=0.003	4.55 (1.68, 13.4); p=0.004
NYHA (III/IV vs II)	1.17 (0.29, 4.64); p=0.8	1.20 (0.32, 4.40); p=0.8	1.33 (0.35, 5.02); p=0.7	1.38 (0.36, 5.22); p=0.6	1.31 (0.35, 4.85); p=0.7	1.28 (0.33, 4.88); p=0.7
No AF vs AF	2.94 (1.05, 8.33); p=0.044	2.56 (1.01, 6.67); p=0.049	2.63 (1.02, 7.14); p=0.049	2.94 (1.15, 8.33); p=0.028	2.63 (1.02, 7.14); p=0.048	2.63 (1.03, 7.14); p=0.047
ECG QRS (ms)	1.01 (0.98, 1.04); p=0.5	1.03 (1.00, 1.06); p=0.037	1.03 (1.00, 1.06); p=0.060	1.03 (1.01, 1.06); p=0.019	1.03 (1.00, 1.06); p=0.050	1.03 (1.00, 1.06); p=0.070

4651 - Atrial Myopathy In Hypertrophic Cardiomyopathy Patients Without A History Of Atrial Fibrillation

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Background & Aim: Left atrial (LA) volume index (LAVI), LA reservoir strain (LARS) and total atrial conduction time (TACT) (estimated by tissue Doppler imaging) are morphological and functional parameters reflecting LA structural and electrical remodeling (atrial myopathy). Aim of this study was to estimate correlations of atrial myopathy characteristics in a cohort of hypertrophic cardiomyopathy (HCM) patients without atrial fibrillation (AF) history.
Methods: We included 100 HCM patients (54±21 years, 75% male, maximum wall thickness 19±3.4mm) without AF history who have consecutively undergone 2D-speckle tracking echocardiography and cardiovascular magnetic resonance (CMR) with late gadolinium enhancement (LGE). TACT and LARS measurement is shown on left panel. Burden of fibrosis (percentage of LV mass) was defined by LGE extent (>5 standard deviations compared to nulled myocardium) in CMR slices.
Results: Mean TACT was 140±22 msec, with LAVI being 32±16 mL/m2 and LARS 26±14%. Among HCM demographic, phenotypic and functional characteristics tested, age and LV mass index were found to be the only independent regressors of TACT (r=0.54, p<0.0005 and r=0.44, p=0.002 respectively, right upper panel), while E/E' (r=-0.44, p=0.003) and fibrosis extent (r=0.36, p=0.02) were the strongest predictors of LARS and LAVI values respectively (right lower panel).
Conclusions: Atrial myopathy parameters seem to correlate with various morphological and functional characteristics of HCM. Atrial electro-mechanical delay assessed through TDI based TACT correlates significantly with LVMI, whereas LARS and LAVI are strong regressors of elasticity properties, partially expressed through diastolic function and underlying fibrosis.

4653 - Flecainide In Outflow Vs. Non-Outflow Tract Premature Ventricular Complexes: A UNIFLECA Comparative Analysis

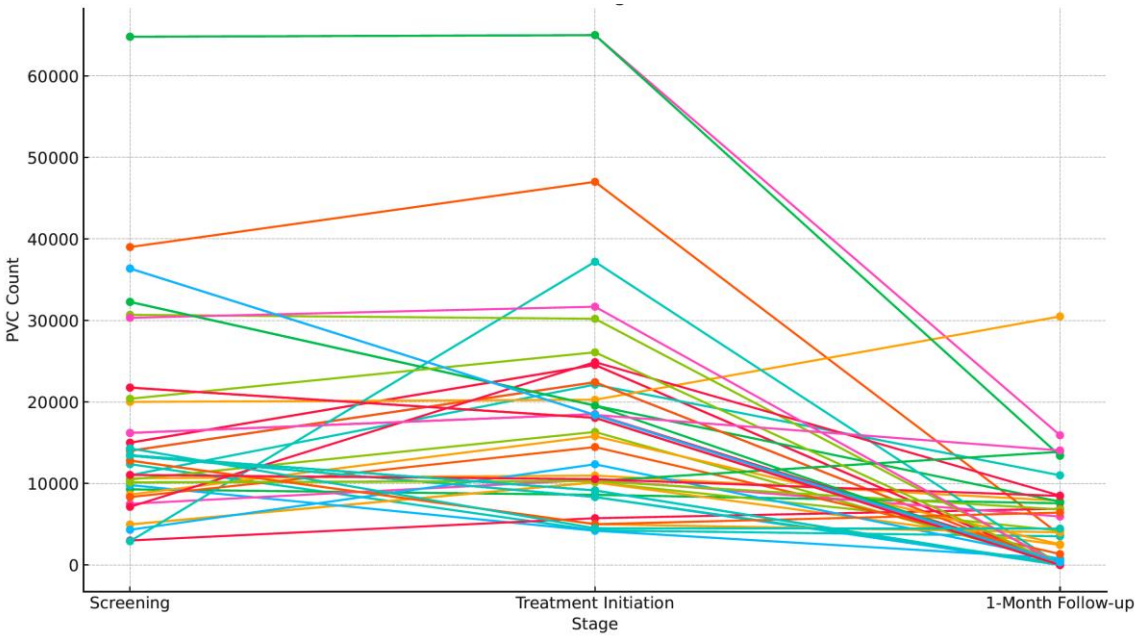
Sotirios Kotoulas[1], Dimitrios Tsiachris[1], Michail Botis[1], Georgios Leventopoulos[2], Eleftherios Kallergis[3], Dimitrios Varvarousis[4], Ioannis Doundoulakis[1], Dimitrios Iliopoulos[4], Andreas Triantafyllis[4], Athanasios Kordalis[1], Leonidas Poulimenos[4], Konstantinos Tsioufis[1]
[1]Hippokration General Hospital, Athens, Greece, [2]University Hospital Patras, Patras, Greece, [3]University Hospital Crete, Crete, Greece, [4]Asklepeion Voula General Hospital, Athens, Greece

Background/Introduction: PVCs frequently originate from ventricular outflow tract (OT) regions. PVCs originating from non-outflow tract (non-OT) regions such as fascicles, papillary muscles, and annular or epicardial locations, may pose greater therapeutic challenges due to their varied responsiveness to medication and ablation therapy. Current guidelines suggest flecainide primarily for OT PVCs (Class IIa), with limited comparative data available for non-OT PVCs.
Objectives: This substudy from the UNIFLECA prospective cohort aimed to compare flecainide's efficacy in PVC burden reduction, responder rates (>80% reduction), and symptom resolution between OT and non-OT PVC patients.
Methods: Patients with a high PVC burden (>5%), who declined catheter ablation, were treated prospectively with slow-release flecainide. Based on ECG PVC morphology the patients were classified into OT and non-OT groups. The primary outcomes included percentage PVC reduction, responder rate, and symptom resolution.
Results: As of April 2025, 72 patients were screened. Among them, 5 experienced spontaneous resolution of PVCs and were excluded from treatment analysis (100% OT PVC Origin). Four additional patients (80% OT PVCs) were classified as treatment failures due to a lack of therapeutic response and were included in the analysis for completeness. 43 completed at least one month of follow-up, including 29 with OT PVCs and 14 with non-OT PVCs. The mean PVC reduction was higher in the OT group (65.8%) compared to the non-OT group (57.2%). Responder rates (>80% reduction in PVC burden) were 60.0% in OT patients and 35.7% in non-OT patients. Symptom-free status was achieved by 63.3% of OT patients versus 42.9% in the non-OT group. Independent t-tests and Chi-square analyses revealed no statistically significant differences in PVC reduction ($p>.05$), responder rates ($p = 0.274$), or symptom resolution ($p = 0.353$).
Conclusions: Flecainide effectively reduces PVC burden regardless of anatomical origin. The study remains ongoing. Initial outcomes are promising and continue to support the use of flecainide as a safe and effective alternative across diverse PVC origins in patients who are not candidates or suitable for catheter ablation.

4654 - The UNIFLECA Study: Prospective Cohort Study On Flecainide's Impact On Persistent High Premature Ventricular Contraction Burden And PVC-Induced Cardiomyopathy

Sotirios Kotoulas[1], Dimitrios Tsiachris[1], Michail Botis[1], Georgios Leventopoulos[2], Eleftherios Kallergis[3], Dimitrios Varvarousis[4], Ioannis Doundoulakis[1], Dimitrios Iliopoulos[4], Andreas Triantafyllis[4], Athanasios Kordalis[1], Leonidas Poulimenos[4], Konstantinos Tsioufis[1]
[1]Hippokration General Hospital, Athens, Greece, [2]University Hospital Patras, Patras, Greece, [3]University Hospital Crete, Crete, Greece, [4]Asklepeion Voula General Hospital, Athens, Greece

Background/Introduction: Persistent high Premature Ventricular Contraction (PVC) burden (>10%) may result in PVC-induced cardiomyopathy. Current guidelines, supported by limited evidence, recommend flecainide for PVCs originating in the ventricular outflow tract (Class IIa).
Aim: UNIFLECA is a prospective cohort study aimed to assess the efficacy and safety of flecainide in PVC burden reduction in adults (irrespective of PVC origin), focusing secondarily on symptom relief and improvement in left ventricular ejection fraction (LVEF) in patients with PVC-induced cardiomyopathy.
Methods: Participants were adults with a PVC burden >5%, confirmed by two 24-hour Holter recordings taken at least one month apart, who denied catheter ablation treatment. Flecainide treatment was initiated with dosage adjustments based on follow-up Holter results and QRS increases. Changes in PVC burden, LVEF, symptoms, and treatment adherence were evaluated.
Results: As of April 2025, a cohort of 72 patients were screened. Persistent high PVC burden and met eligibility criteria were present in 62 patients who were initiated on flecainide slow release treatment (Median time between Holter recordings: 185 days and 5 had previously undergone PVC ablation procedures). A daily dose of 100 mg was administered in 59.7% of patients, 150mg on 30.6%, while the remaining patients are on a 200 mg daily regimen. Among them 43 were monitored over a one-month period following treatment initiation. A significant reduction was present in the mean PVC burden (mean decrease: 66.6% in the first month), with 56.5% of patients achieved a PVC reduction greater than 80%. Symptomatic improvement was observed in 88.6% of patients, with 59.6% reporting complete resolution of symptoms. Among those with baseline left ventricular ejection fraction (LVEF) impairment, functional improvement was noted, and 25% required dose adjustments to achieve optimal efficacy. No patients presented with QRS increase of <25% and no major adverse effects were presented.
Conclusions: Flecainide effectively reduces PVC burden and enhances symptomatic and functional outcomes in adults with persistent high PVC burden, irrespective of PVC origin, presenting a valuable alternative for patients ineligible or denying catheter ablation.


PVC Count
60000
50000
40000
30000
20000
10000
0
Screening
Treatment Initiation
1-Month Follow-up
Stage

4656 - Elevated Left Atrioventricular Coupling Index In Persistent Atrial Fibrillation: A Novel Marker Of Atrial Myopathy

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Introduction: Atrial fibrillation (AF) is often linked to left ventricular (LV) dysfunction and left atrial (LA) remodeling. The left atrioventricular coupling index (LACi), a novel echocardiographic metric reflecting LA-LV interaction and diastolic function, may offer insights into AF progression. However, its association with AF subtypes and clinically relevant thresholds remain undefined.
Purpose: The aim of the present study was to investigate the potential differences in LACi between patients with paroxysmal (PAF) and persistent AF (PerAF).
Methods: In this prospective study, 26 patients with PAF [46% female, mean age: 65.58 ± 8.45 years, mean AF duration: 43.85± 47.84 months] and 15 patients with PerAF [26% female, mean age: 63.13± 8.83, mean AF duration: 57.47± 113.59 months] were examined. All patients underwent standard transthoracic echocardiogram on a GE Vivid E95, to assess systolic and diastolic left ventricular (LV) function, LA diameter, end-systolic and end-diastolic LA volumes. LACi was derived from the ratio of LA end-diastolic volume to LV end-diastolic volume.
Results: Results indicated that PerAF exhibited higher LACi values than the PAF group (0.52±0.27 vs 0.36±0.14, p=0.036). After adjusting for age and gender, the observed statistically significant difference in LACi between the PAF and PerAF groups remained, demonstrating that AF type is an important predictor of LACi.
Conclusion: From a pathophysiological standpoint, LACi is a marker of LA-LV decoupling and diastolic dysfunction and appears to be elevated in PerAF compared to PAF. Measurement is easily accessible with 2D TTE. This suggests that LACi may be a valuable non-invasive tool for risk stratification, potentially predicting AF progression and outcomes of rhythm control strategies. Further studies are warranted to validate its prognostic utility in predicting AF recurrence post-cardioversion or ablation.

4658 - Preliminary Results Of The ECHO-LBBp Study: Impact Of Echocardiographic LBBB Patterns On Immediate QRS Narrowing With LBB Pacing Versus CRT

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Background: Preliminary results from the ECHO-LBBp trial (NCT06689111) suggest that 2D strain echocardiography-based mechanical characterization of left bundle branch block (LBBB) may better predict acute response to cardiac resynchronization therapy (CRT). Left bundle branch pacing (LBBp) has emerged as a physiological alternative to conventional biventricular pacing. This analysis compared immediate QRS duration changes following LBBp and CRT, stratified by typical or atypical mechanical LBBB patterns.

Methods: In this prospective, non-randomized interventional study, 39 patients with heart failure and reduced ejection fraction (LVEF <5%) undergoing CRT were analyzed. Patients were classified by echocardiography into typical or atypical mechanical LBBB patterns before implantation. Four groups were defined: LBBp recipients with typical LBBB pattern (n=7), with atypical LBBB pattern (n=9), CRT recipients with typical LBBB pattern (n=12), and with atypical LBBB pattern (n=8). Four patients who crossed over to LOT-CRT were excluded from group comparisons. QRS duration was measured pre- and post-implantation. Group comparisons of ΔQRS were conducted using ANOVA and t-tests.

Results: QRS reduction differed significantly among groups (ANOVA p = 0.022). LBBp with typical pattern showed greater QRS narrowing than LBBp with atypical pattern (−51.4 ms vs −33.3 ms, p = 0.037). No significant difference was observed between CRT subgroups (−29.5 ms vs −25.0 ms, p = 0.598). Overall, LBBp patients had greater QRS reduction than CRT patients (−41.3 ms vs −28.0 ms, p = 0.022) (Figure 1).

Conclusion: Echocardiographic LBBB pattern may predict acute electrical response. LBBp achieved superior QRS narrowing vs CRT, especially in patients with typical mechanical activation.

4659 - Left Atrial Stiffness Index: A Novel Non-Invasive Indicator of Atrial Myopathy in Atrial Fibrillation

Aikaterini-Eleftheria Karanikola[1], Dimitrios Tsiachris[1], Athanasios Kordalis[1], Michail Botis[1], Athanasios Sakalidis[1], Christos-Konstantinos Antoniou[1], Ageliki Laina[1], Nikos Argyriou[1], Konstantinos Pamporis[1], Panagiotis Tsioufis[1], Panagiotis Xydis[1], Kostantinos Gatzoulis[1], Konstantinos Tsioufis[1]
[1]*First Department of Cardiology, Hippokration General Hospital of Athens, Athens, Greece*

Introduction: Atrial fibrillation (AF) often leads to adverse remodeling of the left atrium (LA). Transthoracic echocardiography (TTE) provides valuable insights into LA anatomical and functional features. A promising TTE-derived metric is the left atrial stiffness index (LASi), an indicator of LA compliance. LASi has been associated with low-voltage areas in the left atrium, though definitive cutoff values remain undefined.
Purpose: The aim of the present study was to investigate the possible differences in LASi between paroxysmal (PAF) and persistent AF (PerAF).
Methods: In this prospective study, 26 patients with PAF [46% female, mean age: 65.58 ± 8.45 years, mean AF duration: 43.85± 47.84 months] and 15 patients with PerAF [26% female, mean age: 63.13± 8.83, mean AF duration: 57.47± 113.59 months] were examined. All patients underwent standard TTE using a GE Vivid E95, to assess systolic and diastolic left ventricular function, LA diameter and LA function. Peak atrial longitudinal strain (PALS) was measured using 2D-speckle tracking echocardiography in the apical four- and two-chamber views, resulting in a biplane LA reservoir strain measurement. LASi was defined as the ratio of early diastolic transmitral inflow velocity/mitral annulus early diastolic velocity [E/e'] to PALS [(E/e')/PALS).
Results: Results indicated a statistically significant difference in mean LASi between the PAF and PerAF 0.40±2.87 vs 0.70±0.34, p = 0.005). After adjusting for age and sex, the observed statistically significant difference in LASi between the PAF and PerAF groups remained, demonstrating that AF type is an important predictor of LASi.
Conclusion: LA stiffness index, as a non-invasive marker of LA compliance, demonstrates increased values in patients with PerAF compared to patients with PAF. Prognostic implications include association with increased recurrence rates after cardioversion and catheter ablation. Representing an easily accessible and highly reproducible marker, LASi holds the potential of a valuable risk stratification tool, when integrated into clinical parameters, in an era of increasing invasive rhythm control strategies.

4660 - Type 1 Brugada Pattern ECG Induced By Fever

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A 39-year-old man was transferred from a doctor's general practice with an ECG suggestive of "acute myocardial ischemia". The patient reported no symptoms of chest pain, palpitations, or shortness of breath. For the past 2 days, and on arrival at our hospital, his body temperature was up to 40°C and he complained of general malaise, myalgias and lumbar pain. Troponin I and markers of myocardial necrosis were negative, and plasma inflammatory markers were elevated. The ECG demonstrated a typical type 1 Brugada pattern with characteristic J point elevation of >2 mV, coved ST elevation, and T wave inversion in precordial leads, V1 to V2 (Figure 1 A, B). As no cause of infection was clearly identified, the patient received an empirical course of antibiotics, which resulted in quick relief of symptoms and fever reduction. Over the subsequent days, the ECG normalized (Figure 1C). Cardiac echo demonstrated a structurally normal heart, normal left ventricular systolic function, and no wall motion abnormalities. 24-hour ECG monitoring revealed no ventricular or supraventricular extrasystoles, no bundle branch morphology or bradycardia (Figure 1D). Brugada phenocopies, like ischemic ECG changes, AV nodal reentry tachycardia, or preexcitation, were excluded. The normal echo excluded phenocopies like myocardial hypertrophy or structural heart disease. There was no history of presyncope or syncope in the patient, and no family history of Brugada or sudden death in a young family member. Fever is a particularly important trigger for Brugada syndrome. He was advised to avoid drugs that may induce ST-segment elevation in right precordial leads, cocaine, cannabis, excessive alcohol intake and treat fever with antipyretic medications. According to current guidelines, as there was no syncope or documented ventricular arrhythmia, he was advised to be regularly followed up.

4661 - A Pseudo-Preexcitation ECG In A Young Patient With Hypertrophic Cardiomyopathy

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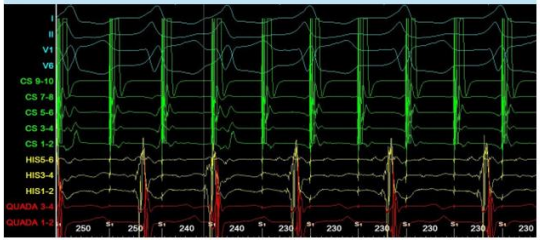
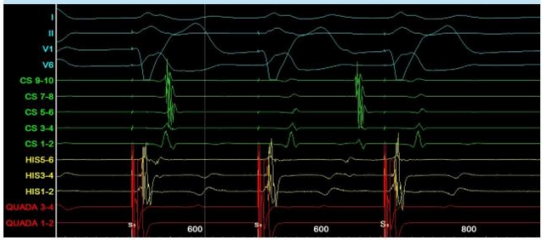
A 17-year-old male was referred to the Electrophysiology Department for occasional episodes of palpitations and an electrocardiogram (ECG) suggestive of preexcitation with LBBB pattern (Figure 1A). He had a family history of hypertrophic cardiomyopathy. Echocardiography revealed left ventricular (LV) hypertrophy, LV ejection fraction of 35-40%, and diastolic dysfunction with normal filling pressures. The cardiac magnetic resonance imaging showed LV dilatation with asymmetric hypertrophy up to 17mm, intraventricular septum dyssynchrony, moderately impaired LV systolic function, and dense late gadolinium enhancement in the basal inferolateral wall, all findings suggestive of hypertrophic cardiomyopathy. His brother had hypertrophic cardiomyopathy, ablation and defibrillator implantation at the age of 21 years, and his mother had atrial fibrillation and pacemaker implantation at the age of 36, with no history of sudden cardiac death. A potential PRKAG2 mutation could explain the combined findings of hypertrophic cardiomyopathy and preexcitation on ECG in that patient.
The electrophysiology study demonstrated HV interval 25 ms, concentric decremental VA conduction, decremental AV conduction during 600 and 400 ms antegrade curves down to AERP - fixed LBBB (no changes in QRS morphology with progressive decrementation). The Weckenbach time point was at 260 ms during incremental antegrade pacing, with no QRS changes (Fig. 1B). Adenosine caused AV block (Fig. 1C), and there was no evidence of AV jump or arrhythmias induced with isoprenaline infusion. Heart failure treatment with bisoprolol, dapagliflozin, and ramipril was initiated. In conclusion, the EP study documented that there was no evidence of an accessory pathway, and the patient's ECG pattern was considered pseudo-preexcitation. In cases of structurally abnormal hearts with cardiac hypertrophy, broad QRS with repolarization abnormalities or bundle branch morphology, ECGs can mimic non-existent accessory pathways.

1A. 12 lead ECG

1B. End of IAP- AV Wenckebach



1C. Adenosine AV block



4662 - Electrocardiographic Differentiation Of Right And Left Ventricular Outflow Tract Arrhythmias: A Diagnostic Accuracy Study

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Introduction: Idiopathic premature ventricular complexes (PVCs) commonly originate from the right and left ventricular outflow tracts (RVOT and LVOT, respectively). The surface 12-lead ECG is commonly used to differentiate the anatomic site of origin, prior to catheter ablation. Multiple ECG algorithms have been published to assist preprocedural localization. We sought to evaluate the diagnostic performance of three commonly implemented algorithms.
Material and Methods: This study included 43 patients (65.1% men, mean age 56 ± 16.6 years), who underwent successful catheter ablation of outflow tract- originating idiopathic PVCs. The diagnostic algorithms evaluated were the V2S/V3R index, the transition zone index and the lead I R wave amplitude (an R wave amplitude ≥ 0.1 mV in lead I predicts LVOT origin). The diagnostic accuracy of the algorithms was assessed by the area under the receiver- operating characteristics curve (AUC). Specificity and sensitivity of each algorithm were measured.
Results: Electroanatomic 3D mapping depicted as site of origin the RVOT in 17 patients (35.3% women, mean age 43.4 ± 14.0 years) and the LVOT in 26 patients (34.3% women, mean age 64.4 ± 12.5 years). The V2S/V3R index yielded a sensitivity of 0.82 and a specificity of 0.76. The AUC was 0.89 (Figure 1). As for the transition score index, sensitivity and specificity were 0.87 and 0.62, respectively, with an AUC 0.77. Lead I R wave amplitude demonstrated a sensitivity of 0.41 and a specificity of 0.96, respectively. The AUC was 0.66.
Conclusions: Published diagnostic algorithms can reliably differentiate right ventricular from left ventricular originating outflow tract arrhythmias.

4663 - Age-Dependent Shift In Idiopathic PVC Origin From RVOT To LVOT

Michail Botis[1], Dimitrios Tsiachris[1], Ioannis Doundoulakis[1], Christos Konstantinos Antoniou[2], Athanasios Kordalis[1], Sotirios Kotoulas[1], Ageliki Laina[1], Panagiotis Xydis[1], Lamprini Iro Bartsioka[1], Nikos Aryriou[1], Aikaterini- Eleftheria Karanikola[1], Georgios Botis[2], Konstantinos Tsioufis[1]

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Introduction: Idiopathic premature ventricular contractions (PVCs) is a frequently encountered clinical arrhythmia. Current guidelines define idiopathic PVCs as those occurring in the absence of structural heart disease. Among the most frequent sites of PVCs origin are the right ventricular outflow tract (RVOT) and the left ventricular outflow tract (LVOT). The study aimed to assess whether increasing age is associated with an RVOT or LVOT origin of PVCs.
Material and Methods: We included 99 patients (36 women, men age 56.04 ± 15.8 years), who underwent successful idiopathic PVC ablation, originating from either RVOT or LVOT, as determined by 3-D electroanatomical mapping, from 2015 to 2024. Univariate logistic regression was applied, to correlate the patients age with the site of the arrhythmia origin.
Results: The site of origin was identified as the RVOT in 47 patients and the LVOT in 52 patients. Advancing age was positively associated with an arrhythmia origin from the LVOT, rather the RVOT (Odds Ratio: 1.07, 95% C.I. 1.04- 1.12, $p < 0.001$, per year increase). The area under the curve was calculated to be 0.78 (Image 1). The age difference among the two sites of origin is also illustrated by Box plots. No differences were noted in the 24-hour burden among RVOT and LVOT originating arrhythmias (20.2% vs 20.6 %, $p = 0.7$). Patients with RVOT-originating arrhythmia were more likely to be symptomatic on initial presentation (42.6% vs 19.23 %, $p = 0.02$). Procedural duration was similar (131.6 vs 127.8 min, $p = 0.8$) for RVOT and LVOT, respectively. Activation mapping depicted similar prematurity, irrespectively of RVOT or LVOT origin (30.3 vs 25.2 msec, $p = 0.06$).
Conclusions: Increasing age is positively correlated with LVOT- originating PVCs, compared with RVOT-originating aortic cusps. The finding is possibly attributed to increased calcium deposition within the aortic cusps and the aortic annulus with increasing age, which leads to micro- reentry circuits and arrhythmogenesis.

4664 - Incidence And Managment Of Atrial Fibrillation In The Emergency Department. Data From HEROMEDICUS STUDY

Nikos Argyriou[1], Dimitris Tsiachris[1], Panagiotis Tsioufis[1], Aggeliki Laina[1], Michail Botis[1], Panagiotis Xydis[1], Christos Antoniou[1], Ioannis Doundoulakis[2], Athanasios Kordalis[1], Konstantinos Tsioufis[1]
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Introduction: Atrial fibrillation (AF) is the most common arrhythmia encountered in the emergency department (ED). Registry data have shown that about 60% of AF patients who visit the ED are being admitted to hospital leading to increased numbers of hospital admissions. Towards this direction we created the "HEROMEDICUS" study for the management of these patients in the acute phase. The protocol includes an aggressive electrophysiologist-guided rhythm control strategy for patients presenting with AF in the ED.
Purpose: We examined retrospectively the incidence and management of AF our ED during the period of September of 2021 to September 2022 and we compared admission rates applying the HEROMEDICUS protocol.
Methods: In the retrospective phase we reviewed the charts of patients diagnosed with a primary diagnosis of Atrial Fibrillation/Afflutter/ Atrial tachycardia who visited our hospital's ED from September 2021 to September 2022 and examined the management of the arrythmia in the emergency department. We applied the HEROMEDICUS protocol from September 2023 to February 2025. There was continuous counseling by a specialist electrophysiologist. Patients with poor anticoagulation were offered rate control and programmed for an outpatient cardioversion. Otherwise, intravenous flecainide was administered and upon failure or in case of contraindications to intravenous flecainide (prior home loading with>mg propafenone or>mg flecainide), electrical cardioversion was performed. The primary endpoint was safety of protocol and efficacy based on hospital admission.
Results: From September 2021 to September 2022, 7338 patients visited the cardiology ED out of which 312 had AF. Among AF patients 120 were admitted to cardiology clinic (38.4%) and the remaining 192 patients were managed in the ED. From the period 08/09/2023 to 25/02/2025, 215 cases visited our ED, of which 11 had AT, 16 had A. flutter and 188 had Afib. Rate control was performed in 20%. Spontaneous cardioversion in 12%. Successful cardioversion to sinus rhythm with i.v. flecainide was performed in 48 of 68 patients (70.5%) while in 87 of 91 patients electrical cardioversion was successful. A total of 75% of patients had sinus rhythm after evaluation and admission took place in 4.1% of cases compared to38.4% before the HEROMEDICUS.
Conclusion: An aggressive EP-guided rhythm control strategy for patients presenting with AF in ED resulted in a significant reduction in admissions.

4665 - Long-Term Efficacy And Safety Of Catheter Ablation In Patients With Frequent PVCs: Results From A Dual-Center Experience

Michail Botis[1], Dimitrios Tsiachris[1], Lamprini Iro Bartsioka[1], Athanasios Kordalis[1], Christos Konstantinos Antoniou[1], Ioannis Doundoulakis[1], Sotirios Kotoulas[1], Ageliki Laina[1], Georgios Kourgiannidis, Georgios Deligiannis[1], Panagiotis Tsioufis[1], Konstantinos Tsioufis[1]
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Background: Premature ventricular complexes (PVCs) constitute a commonly encountered arrhythmia. Catheter ablation has emerged as a safe and effective therapeutic modality. However, long term follow-up data are still lacking. We conducted long term follow-up of patients who underwent catheter ablation for frequent PVCs, defined as more than 10.000 during at least two 24- hour ambulatory ECG- monitoring.
Methods: This ambidirectional cohort study included 180 patients (32 % female; median age 59.1, IQR 24.9 years) who underwent catheter ablation at two centers from 2015 to 2024. We sought to evaluate the following factors: Patient demographics, procedural characteristics and outcomes, complication rates and long-term clinical outcomes. There were 47 (26.1%) patients with already diagnosed structural heart disease (32 with ischemic heart disease, 10 with dilated cardiomyopathy, 2 with valvular heart failure, 1 with hypertensive heart failure and 2 with non- dilated left ventricular cardiomyopathy). A diagnosis of PVC induced cardiomyopathy, prior to ablation, was established in 28 (15.56%) of cases. Prior to catheter ablation, 169 patients had received beta-blockers and 42 had received class IC or III antiarrhythmics, without PVCs suppression.
Results: Acute procedural success was achieved in 166 (92.2 %) of patients. In the long term follow up of the successful cases (mean follow up 3.4 ± 2.5 years), 6 recurrences were observed (among them, a new origin of PVCs was noted in one patient, 4 years after the index procedure). Patients with PVCs originating from sites other than the outflow tracts were more likely to experience arrhythmia recurrence (log- rank test, p = 0.05) (Figure). Interestingly, diagnosis of structural heart disease prior to catheter ablation was not associated with arrhythmia recurrence (Figure). PVC induced cardiomyopathy resolved in 25 out of 28 patients, post catheter ablation. Among the failed cases, one procedure was discontinued due to intraprocedural tamponade. The rest of the failed cases were attributed to inaccessible site of origin, mainly left ventricular summit (n= 5) and papillary muscle (n = 5).
Conclusion: In the long term follow up, catheter ablation of frequent PVCs demonstrates safety and effectiveness, and requires multidisciplinary approach of complications management.

4666 - Improved Management Of Patients With Atrial Fibrillation In The Emergency Department Based On An Aggressive Rhythm Control Strategy. The HEROMEDICUS Study

Nikos Argyriou[1], Dimitris Tsiachris[1], Panagiotis Tsioufis[1], Christos-Konstantinos Antoniou[1], Athanasios Kordalis[1], Elina Karanikola[1], Michail Botis[1], Ioannis Doundoulakis[1], Aggeliki Laina[1], Konstantinos Tsioufis[1]
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Introduction: Atrial fibrillation (AF) accounts for 1-2% of emergency department (ED) visits to a general hospital, of which 60% are admitted. The lack of concrete guidelines justifies the use of a more conservative rather than a more aggressive strategy.
Purpose: In this context, we created the "HEROMEDICUS" study for the management of these patients in the acute phase. The protocol includes an aggressive electrophysiologist-guided rhythm control strategy for patients presenting with AF in the ED.
Methods: All patients who visited the ED from September 2023 to February 2025 due to AF or atrial flutter were tested for possible inclusion in the protocol. Patients with acute coronary syndrome or heart failure were excluded. With the use of tablet and an application designed specifically for this protocol, there was counseling by a specialist electrophysiologist. Patients with poor anticoagulation were offered rate control (verapamil on atrial tachycardia and beta-blockers on atrial fibrillation) and programmed for an outpatient cardioversion. Otherwise, intravenous flecainide was administered and upon failure or in case of contraindications to intravenous flecainide (prior home loading with>mg propafenone or>mg flecainide), electrical cardioversion was performed. The primary endpoint was safety of protocol and efficacy based on hospital admission.
Results: From the period 08/09/2023 to 25/02/2025, 215 cases visited our ED, of which 11 had atrial tachycardia, 16 had atrial flutter and 188 had atrial fibrillation. Mean age was 71.3±5.7 years (53% female) and 95 patients had their first episode of arrhythmia. Mean CHA2DS2-VA score was 2.2 ±0.1 and the mean ventricular frequency was 120±3.5bpm. 43% was on prior anticoagulant medication. Rate control was performed in 20%. Spontaneous cardioversion happened in 12%. Successful cardioversion to sinus rhythm with intravenous flecainide was performed in 48 of 68 patients (70.5%) while in 87 of 91 patients electrical cardioversion was successful. A total of 75% of patients had sinus rhythm after evaluation and admission took place in 4.1% of cases. An adverse event (allergy to administered medicines) was reported in 0.4% of patients.
Conclusion: Aggressive rhythm control strategy through implementation of the HEROMEDICUS protocol in the ED showed that 75% of the study population reverted to sinus rhythm and admissions were limited to 4.1% without compromising safety.

4667 - ECG Characteristics Discriminating Focal Atrial Tachycardia Originating From The Base Or Distal Part Of Left Atrial Appendage. A Single Center Experience Of Two Rare Cases

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Background: The Left Atrial Appendix (LAA) is an uncommon site of origin for focal atrial tachycardia (AT) (2.1%). These ATs affect younger patients, tend to be incessant and have increased risk of tachycardia induced cardiomyopathy. In addition, successful catheter ablation in this anatomic region can be difficult and may pose risks of perforation and cardiac tamponade.
Methods: Purpose of this study is to describe electrocardiographic features of this origin site to guide focal ablation. These ATs have characteristic P-wave morphology. P-wave was negative in leads I and aVL. Negative amplitude was greater in aVL than in I. Also, positive in inferior leads. Greater in III than in aVF and II. Lead aVR, was biphasic with initial positive deflection; always low amplitude. In our first, and most difficult case, origin was the roof of LAA. In precordial leads, was broad positive in V1. Leads V2–V6 showed a flat component (Figure 1). In the second case, AT's origin was the base of LAA. In precordial leads, P-wave was steep positive with triangular shape in V1. Leads V2–V6 showed the same pattern gradually decreasing (Figure 2).
Results: These features guided our high density electro-anatomical mapping and subsequently leading to successful focal ablation and termination of AT. Both patients remain free of relapse one year after the procedure.
Conclusion: The LAA is an uncommon site of origin for focal AT, specially distal LAA. ATs at this location showed typical electrocardiographic characteristics that may guide focal ablation with long-term success.

4669 - Increased incidence of elevated troponin levels and low indicence of acute conorary syndrome in Patients Presenting with Atrial Fibrillation in the Emergency Department. Data from the HEROMEDICUS Study

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Introduction: Atrial fibrillation (AF) is a common arrhythmia frequently encountered in the emergency department (ED). Troponin, a biomarker for myocardial injury, is often measured in AF patients even when acute coronary syndrome (ACS) is not suspected. The clinical relevance of elevated troponin in this context remains unclear. This study examines the incidence of elevated troponin in AF patients presenting to the ED and explores its impact on diagnosis, prognosis, and treatment.
Methods: We conducted a retrospective chart review of patients diagnosed with AF, atrial flutter, or atrial tachycardia in our ED between September 2023 and October 2024. We assessed troponin levels, ACS diagnosis, demographics, clinical presentation, laboratory findings, and treatment approaches.
Results: A total of 202 patients presented with AF (83%), atrial flutter (4.2%), or atrial tachycardia (12.8%). Of these, 47 patients (23.3%) had elevated troponin levels. Over half (55.3%) experienced arrhythmia for the first time. The most common symptoms were palpitations (53.2%), dyspnea (36.2%), chest pain (12.8%), fatigue (6.4%), and dizziness (4.3%). The median age was 78 years (IQR 10), with 59.6% female. The median CHA2DS2-VASc score was 3 (IQR 2), and median heart rate was 130 bpm (IQR 40). Oral anticoagulation was reported in 45.8% of patients, with 37.5% on treatment for over 30 days. The median initial troponin was 41 ng/L (IQR 91), and peak was 94 ng/L (IQR 351), with a median change of 58% (IQR 207.1). Median hospital stay was 3 days; median ejection fraction was 45% (IQR 15). Only 5 patients (10.4%) with elevated troponin were diagnosed with ACS. Cardioversion was attempted in 47 patients, with 57.45% receiving either pharmaceutical (17%) or electrical (40.4%) intervention. Of these, 48.9% had successful cardioversion. No significant differences were found in age, peak troponin, heart rate, or CHA2DS2-VASc scores between ACS and non-ACS patients, though initial troponin levels and their change showed trends toward significance.
Conclusion: Troponin elevation occurred in about 1 in 4 AF patients in the ED, but only 1 in 10 of these had ACS, suggesting that elevated troponin alone should not dictate ACS management.

	Acute Coronary Occlusion	NOT Acute Coronary Ocllusion	P value
Age Median, IQR	72 (15)	78.5 (14)	0.42
Trop Max Median, IQR	102.0 (2389)	92 (306)	0.47
TropInitial Median, IQR	**17.0 (22)**	**49.5 (107.5)**	**0.05**
TropPercentChange Media, IQR	5000 (16950)	58.3 (183)	0.07
EF Median, IQR	35 (15)	45 (13.8)	0.1
DaysHospitalization Median, IQR	5 (2)	3 (3)	0.2
CHADSVASC	3 (2)	3 (2)	0.3
Heart Rate	130 (30)	130 (40)	0.48

4670 - Intravenous Flecainide In The Emergency Department In Patients Presenting With Atrial Fibrillation: Safety And Efficacy. An Aggressive Rythm Control Strategy (HEROMEDICUS Protocol)

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Introduction: Atrial fibrillation (AF) accounts for 1-2% of emergency department (ED) visits at a general hospital. The lack of specific guidelines for the treatment of AF in the acute phase justifies the use of a conservative versus a more aggressive strategy. **Purpose:** In the HEROMEDICUS study we developed a protocol for the treatment of these patients in the acute phase. The protocol includes an aggressive electrophysiologist-guided rhythm control strategy for patients presenting with AF in the ED. In the present study, the endpoint is the safety and efficacy of AF reduction with intravenous flecainide in the ED.
Methods: All patients who visited the ED from September 2023 to February 2025 were tested for possible inclusion in the protocol. Patients with acute coronary syndrome or heart failure were excluded. With the use of tablet and an application designed specifically for this protocol, there was continuous counseling by a specialist electrophysiologist. Patients without prior home loading with> mg propafenone or> mg flecainide were given iv flecainide (2 mg/kg, up to 150 mg dose in 10'). After patients' discharge from ED, monitoring was scheduled through the application at the outpatient AF clinic.
Results: From the period of 08/09/2023 to 25/02/2025, 215 cases with AF inclusion study criteria were presented to the ED, of which 11 had atrial tachycardia, 16 had atrial flutter and 188 had AF. Mean age was 71.3±5.7 years (53% female) and 95 patients had their first AF episode. Mean CHA2DS2-VA score was 2.2 ±0.15, mean ventricular frequency was 120 ± 3.5 and 43% were on prior anticoagulant medication. Among 68 patients receiving intravenous flecainide, 48 (70.5%) were successfully converted to sinus rhythm. From the remaining 20 patients, 18 were then electrically cardioverted to sinus rhythm in the ED and only 2 patients failed both iv flecainide and electrical cardioversion. No patients experienced ventricular proarrhythmia or atrial flutter with 1 to 1 treatment. Admission took place in only 4.1% of the total study population.
Conclusion: Flecainide intravenously can be safely and effectively used in the ED for the cardioversion of AF resulting in significant reduction of admissions.

4671 - Electrical Cardioversion Of Atrial Fibrillation In The Emergency Department: Safety And Effectiveness. The HEROMEDICUS Study

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Introduction: Atrial fibrillation (AF) accounts for 1-2% of emergency department (ED) visits of a general hospital. AF management in the ED varies from country to country and the lack of specific guidelines justifies the use of a conservative rather than a more aggressive strategy. Purpose: In the HEROMEDICUS study we developed a protocol for the treatment of these patients in the acute phase. The protocol includes an aggressive electrophysiologist-guided rhythm control strategy for patients presenting with AF in the ED. In the present study, the final endpoint is the safety and efficacy of electrical cardioversion of AF in the ED.
Methods: All patients who visited the ED from September 2023 to February 2025 due to AF or atrial flutter were tested for possible inclusion in the protocol. Patients with acute coronary syndrome or heart failure were excluded. There was continuous counseling by a specialist electrophysiologist. In case of AF cardioversion failure with intravenous flecainide, or on contraindication of intravenous flecainide use (prior home loading with >300mg propafenone or>mg flecainide), electrical cardioversion was performed in properly anticoagulated patients. According to institutional protocol this was performed in the absence of anesthesiologist by trained cardiologists in Advanced Life Support without the use of transesophageal echocardiography with the patient fasting for 6 hours and with sedation and analgesia administration followed by biphasic synchronous current administration.
Results: From the period 08/09/2023 to 25/02/2025, 215 cases visit our Emergency Department, of which 11 had atrial tachycardia, 16 had atrial flutter and 188 had atrial fibrillation. The mean age was 71.3±5.7 years (53% female). 63 patients had their first episode of arrhythmia. The mean CHA2DS2-VA score was 2.2 ±0.1 and the mean ventricular frequency was 120 ± 3.58bpm. In 87 out of 91 patients electrical cardioversion was successful. In the remaining 4 patients a rate control strategy was initially applied. No patients experienced rhythm or anesthesia disturbances. A total of 206 out of 215 patients were discharged from the ED with a scheduled referral to the outpatient AF clinic.
Conclusion: The implementation of the HEROMEDICUS protocol in the Emergency Department shows that electrical cardioversion is safe and effectively and significantly reduces admissions from the ED of patients presenting with AF.

4672 - At Dawn With This ECG Who You Should Call?

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Introduction: Atypical presentation of ST-segment-elevation myocardial infarction (STEMI) carries a significant mortality and morbidity risk due to inertia or delay of the proper recognition, especially in the geriatric population. As age progresses, the prevalence of elevation of the ST segment (as per mm) declines, whereas symptoms are less indicative of an acute coronary syndrome.
Case study: A nonagenarian male presents at the Emergency Department reporting epigastric pain and vomiting in the last two hours, at 5.00 am. His past medical history includes diabetes mellitus, dyslipidemia (LDL= 118mg/dl) and chronic kidney disease stage III (GFR = 37 ml/min/1.73m2). His current medications are rosuvastatin 10mg od and metformin 1gr bid. He is febrile (37.8o C), with warm and wet extremities, borderline blood pressure [95/55mmHg] and his O2 saturation is 93% (room air). The first medical contact electrocardiogram (ECG) (Image 1) reveals sinus rhythm at 60bpm, negative p waves in V1-V4, slight elevation of ST segment in I, AVL (<1 mm), slight ST segment depression in V2-V3 (1 mm), negative T waves in I, AVL, V5-V6 and transition zone at V2 lead. The meticulous anagnosis of the ECG activated the primary percutaneous coronary intervention protocol without delay for the laboratory results. The initial speculation of a lateral STEMI with proximal total occlusion of the Lcx was confirmed. (Image 2).
Results: The patient underwent an uneventful primary angioplasty with two overlapping everolimus eluting stents (total length 35mm) under intravenous dripping of cangrelor and loading dose of aspirin. Cangrelor was switched to clopidogrel with loading dose, after 2 hours. The peak troponin level was 136.000 ng/L and NTpro BNP was 788 pg/mL. His medications at discharge included dual antiplatelet therapy (up to 6 months) due to high PRECISE-DAPT score (38) with planned clopidogrel monotheapy thereafter and GDMT for the consecutive systolic dysfunction (EF 35%).
Conclusions: Dominant R waves (>5mm) in lead V1, V2 is present in up to 65% of lateral STEMI (former known as posterior STEMI), as a mirror image of a Q wave of the posterior leads. Nota bene, by clockwise the ECG by 180 degrees you may be able to appreciate the ST elevation, even without interpretating "posterior leads". The early identification of this pattern, especially in atypical clinical entities (elderly, non-chest pain cases) leads to proper coronary revascularization and lessens mortality.


ID:3
Όνομα:
Φύλο:Α
Ημερομηνία γέννησης:
έτη
Φάρμακο:
cm
mmHg
60 bpm
Συμπτώματα:
Ιστορικό:
10 mm/mV 25 mm/s
Φίλτρα: H50 d 35 Hz
10 mm/mV
16-Αυγ-2024 5:31:21
I
II
III
aVR
aVL
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V1
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V6
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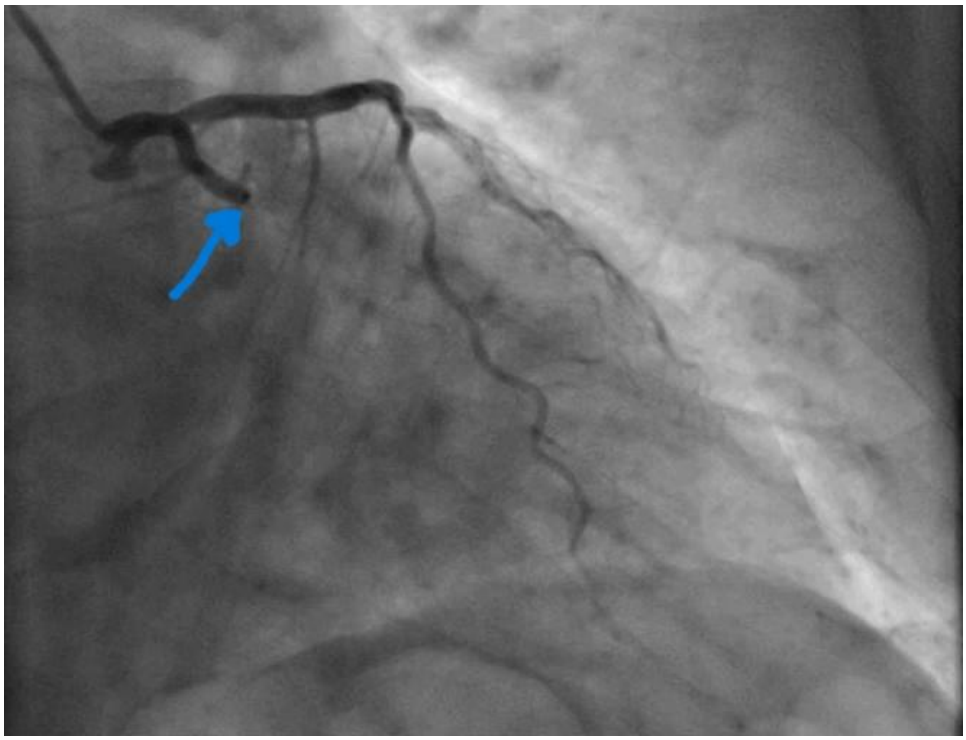
Τμήμα:
Εξέταση:



4673 - Determinants Of Acute Procedural Success In Catheter Ablation Of Premature Ventricular Complexes

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Background: Premature ventricular complexes (PVCs) is a commonly encountered clinical arrhythmia. Catheter ablation is a well- established therapeutic modality. However, predictors of acute procedural success are still lacking. We sought to identify predictors of acute procedural success, in a contemporary cohort of patients undergoing PVC catheter ablation.
Methods: This ambidirectional cohort study included 174 patients from two centers, undergoing frequent PVCs ablation (defined as more than 10% burden, measured by 24-hour ambulatory monitoring).
Results: Acute procedural success was achieved in 160 patients (92.0 %). Among the successful cases, there was a lower incidence of already diagnosed structural heart disease (22.5% vs 57.1%, p = 0.001). ECG morphology indicative of an outflow tract origin, beyond LV Summit, was commonly observed among successful cases (63.8%), whereas none of the unsuccessful cases exhibited this morphology. Age did not differ significantly among the two subgroups (59.0 ± 25.4 vs 66.33 ±15.37, p = 0.14). More than one clinically significant PVC morphologies, prior to catheter ablation, were more frequent among unsuccessful cases. However, this trend did not reach statistical significance (7.3% for successful cases and 27.3% for unsuccessful cases, p = 0.06). Interestingly, PVCs 24- hour burden was lower among unsuccessful cases (18.16% ± 15.6 vs 13.0% ± 7.8, p = 0.05).
Conclusion: Structural heart disease is associated with lower rates of acute procedural success in patients undergoing catheter ablation for frequent PVCs. Additionally, an ECG morphology indicative of an outflow tract origin is strongly associated with a high likelihood of acute procedural success.

4674 - Exploring The Potential Of Artificial Intelligence (AI) In Cardiology Education

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Introduction: Artificial intelligence (AI) is rapidly becoming a cornerstone of innovation in medical and patient education. The aim of this study was to evaluate the ability of ChatGPT to simulate clinical reasoning and decision-making by interacting with a wide range of Virtual Patient (VP) scenarios offered through the MobiVIP app. Another aspect of this study was the comparative assessment of the GPT-3.5 and GPT-4 performance in resolving VP cases.
Materials and Methods: The Mobile Virtual Patients Scenarios app (MobiViP) was developed by the Lab of Medical Physics and Digital Innovation at the School of Medicine, Aristotle University of Thessaloniki (AUTH), for educational purposes. An interactive, step-by-step process was followed in this study and each VP scenario node - a point of decision or question- was presented to ChatGPT in natural language. The ChatGPT versions 3.5 and 4.0 were utilized. The evaluation framework enabled a systematic assessment of ChatGPT's ability to simulate clinical reasoning and support decision-making processes in VP scenarios.
Results: The freely available version of theChatGPT software (3.5), had a success rate of 83%. Among these correct answers, in a percentage of 16% the software faced technical issues, as the closed-ended questions in the clinical problems were contradictory to the software's tendency to answer in a detailed manner. The improved version (4.0) diminished the errors to a percentage of just 5% (success rate of 95%) and faced technical issues in only 3% of the correct answers. ChatGPT answered correctly even the questions that included electrocardiograms and X-rays.
Conclusions: AI-powered tools like ChatGPT hold great promise for revolutionizing medical and patient education. ChatGPT 4.0 had an accuracy of 95% in resolving real life clinical scenarios. This study is important not only for the immediate results of the performance of Artificial Intelligence in resolving clinical problems, but also for the extensions it has in the possibility of strengthening modern medical education. The combination of using interactive applications such as Virtual Patients and Artificial Intelligence can support doctor and patient education in the context of the wider digital transformation of medical education.

4675 - Impact of Superior Vena Cava Isolation on Outcomes of Atrial Fibrillation Ablation: A Systematic Review and Meta-Analysis

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Background: Pulmonary vein (PV) isolation is the mainstay in atrial fibrillation (AF) ablation. However, additional arrhythmogenic foci seem to contribute to AF initiation and maintenance. A great proportion of those non-PV foci have been reported to be located in the superior vena cava. We aimed to investigate the effectiveness of SVC isolation as an adjunctive therapy to PV isolation.
Methods: We performed a systematic review of MEDLINE and CENTRAL. Inclusion criteria were cohort studies with control group or randomized clinical trials, comparing patients undergoing PV isolation only and patients undergoing PV isolation with concurrent SVC isolation, in effects of freedom from atrial tachycardia.
Results: A total of 9 studies, incorporating 1.874 patients, were included. The combination of SVC and PV isolation in patients undergoing AF ablation was more effective than PV isolation alone (odds ratio = 0.72; 95% confidence interval, 0.54-0.97). In a subgroup analysis, radiofrequency ablation demonstrated effectiveness (odds ratio = 0.71; 95% confidence interval, 0.52-0.96). Conversely, the use of cryoablation did not alter clinical outcomes (odds ratio = 0.69; 95% confidence interval, 0.13- 3.61).
Conclusions: The outcomes of AF ablation are favorable when additional SVC isolation is conducted, using radiofrequency energy, rather than cryo energy, in terms of atrial tachycardia reccurence.

4676 - Linking Genotype To Imaging And Clinical Arrhythmic Risk Factors In Dilated Cardiomyopathy For Sudden Cardiac Death Prevention

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[1]1st Cardiology Department, Hippokration Hospital, National and Kapodistrian University of Athens, 114 Vas Sofias Avenue, 11527, Athens Greece, [2]State Department of Cardiology, "Hippokration" Hospital, Vasilisis Sofias 14, 11256, Athens, Greece

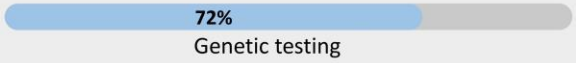
Background: Risk stratification for sudden cardiac death (SCD) in patients with dilated cardiomyopathy (DCM) or non-dilated left ventricular cardiomyopathy (NDLVC) is essential for guiding implantable cardioverter-defibrillator (ICD) therapy. Genetic testing may help identify high-risk patients, even beyond the presence of reduced left ventricular ejection fraction (LVEF). This study aimed to assess the correlation between genetic substrate and clinical/imaging arrhythmic risk factors in patients with DCM or NDLVC.
Methods: Patients with DCM or NDLVC receiving optimal medical therapy were included. All underwent comprehensive cardiac evaluation: cardiac magnetic resonance imaging (CMR), transthoracic electrocardiography, echocardiography, 24-hour Holter monitoring, and signal-averaged ECG. Genetic testing using a gene panel was performed according to 2023 ESC guidelines. Genetic findings were classified as negative (benign, likely benign, or variants of unknown significance - VUS) or positive (pathogenic/likely pathogenic mutations).
Results: Seventy-nine patients (mean age 48.5 ± 15.3 years, 30% female) were enrolled over three years. Genetic testing was performed in 56 patients; 17 (30%) had a positive result, and 17 (30%) had a VUS. The most frequent mutation was in the TTN gene (7/17 positive cases). There was no significant difference in the prevalence of severe LV dysfunction (LVEF ≤35%) between those with positive and those with negative genetic results (15.3% vs. 26.3%, p=0.407). Patients with late gadolinium enhancement (LGE) on CMR had a higher frequency of non-sustained ventricular tachycardia (NSVT) on Holter monitoring compared to those without LGE (44.1% vs. 15%, p=0.018). No association was found between LGE presence and genetic test outcome.
Conclusions: In patients with DCM or NDLVC, pathogenic mutations were not associated with reduced LVEF. However, the presence of LGE on CMR was significantly related to NSVT, suggesting that LGE may serve as a useful marker for arrhythmic risk beyond genetic findings.

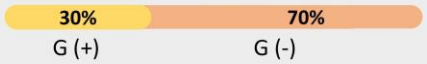
PATIENT DATA

~30% (19) Female

~70% (60) Male

Mean age 48.46 (±15.3) years

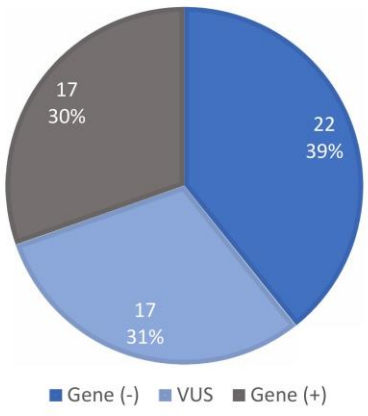




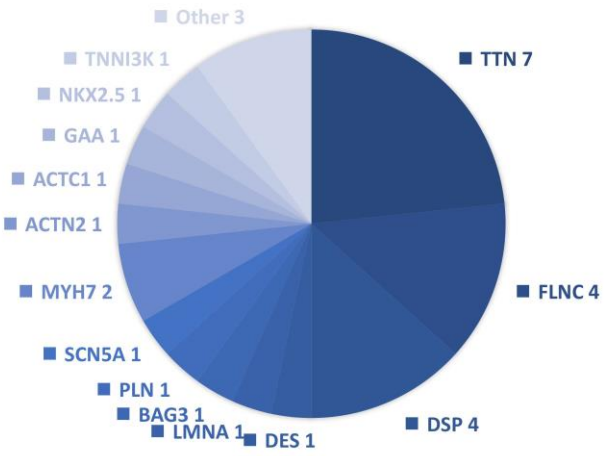
Genetic testing in **56/79**patients

Gene positive – **17** patients
Gene negative – **39** patients

GENETIC TESTING RESULTS



GENES



4677 - Arrant Ominous ST-Waves

Theodora Bampali[1], Zois Panos[1], Evagelia Kalampoki[1], Polyxeni Oikonomou[1], Vasiliki Telaki[1], Pavlos Karanikis[1]
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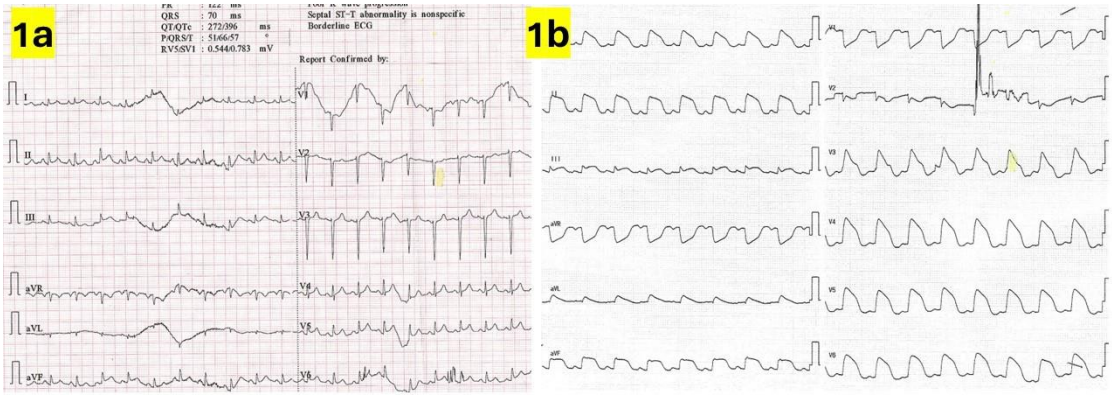
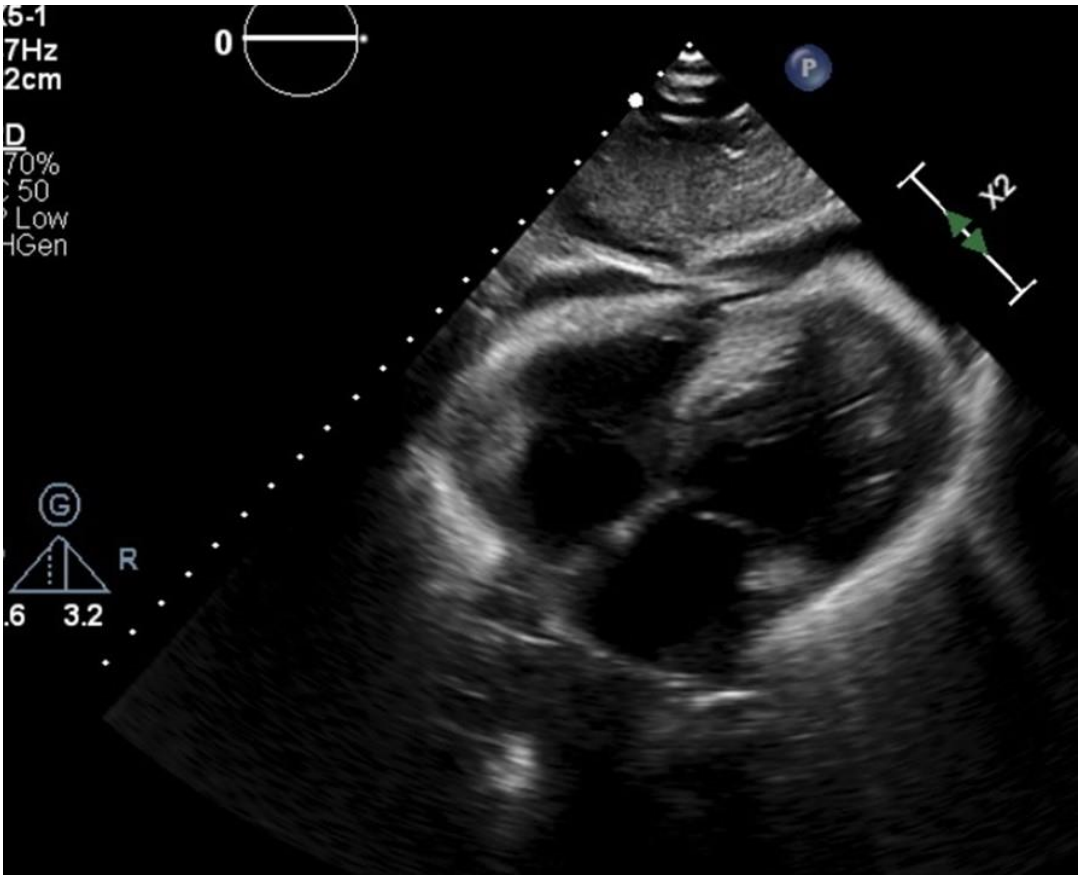
Introduction: The incidence of viral myocarditis is estimated to be 15 cases per 100,000/year, whereas the incidence of fulminant myocarditis is considered quite rarer.
Case study: A 36-year-old female with unremarkable past medical history presents at the Emergency Department reporting fatigue, fever, dry cough and a recent diagnosis of Flu Group A. She is pallor, modestly disorientated and complains about chest pain. Her blood pressure is 90/70, she is tachycardic (140bpm), the O2 saturation is 91% (room air) and tachypnoic. Lung auscultation revealed rales, decreased sounds at the bases and rhonchi bilateral. She was ashy, with cold extremities. Laboratory results showed acute kidney injury, severe leukocytosis, Troponin I 2326 ng/L, d-dimers 0.61 mg/l and nt-ProBNP 9000pg/mL. Arterial gas analysis revealed galactic acidosis. The ECG showed sinus tachycardia, concave mild elevation of ST segment at the II, III, AVF leads, narrow QRS complex and poor R-progression (Image 1a). After 1 hour the patient collapsed. After resuscitation, the ECG revealed broaden QRS and global "tomb-like" elevation of the ST segment. (Image 1b). Bedside cardiac echo showed biventricular akinesia.
Results: At the cath lab an intra-aortic balloon pump was inserted [1:1 pulse-orientated]. She was under inotropic support with dripping noradrenaline. The coronary angiogram revealed no stenosis. Despite the infusion of high-volume crystalloids and escalation of the inotropic drugs to vasopressin and adrenaline, the mean arterial pressure was<5mmHg. She received 150mg oseltamivir, 0.5mg colchicine and loading dose of hydrocortisone. Sequential cardiac echoes revealed severe global akinesia/dyskinesia of the heart, significant hypertrophy of the left ventricle's walls, which had a watery, oedematose appearance, gradually increasing circumferential pericardial effusion and collapsed inferior vena cava despite the preload support. (Image 2.). The time trajectory between the first medical contact and the death of the patient was 6 hours.
Conclusions: Fulminant myocarditis is a life-threatening condition characterized by severe myocardial inflammation, evolving rapidly to cardiogenic shock via myocyte necrosis. Rapid clinical evaluation of an imminent cardiogenic cataplexy and mainly, recognition of the initial status of the ECG alterations (i.e poor R wave progression and concave ST elevation) may gain crucial time before the blatant presentation of the macabre "tomb"-like ST-waves.


1a
1b
Septal ST-T abormality is nonspecific
Borderline ECG
Report Confirmed by:

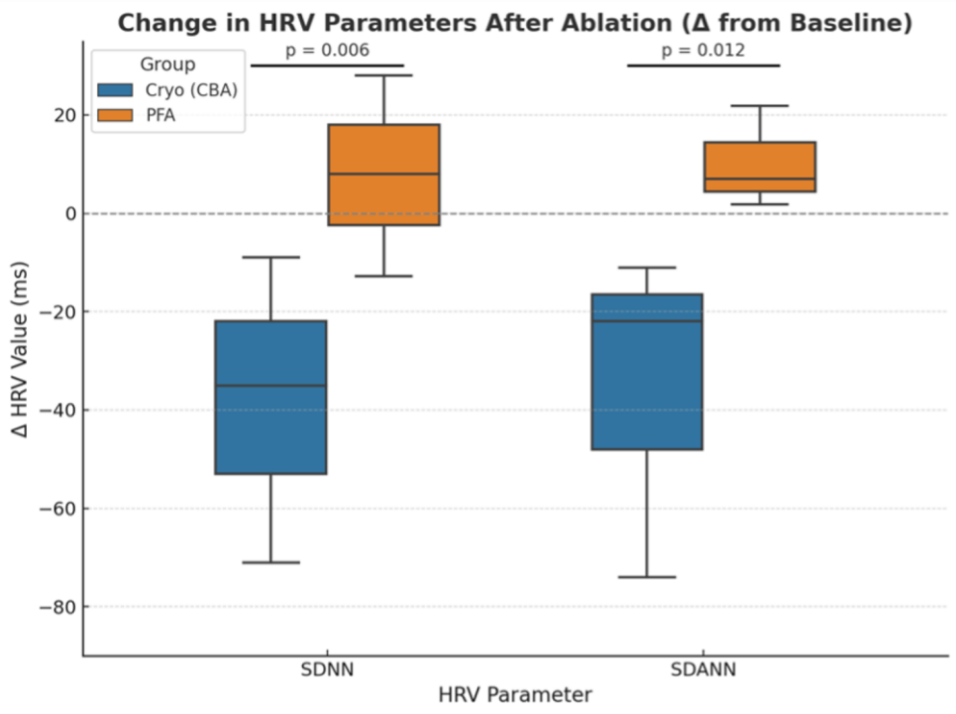

X2

4679 - Impact Of Energy Source For Pulmonary Vein Isolation On Heart Rate Variability And Autonomic Modulation

Aikaterini-Eleftheria Karanikola[1], Dimitrios Tsiachris[1], Michail Botis[1], Athanasios Kordalis[1], Ageliki Laina[1], Christos-Konstantinos Antoniou[1], Maria Kouremeti[1], Panagiotis Xydis[1], Nikos Argyriou[1], Ioannis Kachrimanidis[1], Konstantina Aggeli[1], Konstantinos Gatzoulis[1], Konstantinos Tsioufis[1]
[1]*First Department of Cardiology, Hippokration General Hospital of Athens, Greece*

Introduction: Autonomic nervous system modulation has emerged as a potential therapeutic target in atrial fibrillation (AF) management. Ganglionated plexi located within the left atrium may be affected by the energy delivered around the pulmonary veins during catheter ablation, potentially influencing autonomic tone. Heart rate variability (HRV) provides a non-invasive assessment of autonomic function and has been previously utilized to evaluate autonomic changes post-ablation. This study aimed to investigate differences in HRV parameters following pulmonary vein isolation (PVI) performed with either cryoballoon ablation (CBA) or pulsed field ablation (PFA).
Methods: In this prospective single-center study, we included 17 patients treated with CBA [35.3% female, mean age: 63.2 ± 11.7 years, 82.4% paroxysmal AF, mean AF duration: 99.4 ± 84.4 months] and 10 patients treated with PFA [40% female, mean age: 65.5 ± 7.3 years, mean AF duration: 46.4 ± 44.8 months]. Standard 24-hour Holter monitoring was performed before catheter ablation and repeated three months post-procedure. Heart rate (HR) and HRV time-domain parameters were analyzed and compared within and between the two groups.
Results: At three-month follow-up, the CBA group (N=17) showed significant HRV reductions, with decreased SDNN (Δ SDNN= −49.6 ms, p = .007) and SDANN (Δ SDANN = −40.4 ms, p = .009), and increased night HR (p = .002). A trend towards reduced SDNN index was noted (p = .067). Supraventricular extrasystoles burden and RMSSD/pNN50 showed no significant changes. Conversely, the PFA group (N=10) showed no significant changes in HRV time-domain indices or arrhythmia burden. CBA was associated with significantly greater reductions in SDNN (p = 0.006) and SDANN (p = 0.012) compared to PFA. No significant between-group differences occurred for mean heart rate, RR interval, pNN50, RMSSD, or SDNN index.
Conclusion: These findings suggest that CBA may have a more pronounced effect on autonomic modulation compared to PFA in the early post-ablation period. Prognostic implications include a potential for personalizing AF treatment based on the energy source used for PVI, particularly in patients where autonomic neuromodulation is a consideration. Future research should explore the integration of thermal and non-thermal energy sources to optimize clinical outcomes.

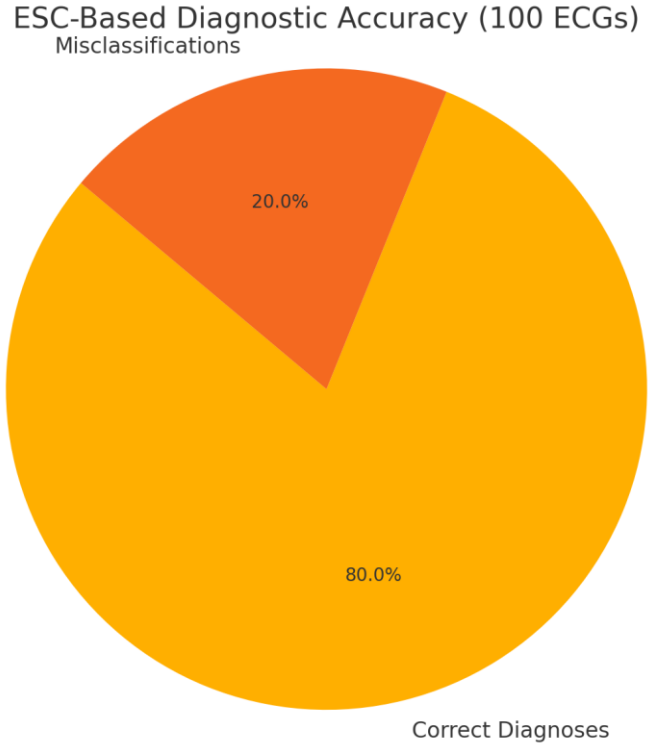
Parameter	Δ CBA (Median [IQR])	Δ PFA (Median [IQR])	p-value
Mean HR (bpm)	5 [-1.0, 9.0]	2 [0.25, 4.75]	0.579
RR (ms)	-38 [-119.0, 0]	-30.5 [-59.2, -0.5]	0.598
SDNN (ms)	-35 [-71.0, -9.0]	8 [-12.8, 28.0]	**0.006**
SDANN (ms)	-22 [-74.0, -11.0]	7 [1.75, 21.8]	**0.012**
pNN50 (%)	-4 [-13.0, -1.0]	-1.5 [-9.75, 8.25]	0.451
RMSSD (ms)	-6 [-53.0, 33.0]	4.5 [-43.2, 34.0]	0.651
SDNN index (ms)	-9 [-20.0, 3.0]	5.5 [-19.0, 14.2]	0.339

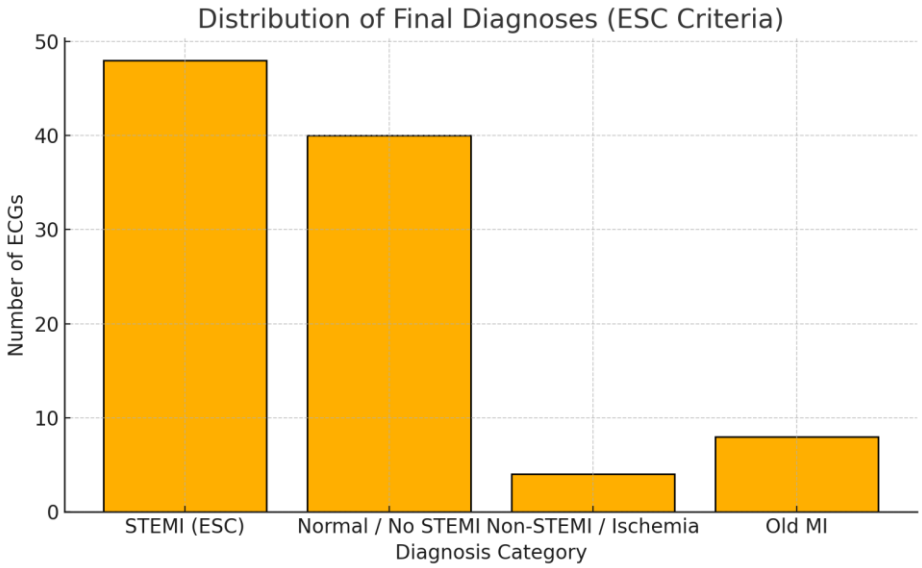


4680 - From Smartphone To STEMI: Enhancing ECG Interpretation Accuracy Using ESC Guidelines And AI Integration

Ioannis Kachrimanidis[1], Anastasios Apostolos[1], Panagiotis K Vlachakis[1], Panagiotis Tsioufis[1], Nikolaos Argyriou[1], Ioannis Skalidis[1], Dimitrios Tsiachris[1], Konstantinos Tsioufis[1], Konstantinos Toutouzas[1]
[1]Ippokrateio General Hospital of Athens, Athens, Greece

Introduction: Rapid and accurate diagnosis of ST-Elevation Myocardial Infarction (STEMI) is essential to ensure timely reperfusion therapy and reduce adverse clinical outcomes. With the increasing availability of ECGs in digital and photographic formats, artificial intelligence (AI) offers a promising solution for augmenting clinical decision-making, particularly in settings where specialist interpretation may not be immediately available. This study aimed to evaluate the diagnostic performance of structured ECG interpretation using smartphone-acquired images, applying the European Society of Cardiology (ESC) STEMI criteria. Additionally, the project highlights the foundational role of labeled datasets in enabling AI-based systems to reliably replicate expert-level ECG interpretation and improve over time with expanded data.
Method & Methodology: A dataset of 100 12-lead ECGs was compiled from patients presenting to the Emergency Dpt with ACS, using smartphone photography. Initial ECG interpretations were made based on standard clinical pattern recognition, followed by a re-evaluation using ESC STEMI guidelines, which define new ST-segment elevation at the J-point in at least two contiguous leads: ≥2.5 mm in men <0 years, ≥2 mm in men ≥40 years, ≥1.5 mm in women in V2–V3, and ≥1 mm in other leads, excluding cases with left bundle branch block or left ventricular hypertrophy. Each ECG was reclassified based on ESC criteria into categories: STEMI, non-STEMI/ischemia, old myocardial infarction, or normal. Accuracy metrics were derived by comparing initial clinical impressions with ESC-standard reclassification. This process was designed to inform future training of AI-based diagnostic models, which rely on consistently annotated data for effective learning.
Results: Out of 100 ECGs, 80 were correctly classified according to ESC criteria, while 20 required reclassification, yielding an overall diagnostic accuracy of 80%. Specificity for non-STEMI and normal ECGs was 100%, and 96% consistency was achieved for confirmed STEMI cases. The final diagnosis distribution included 48 STEMI, 40 normal ECGs, 8 old infarcts, and 4 ischemic non-STEMIs. Culprit vessel localization (e.g., LAD, RCA) remained accurate in clinically significant cases.
Conclusion: This project reinforces the diagnostic value of standardized, image-based ECG interpretation and underlines the importance of dataset expansion to improve the reliability and generalizability of future AI-assisted diagnostic tool.

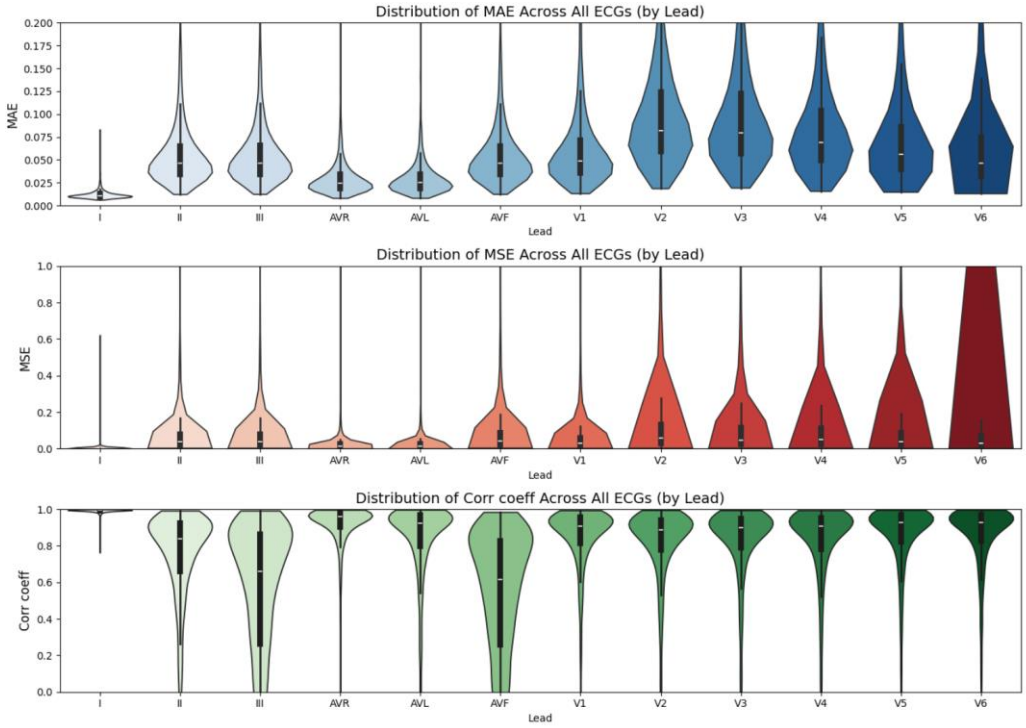

ESC-Based Diagnostic Accuracy (100 ECGs)
Misclassifications
20.0%
80.0%
Correct Diagnoses


Distribution of Final Diagnoses (ESC Criteria)
Number of ECGs
0
10
20
30
40
50
STEMI (ESC)
Normal / No STEMI
Non-STEMI / Ischemia
Old MI
Diagnosis Category

4681 - Reconstruction Of 12-Lead ECG From 3-Lead Wearable Monitoring: A Clinically Validated Deep Neural Network Approach

Mikhail Chmelevsky[1], Khamzin Khamzin[2]
[1]Fondazione Cardiocentro Ticino, Lugano, Switzerland, [2]Saint Petersburg State University, Saint-Petersburg, Russia

Background: Remote cardiac monitoring through wearable devices is rapidly expanding but typically limited to 1–3 leads reducing diagnostic power. This study aims to reconstruct full 12-lead ECGs from only 3-lead input using deep learning enabling broader diagnostic capabilities from minimal sensors.
Methods: A convolutional neural network (CNN) and transformer-based hybrid model were developed to synthesize 12-lead ECG signals from three orthogonal leads (I, II, V2). Model training utilized a merged dataset from three large open-access repositories: Chapman University, PTB-XL and Shandong Provincial Hospital totaling 41170 annotated 12-lead ECG recordings. Data were split 80%:20% for training and validation. Label categories included normal ECGs, conduction blocks (LBBB, RBBB, etc.), ventricular preexcitation and various myocardial infarctions. The reconstructed leads were compared to original signals using correlation coefficients (Corr), mean absolute error (MAE) and mean squared error (MSE) per lead. A prospective clinical study enrolled 100 patients undergoing real-time 3-lead ECG monitoring via a wearable device. The model-reconstructed 12-lead ECGs were compared against simultaneously recorded clinical standard 12-lead ECGs confirming model generalizability and clinical applicability.
Results: Correlation across all leads averaged 0.78 with highest agreement in leads I (0.99), V5 (0.84) and V6 (0.84). MAEs remained below 0.07 mV for most leads. Figure 1 illustrates the per-lead distribution of these metrics.
Conclusion: Our approach demonstrates high-fidelity reconstruction of 12-lead ECGs from 3-lead wearable data with robust generalization across datasets and real-world clinical validation. This method has the potential to enhance remote diagnostics especially for arrhythmia and ischemia detection while reducing hardware complexity.


Distribution of MAE Across All ECGs (by Lead)
MAE
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
I
II
III
AVR
AVL
AVF
V1
V2
V3
V4
V5
V6
Lead
Distribution of MSE Across All ECGs (by Lead)
MSE
1.0
0.8
0.6
0.4
0.2
0.0
Lead
Distribution of Corr coeff Across All ECGs (by Lead)
Corr coeff
Lead

4683 - Remodelling Of Electrocardiogram With Mavacamten In Hypertrophic Obstructive Cardiomyopathy: A Case Report

Pavlos Rouskas[1], Georgios Tziomalos[1], Thomas Zegkos[1], Despoina Parcharidou[1], Thomas Gossios[1], Sotiris Katranas[1], Christos Kallimanis[1], Antonios Ziakas[1], Georgios Efthimiadis[1]
[1]*Department of Cardiology, AHEPA Hospital, School of Medicine, Aristotle University of Thessaloniki, 54636 Thessaloniki, Greece*

Background: Mavacamten is the first cardiac myosin inhibitor used to treat symptomatic hypertrophic obstructive cardiomyopathy (HOCM). Electrocardiogram (ECG) changes in HCM include findings of left ventricular hypertrophy (LVH), especially increased precordial voltages and left ventricular "strain pattern". There is limited literature describing the dynamic ECG trajectory in patients who have been started on mavacamten.
Methods: A 62-year-old female patient with HOCM was reviewed at our outpatient cardiomyopathy clinic with NYHA class III symptoms while being on maximum tolerated dose of b-blocker and disopyramide. Baseline ECG (Figure 1A) noted deep S-waves in V1-V2 and large R waves in V4-V6, I, II, aVF combined with QRS duration more than 90msec and signs of left atrial involvement, meeting criteria for LVH per Romhilt-Estes (10 points). Additionally, repolarization abnormalities signifying LV strain were also present, including ST depression and T wave inversion in I, II aVL, avF and V3-V6 respectively reflecting reduced subendocardial perfusion.
Results: Patient was initiated on mavacamten 5mg daily with the simultaneous interruption of disopyramide. ECG within the first 6 months (Figure 1B) demonstrated improved LVH patterns whereas after the initiation of the 10mg dose LV strain patterns exhibited complete resolution within a year (Figure 1C) along with parallel complete LV outflow tract obstruction resolution, no LV ejection fraction reduction, great drop in NT-proBNP consecutively (2338>394>103 pg/ml) and transition to NYHA I class.
Conclusion: This case illustrates the dynamic ECG effect associated with mavacamten therapy and exhibits the overall sequential improvement in clinical, echocardiographic and biochemistry parameters.

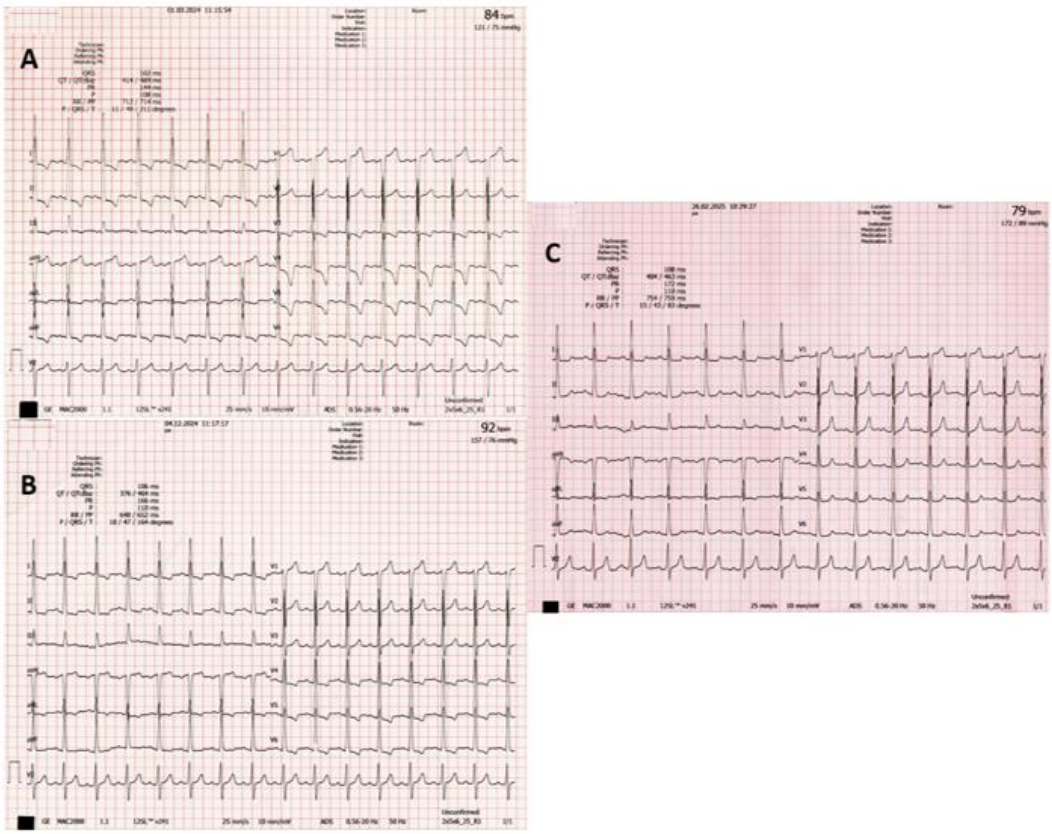


Figure **1**. Remodelling of LVH and LV strain patterns on serial ECGs.
A) Baseline, prior to starting mavacamten, **B)** On mavacamten 5 mg daily **C)** On mavacamten 10 mg daily

4566 - Association Of Cognitive Impairment With Treatment Burden In Multimorbid Patients

Miroslav Mihajlovic[1], Jelena Simic[1], Tatjana Potpara[2]
[1]Cardiology Clinic, University Clinical Centre of Serbia, Belgrade, Serbia, [2]School of Medicine, Belgrade University, Belgrade, Serbia

Background: Treatment burden (TBN) is defined as patients' health-related workload and its impact on patients' everyday lives. Studies have indicated that high TBN correlates with adverse outcomes, including diminished adherence, exacerbation of health conditions, higher hospitalisation rates and reduced quality of life. The present interim analysis aims to explore differences in TBN concerning cognitive impairment among multimorbid patients.
Methods: Within the ongoing prospective, single-centre study, consecutive adult patients who sought care at the University Clinical Centre of Serbia from January to December 2023, voluntarily completed the Multimorbid Treatment Burden Questionnaire (MTBQ), which encompasses 11 items with a score range from 0 to 55 points. Cognitive function was assessed using the Mini Mental Status exam (MMSE). Cognitive impairment was defined as an MMSE score below 24 points, whereas multimorbidity was defined as the presence of two or more health conditions.
Results: Out of 437 patients, 340 (77.8%) multimorbid patients were included in the present analysis. Cognitively impaired patients (n=31, 9.1%) reported significantly higher MTBQ score value compared to those with normal cognitive function (22.26 ±11.89 vs 17.41 ±9.96 points, $p<0.001$, respectively), Figure 1. Regarding specific MTBQ items, cognitively impaired patients reported significantly higher TBN concerning several domains, including taking lots of medications, remembering to take medications, self-monitoring, adopting recommended lifestyle changes, and reliance on family and friends, Figure 2.
Conclusion: Our findings suggest an association between cognitive impairment and significantly increased TBN, especially concerning more cognitively challenged health-related tasks. Consequently, patients with cognitive impairment might benefit more from the principles of minimally disruptive medicine.

Figure 1. Overall Multimorbid Treatment Burden Questionnaire (MTBQ) score and difference between patients with and without cognitive impairment.

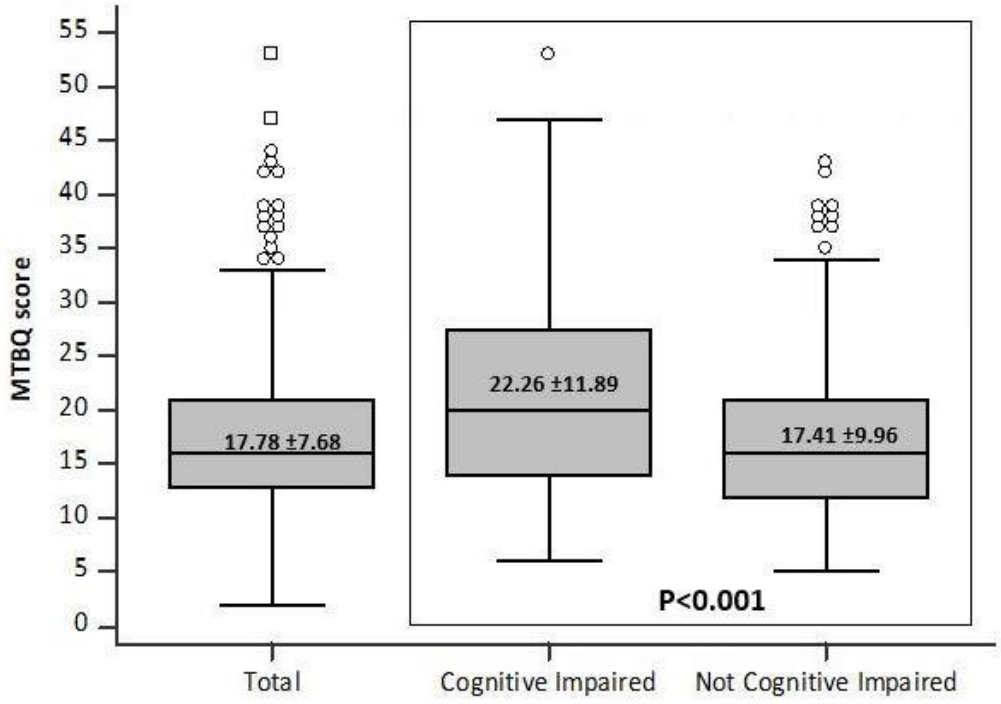
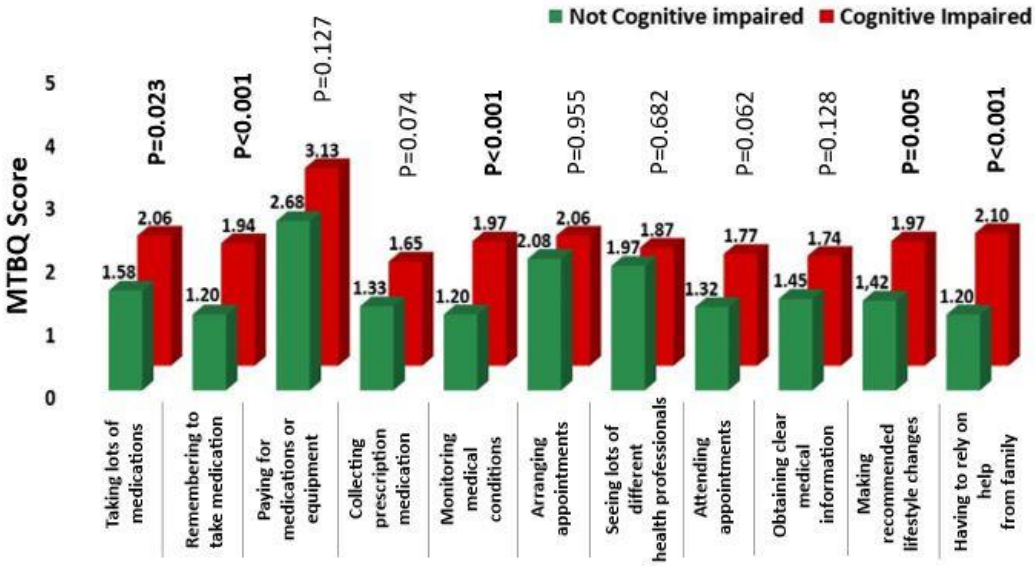


Figure 2. Item-specific Multimorbid Treatment Burden Questionnaire (MTBQ) score and difference between patients with and without cognitive impairement.



4567 - Association Of Treatment Burden With Moderate To Severe Depression, Assessed With The Patient Health Questionnaire (PHQ-9) In Multimorbid Patients

Miroslav Mihajlovic[1], Jelena Simic[1], Tatjana Potpara[2]
[1]*Cardiology Clinic, University Clinical Centre of Serbia, Belgrade, Serbia*, [2]*School of Medicine, Belgrade University, Belgrade, Serbia*

Background: The concept of Treatment Burden (TBN) represents the impact of health-related workload on patients´ well-being. The high TBN has been associated with lower adherence, exacerbation of chronic health conditions and higher hospitalisation. The present interim analysis aims to investigate differences in TBN experienced by multimorbid patients with cardiovascular diseases afflicted with moderate to severe depression.
Methods: In the ongoing prospective, single-centre study, consecutive patients aged ≥18 years who were seen at the University Clinical Centre of Serbia, between January to December 2023, voluntarily completed the Multimorbid Treatment Burden Questionnaire (MTBQ) and the Patient Health Questionnaire (PHQ-9). A PHQ-9 score of 10 points or higher denoted the presence of moderate to severe depression. Multimorbidity was defined as the presence of two or more health conditions.
Results: Out of 437 patients, 340 (77.8%) multimorbid patients were included in the present analysis. Patients with moderate to severe depression (n=81, 23.8%) reported significantly higher MTBQ score value compared to those without (23.72 ±8.83 vs. 15.90 ±6.24 points, p<0.001, respectively), Figure 1. Regarding item-specific MTBQ depressed patients reported significantly higher TBN concerning all domains, Figure 2.
Conclusion: Our findings suggest that patients with moderate to severe depression could experience a significantly higher TBN than those individuals with either no depression or mild depressive symptoms. Consequently, patients identified with moderate to severe depression through the PHQ-9 screening tool could potentially benefit from interventions aimed at managing depression and thus reducing the associated TBN.

Figure 1. Overall Multimorbid Treatment Burden Questionnaire (MTBQ) score and difference between patients with and without moderate to severe depression.

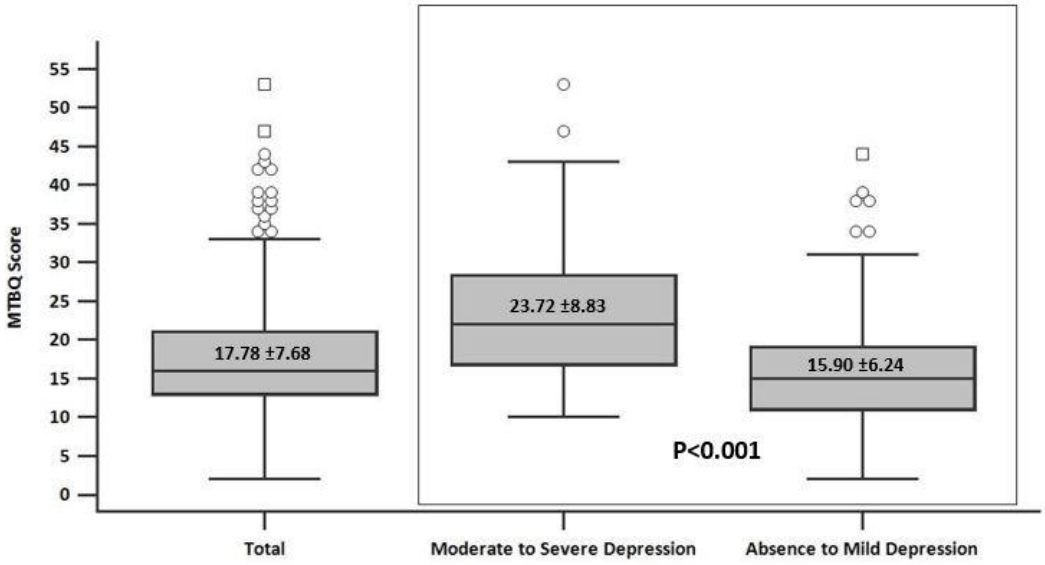
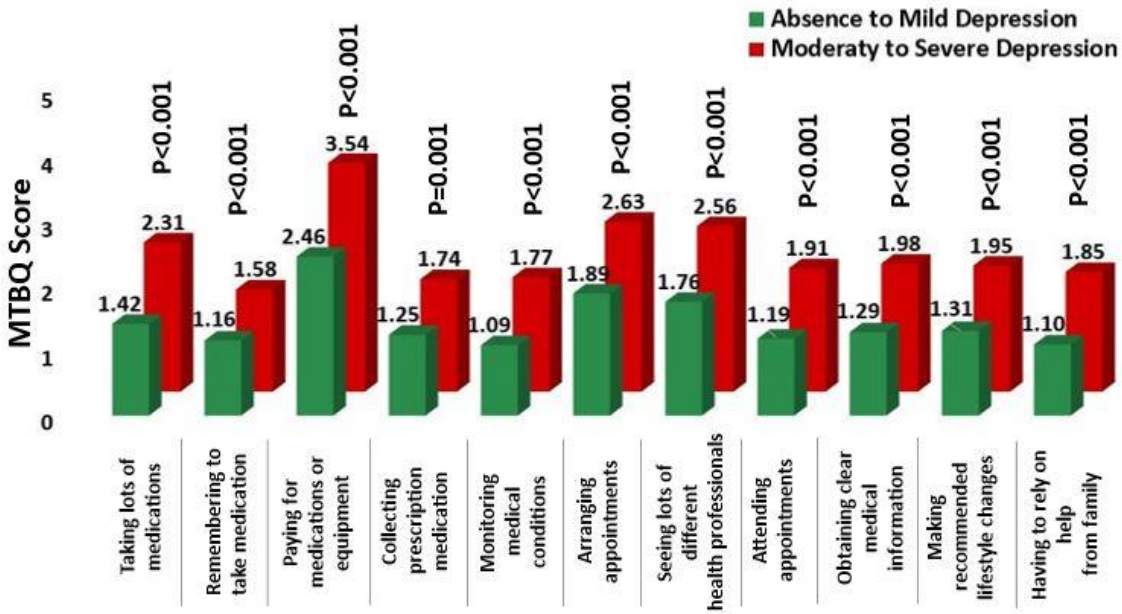


Figure 2. Item-specific Multimorbid Treatment Burden Questionnaire (MTBQ) score and difference between patients with and without moderate to severe depression.



4581 - Pulsed-Field Ablation For Long Standing Persistent Atrial Fibrillation: A Propensity Score Matched Comparison With Hybrid Ablation

Ioannis Doundoulakis[1], Domenico Giovanni Della Rocca[1], Luigi Pannone[1], Gezim Bala[1], Alexandre Almorad[1], Erwin Ströker[1], Juan Sieira[1], Dimitrios Tsiachris[2], Serge Boveda[3], Andrea Sarkozy[1], Gian Battista Chierchia[1], Carlo De Asmundis[1]
[1]Heart Rhythm Management Centre, Postgraduate Program in Cardiac Electrophysiology and Pacing, University Hospital Brussels-Free University Brussels, European Reference Networks Guard-Heart, Brussels, Belgium, [2]First Department of Cardiology, National and Kapodistrian University, "Hippokration" Hospital, Athens, Greece, [3]Département de Rythmologie, Clinique Pasteur, Toulouse, France

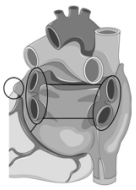
Introduction: Rhythm control of long-standing persistent AF is significantly more challenging, due to advanced electrical and structural remodeling of the left atrium. As such, the procedural endpoint for these patients remains doubtful. The aim of this study was to explore the 1-year efficacy of pulsed field ablation (PFA) versus a single-staged, radiofrequency-based, hybrid ablation strategy.
Methods: This is a prospective multicenter observational study. We included consecutive patients with long-standing persistent AF (defined as continuous AF with duration> months) undergoing a first left atrium ablation with a PFA platform (Farapulse, Menlo Park, CA, USA) or monolater, thoracoscopic hybrid radiofrequency ablation at three different European centers. Propensity score matching (1:1 ratio) was adopted to attenuate the imbalance in clinical characteristics.
Results: 55 consecutive PFA and 79 hybrid patients were included in the study. The mean age was 67.3 (±10) years, 38.1% were female and the mean CHA2DS2VASc score was 2.7±1.4. Procedural durations was 99.7±22.9 with PFA and 263±61.3 minutes with hybrid (p<0.001). Arrhythmia recurrence occurred in 17 (30.9%) PFA and 33 (41.8%) hybrid patients (P = 0.201). No difference in antiarrhythmic drug use was found (PFA N=23, 40.4% vs Hybrid N=33, 41.8 %; p=0.996). No significant differences were documented in the type of recurrent arrhythmia. Propensity score matching based on six clinical variables yielded 43 patients per group. Follow-up results remain unchanged, with the 1-year Kaplan–Meier analysis showing freedom from any atrial tachyarrhythmia in 69.8% of PFA and 53.5% of hybrid patients (log-rank P-value: 0.121). Major periprocedural complications occurred in 2 (3.6%) PFA and 12 (15.2%) hybrid patients. Two (3.6%) PFA patients with pre-existing left ventricular systolic dysfunction (EF<5%) required inotropic therapy due to acute heart failure with low cardiac output and hypotension (systolic blood pressure <0 mmHg); hemodynamics normalized within 24h. Among 12 (15.2%) complications in the hybrid group, 3 patients experienced acute respiratory insufficiency, 1 patient had a hemothorax, 4 experienced pneumothorax, and 3 patients had a pericarditis. One patient experienced a late tamponade (7 days after the procedure).
Conclusion: PFA contributed to significantly shorter procedural times and lower

procedural complications. Long-term arrhythmia freedom in patients with long standing persistent AF was high and not significantly different between PFA and Hybrid ablation.

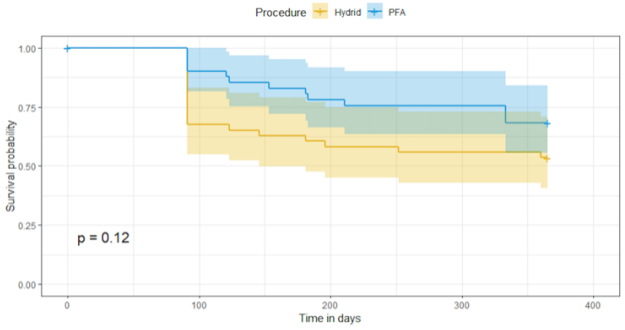
Long standing persistent atrial fibrillation
55 consecutive patients with pulsed field ablation and 79 consecutive patients with single stage hybrid ablation were included in the study.

1:1 propensity score matching

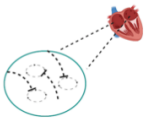
PFA
43 patients



Hybrid
43 patients



Decreasing electrical active atrial mass
It is more likely fibrillation waves are collided, increasing the chance of maintenance of sinus rhythm

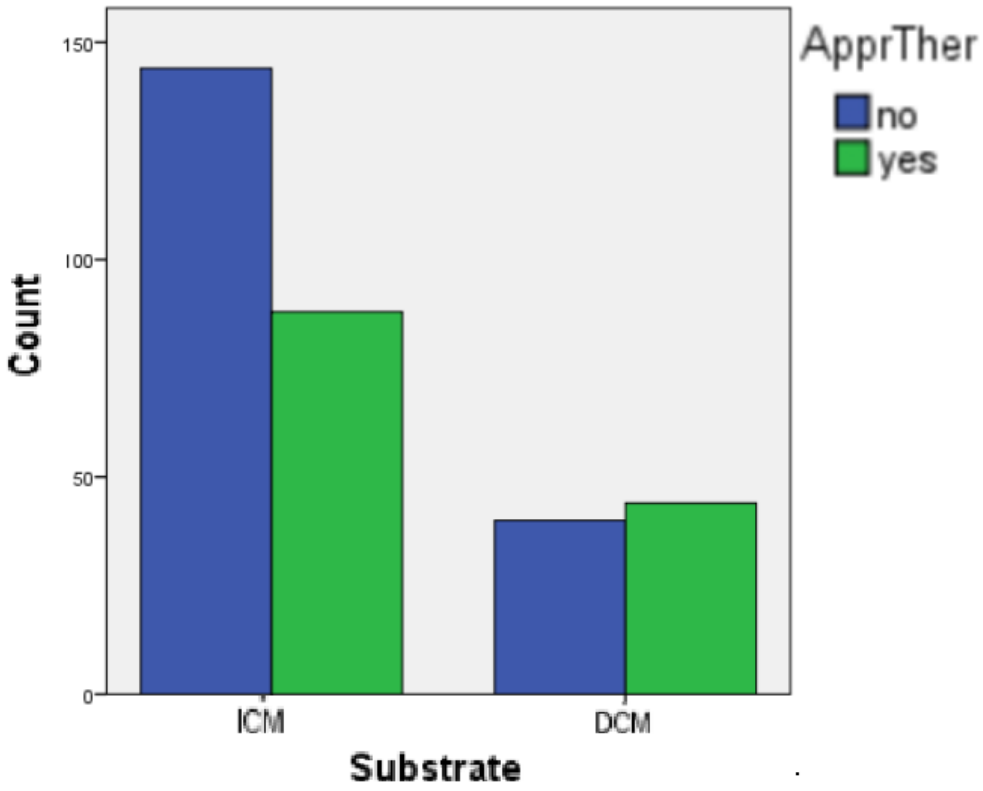


Long-term arrhythmia freedom in patients with long standing persistent atrial fibrillation was high and not significantly different between pulsed field ablation and hybrid ablation.

4582 - Comparative Outcomes Of Ischemic And Non-Ischemic Dilated Cardiomyopathy In ICD Recipients: A 30-Year Retrospective Analysis

Themistoklis Pateromichelakis[1], Emmanouil Koutalas[1], Eleutherios Kallergis[1], Hercules Mavrakis[1], Emmanouil Kanoupakis[1], Georgios Kochiadakis[1]
[1]*University Hospital of Heraklion, Heraklion, Crete, Greece*

Background: Ischemic cardiomyopathy (ICM) and non-ischemic dilated cardiomyopathy (NIDCM) are the two main entities included in the landmark studies that established the use of implantable-cardioverter-defibrillators (ICDs). While arrhythmogenesis is in both cases triggered primarily in fibrotic areas of the ventricular myocardium due to reentry mechanisms, little is known regarding outcomes of patients with ICM vs NIDCM after the implantation of the ICD.
Methods: Data from the ICD registry of our Cardiology department were analyzed. The registry encompasses data from 1993 to the present. All patients that receive an ICD for primary or secondary prevention in our hospital are registered. We retrospectively compared the two main subgroups of patients, those with ICM to NIDCM regarding appropriate therapies from the ICD (anti-tachycardia pacing or shock) during a mean follow up period of over 15 years.
Results: A total of 1582 patients were included in the analysis. Of them, 1064 suffered from ICM and the rest from NIDCM. 1265 patients received an ICD for primary prevention and 317 patients for secondary prevention. Regarding the likelihood of receiving appropriate therapy, no significant difference was observed between ICM and NIDCM patients overall. In the primary prevention subgroup, the incidence of appropriate therapy was similar between groups; however, NIDCM patients experienced a significantly shorter time to therapy (p=0.002). In contrast, within the secondary prevention subgroup, while time to therapy was comparable between the two groups, NIDCM patients received appropriate therapies significantly more often than ICM patients (52.3% vs. 37.9%, p=0.021).
Conclusions: While primary prevention outcomes are similar between ICM and NIDCM, patients with NIDCM may be diagnosed later in the disease course. In secondary prevention, the risk of malignant arrhythmias is significantly higher in the NIDCM subgroup compared to ICM. A potential genetic predisposition giving rise to more wild phenotypes in NIDCM, along with the evolving nature of its arrhythmogenic substrate, appears to play a crucial role in this increased risk.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4583 - Cardiac Sympathetic Denervation In Patients With Refractory Ventricular Arrhythmias: A Single-Center Experience

Ioannis Doundoulakis[1], Luigi Pannone[1], Domenico Giovanni Della Rocca[1], Giampaolo Vetta[1], Gezim Bala[1], Alexandre Almorad[1], Erwin Ströker[1], Juan Sieira[1], Gian Battista Chierchia[1], Andrea Sarkozy[1], Mark La Meir[1], Carlo De Asmundis[1]
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Introduction: Cardiac sympathetic denervation (CSD) is a therapeutic option in patients with refractory ventricular arrhythmias (VAs). However, prospective data on long term outcomes in different population cohorts undergoing CSD are scarce. The aim of this study is to evaluate acute results, complications, and long-term outcomes of CSD as a bailout therapy for VAs refractory to catheter ablation.
Methods: Adult patients who underwent CSD from October 2015 to February 2020 were retrospectively analyzed. Follow-up was conducted via implantable cardioverter defibrillator (ICD) interrogation and reviewing medical records.
Results: A total of 15 patients (mean age 41.8 ± 21.1, 33.3% female) with nonischemic dilated cardiomyopathy (N = 5), idiopathic ventricular fibrillation (N = 4), catecholaminergic polymorphic ventricular tachycardia (N=3), Long QT syndrome (N=2) and Brugada syndrome overlap with long QT (N=1) underwent CSD (left sided in 2 and bilateral in 13 patients). All patients had refractory VAs despite multiple anti-arrhythmic drugs and prior VAs ablation (mean number of procedures was 3.4 ± 1.8). At a mean follow-up of 80.3 ± 17.7 months, 66.7% and 80% of patients were free from any VAs or ICD shocks, respectively. Two patients experienced single ICD shock due to a monomorphic ventricular tachycardia (VT). One patient experienced multiple anti-tachycardia pacing bursts and shocks due to polymorphic VT. No major complications of CSD occurred. No patient suffered from Horner syndrome.
Conclusion: The current retrospective analysis re-emphasizes the role of surgical CSD to suppress VAs, when performed as a bailout therapy after previously unsuccessful catheter ablation. Further studies are needed to validate this finding in a prospective setting.

4584 - Preliminary Assessment Of Cognitive Function In Atrial Fibrillation Patients Prior To Catheter Ablation Using The REMEDES For Alzheimer-(R4Alz) Tool

Sotirios Chiotis[1], Georgios Giannopoulos[1], Maria Toumpourleka[1], Alexandros Evaggeliou[1], Konstantinos Triantafyllou[1], Vasileios Vassilikos[1]
[1]*Third University Department of Cardiology, "Hippokration" General Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece*

Background: Cognitive impairment is prevalent in atrial fibrillation (AF) patients, linked to reduced cerebral perfusion, stroke risk, and microembolic events. While the Montreal Cognitive Assessment (MoCA) evaluates global cognitive function, REMEDES for Alzheimer (R4Alz), a recently developed tool, focuses on domains like working memory, attention control, and cognitive flexibility. This preliminary analysis aims to identify potential cognitive differences between AF patient subgroups and associations of cognitive performance with various clinical factors, using both MoCA and R4Alz tools, with plans to evaluate post-ablation changes.
Methods: AF patients undergoing evaluation for CA completed cognitive assessments using MoCA and selected R4Alz subdomains. Baseline cognitive performance was compared across patient subgroups, and correlations between MoCA and R4Alz scores and relationships with clinical risk factors were examined.
Results: In 61 AF patients (41% female; 51% paroxysmal, 49% persistent; mean age 61.5 ± 10.6 years), MoCA and R4Alz total scores showed a moderate positive correlation (Spearman's rho = 0.33, p = 0.009). Among different subgroups, significant changes were found between patients with paroxysmal and persistent AF with the R4Alz (mean score 179.2 vs 171.1, p = 0.005), while MoCA scores did not differ significantly (mean score 27.4 vs 26.9, p = 0.3). R4Alz scores showed a significant negative correlation with CHA2DS2-VASc (rho = -0.41, p < 0.001), while correlations with MoCA were non-significant (rho = -0.08, p = 0.54).
Conclusion: R4Alz may effectively assess cognitive domains in AF patients, potentially identifying deficits overlooked by MoCA. Future analyses will examine follow-up cognitive assessments post-ablation to determine the impact of rhythm control on cognitive function.

4585 - Predictors Of Arrhythmic Events In Hypertrophic Cardiomyopathy Patients With An Implantable Cardioverter-Defibrillator: A Systematic Review And Meta-Analysis

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[1]*Third University Department of Cardiology, "Hippokration" General Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece*, [2]*Heart Rhythm Management Centre, Postgraduate Program in Cardiac Electrophysiology and Pacing, Universitair Ziekenhuis Brussel - Vrije Universiteit Brussel, European Reference Networks Guard-Heart, Brussels, Belgium*

Background: Hypertrophic cardiomyopathy (HCM) is a common genetic cardiac disorder and a leading cause of sudden cardiac death (SCD). Implantable cardioverter-defibrillators (ICDs) are critical for SCD prevention, but risk stratification remains challenging. The objective of this study is to evaluate the predictive performance of conventional risk factors for arrhythmic events in HCM patients with ICDs.
Methods: We conducted a systematic search of PubMed, Cochrane Central Register of Controlled Trials (CENTRAL) and Clinical Trials from inception to November 2024, including studies reporting hazard ratios (HRs) for clinical, electrocardiographic, and imaging predictors of arrhythmic events in ICD recipients with HCM. Pooled HRs were calculated using random-effects model.
Results: 12 studies of 3,297 HCM patients with ICDs (91% primary prevention, 9% secondary prevention) were included, with a mean age of 50 years. The annual arrhythmic event rate was 5% (95% CI: 4–7%) during a mean follow-up of 4 years. Significant predictors of arrhythmic events included non-sustained ventricular tachycardia (NSVT) (HR: 2.19, 95% CI: 1.62–2.98), left ventricular ejection fraction (LVEF) <0% (HR: 1.91, 95% CI: 1.27–2.89), intraventricular pressure gradient (IVPG)> mmHg (HR: 1.92, 95% CI: 1.03–3.56), and secondary prevention indication (HR: 2.18, 95% CI: 1.39–3.41). Conversely, traditional risk factors such as extreme hypertrophy, family history of SCD, and syncope showed limited predictive value.
Conclusion: This analysis demonstrates that conventional markers like NSVT, LVEF <0% and IVPG> mmHg remain strong predictors of arrhythmic events in HCM patients with ICDs, but other traditional risk factors may lack predictive utility.

4586 - The Impact Of SGLT2 Inhibitors On Pacemaker-Induced Cardiomyopathy: Preserving Cardiac Function And Remodeling

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Introduction: Pacemaker induced-cardiomyopathy (PiCM) arises from prolonged, high-burden right ventricular pacing (RVP) following pacemaker implantation. Its incidence is increasing, and despite treatment advancements, it remains a significant cause of morbidity and mortality. Sodium-glucose-co-transporter-2 inhibitors (SGLT2i) have shown improvements in cardiac remodeling and function.
Materials and methods: Patients with a baseline left ventricular ejection fraction (LVEF)≥50% who underwent pacemaker implantation and RVP>80%, were divided into two groups based on the initiation of SGLT2i. They were monitored clinically and via echocardiography for three months to assess the development of PiCM and evaluate whether SGLT2i helped mitigate cardiac remodeling.
Results: A total of 95 patients were included in the study, with a mean age of 78 years. The majority were male (58, 61.1%), and more than half had hypertension (64.2%) and hyperlipidemia (58.9%). Chronic heart failure was present in 23.2% of patients, while 25.3% had paroxysmal atrial fibrillation, and none had a history of coronary artery disease. Patients receiving SGLT2i (Group A) had a significantly smaller reduction in LVEF compared to those who did not (Group B): -0.2(±3.8)% vs. -3.3(±4.2)%,p=0.02. A similar trend was observed for left ventricular end-diastolic-diameter, with Group A showing -0.66(±4.6)% vs. 1.8(±5.8)% in Group B (p=0.04). Additionally, the percentage change in Left-Ventricular Longitudinal-Global Strain between the first and third month was significantly lower in Group A (0.3±0.16%) compared to Group B (1.6±1.3%,p<0.001).
Conclusions: SGLT2i were associated with a smaller decline in LVEF and less adverse cardiac remodeling over three months in patients with pacemaker implantation.

4587 - The Role Of Multipoint Left Ventricular Pacing Compared To Optimized Cardiac Resynchronization Therapy On Long-Term Follow-Up In Chronic Heart Failure Patients

Polychronis Dilaveris[1], Panos Xydis[1], Christos-Konstantinos Antoniou[1], Konstantinos Konstantinou[1], Nikolaos Magkas[1], Konstantinos Tsioufis[1], Christina Chrysohou[1], Panagiota Manolakou[1]

[1]*1st University Department of Cardiology, Hippokration Hospital, National & Kapodistrian University of Athens Medical School, Athens, Greece*

Introduction: The aim of this study was to assess the capacity of optimized multipoint pacing (MPP) over cardiac resynchronization therapy (CRT), in terms of clinical, functional, and echocardiographic parameters among dyssynchronous heart failure (HF) patients on the 5-year mortality.
Methods: We evaluated the echocardiographic and clinical response of 80 patients (Caucasian, 77.5% male, 68.4±10.1 years, 53.8% ischemic cardiomyopathy) with HF under optimal medical treatment, treated with either CRT with hemodynamic and electrical optimization of the LV pacing site (optimized [OPT-CRT] n= 34, 49%), or OPT combined with MPP (OPT-MPP group, n =36, 51%) for a follow-up of 5 -years.
Results: During the 5-year follow-up, 36 patients died (45 per 100 patients mortality rate). There was a significant difference in death rates between OPT (54%) and OPT-MPP (40%), revealing that OPT-MPP was related with 7% less probability of death in a 5-year follow-up, compared with OPT-CRT (p=0.01). The diseased patients had higher prevalence of ischemic HF, impaired baseline ventricle-arterial coupling (VAC), higher baseline left atrial (LA) volume, impaired baseline LA strain and lower baseline right ventricle (RV) strain (all p-values<0.05). Furthermore, OPT-MPP had higher survival rates, through beneficial effect on VAC (OR=0.03, 95%CI 0.02-0.467) and LA strain (OR=0.68, 95% CI 0.507-0.929), reflected on better score on Minnesota QoL questionnaire (OR=0.89, 95%CI 0.799-0.99), compared to OPT-CRT.
Conclusions: In chronic HF patients under CRT implantation, OPT-MPP showed beneficial effect on survival especially compared to OPT-CRT only, through favorable changes in various clinical, functional, and echocardiographic parameters, as well as quality of life.

4589 - Phychological Distress And Is Associated Infection Is An Independent Risk Of Atrial Fibrillation Recurrences Rate After First Ablation Procedure

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[1]Electrophysiology Department -Head of Electrophysiology Department, Saint Lukes Private Hospital, Thessaloniki, Greece, [2]Electrophysiology Department, Saint Lukes Private Hospital, Thessaloniki, Greece

Introduction: Atrial fibrillation (AF) is associated with significant depression and health-related quality of life (QoL) impairments. While there is evidence that major depression (MD) is related to reduced natural killer cell cytotoxicity (NKCC) and enhanced cytokine production in healthy individuals.

Methods: We examined the role of hostility, depression, somatic symptom, anxiety, overall phychological distress and associated infectious illness on AF recurrences in pts after the first ablation procedure. The study included 108 pts with AF (68 men), mean age 57±14 years, after the first recurrence episode of Afin these pts, followed prospectively with annual Kellner Symptom phychometric questionnaire at 8 weeks interviews. Blood was drawn after the randomization, at each interview and during the AF recurrence episode. NKCC was measured by 3-hour chromium release assay. We calculated the incidence rate of AF by quartiles of phychometric scores.

Results: After adjusting for non phychological risk factors, of AF, such as age, sex, type of ablation procedure, higher anxiety, depression hostility somatic symptom and total phychological distress were significantly associated with risk recurrences of AF. For each higher quartile group, adjusted odds ratio for total phychological distress was 2.4 (CI , 1.4-4.3).Depressed pts had diminished NKCC (22.1± 12 vs 13.4±9.8% [50:1effector to target ratio], p=0.02.

Conclusions: Among patients with recurrences after the first ablation for AF, phychological distress in general is which is associated with reduced NKCC increased infectious illness is an independent risk factor. The data support a cognitive behavioral therapy may hold promise for improving depression and for reducing AF recurrences in this population.

4590 - Bradyarrhythmias In Young Pregnant Woman With Repaired Tetralogy Of Fallot

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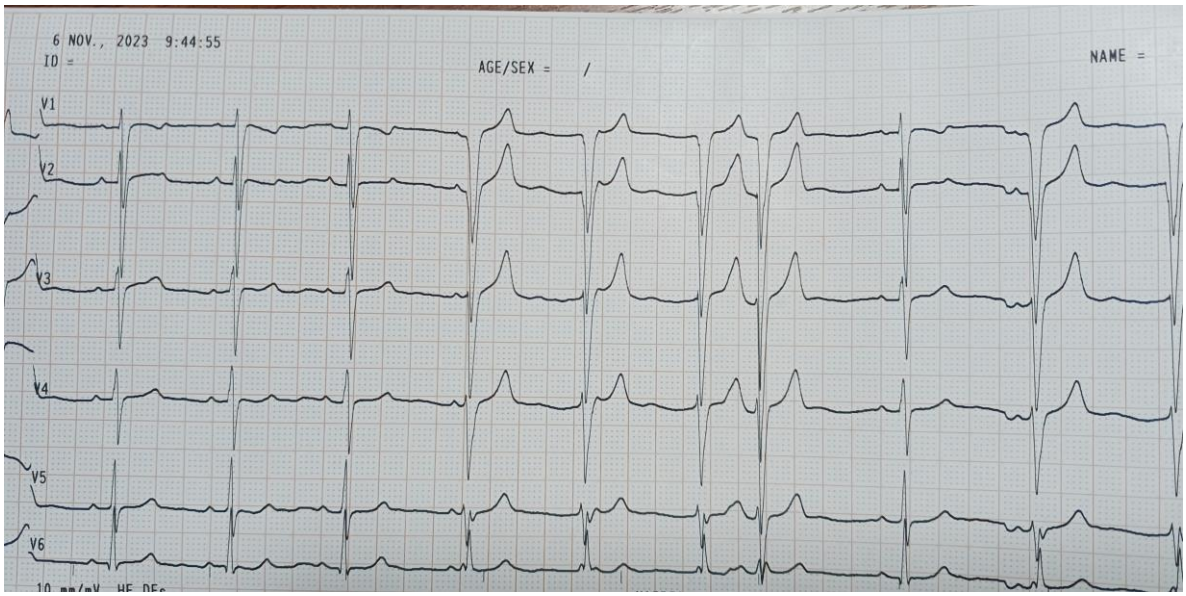
A 22-years pregnant woman was presented for routine clinical examination (sixth month of pregnancy). Her past medical history included repaired Tetralogy of Fallot (TOF) and pulmonary valve replacement (bioprosthetic valve 2018). None medication. ECG: Bradyarrhythmias, without symptoms, blood pressure :110/70 mmHg, 50 beats per minute. Echo: EF=60%, normal LV/RV, no pulmonary hypertension, normal bioprosthetic pulmonary valve. Lab test, especially electrolytes were normal. Holter rhythm 48 hours: sinus rhythm, no AVB, no pauses> sec. seven month of pregnancy ECG was normal (sinus rhythm, no AVB, no pauses> sec, no prolonged QRS duration). Also Holter rhythm was normal. According to ESC Guidelines 2020: Permanent pacemaker (PM) should be considered in patients with severe congenital heart disease (CHD) and sinus or junctional bradycardia (daytime heart rate <0beats /per minute or pauses> sec. Also PM should be considered for patients with CHD and compromised hemodynamics due to sinus bradycardia or loss of AV synchrony (class IIa). As a result pacemaker was not indicated. Finally caesarean section was performed, without complications. Follow up: normal ECG, normal Holter, normal cardiac function. Normal fetus. Cardiac Magnetic Resonance (CMR) after 9 months was also normal: RV dimensions were in normal range, also RVEF. NO LGE (late-gadolinium enhancement).

Conclusions: 1) In repaired Tetralogy of Fallot (TOF), asymptomatic young women with bradyarrhythmias and no pacemaker generally experience uneventful pregnancies, provided that the QRS duration is not prolonged (ie, the escape rhythm is junctional and not infranodal) and ventricular function is normal, which is usually the case.

2) Permanent pacemaker(PM) should be considered in patients with severe CHD and sinus or junctional bradycardia(daytime heart rate <0beats /per minute or pauses> sec. Also PM should be considered for patients with CHD and compromised hemodynamics due to sinus bradycardia or loss of AV synchrony (ESC 2020- class IIa). If PM becomes necessary during pregnancy, the procedure should be performed after the eight month.

3)EPS, including PES, should be considered for risk stratification for SCD in patients with additional risk factors (RV,LV dysfunction, NSVT symptomatic, QRS>180msec, extensive scarring on CMR (class IIa).

4) Risk stratification for late AV block remains challenging with limited data and no prospective studies of screening strategies.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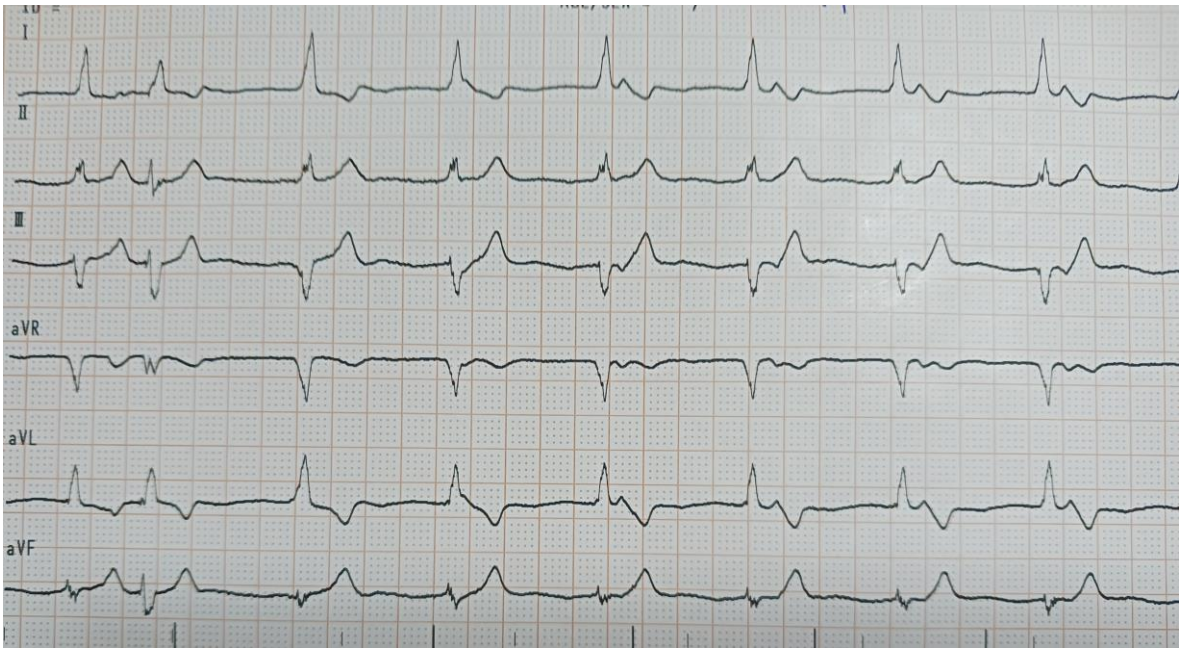
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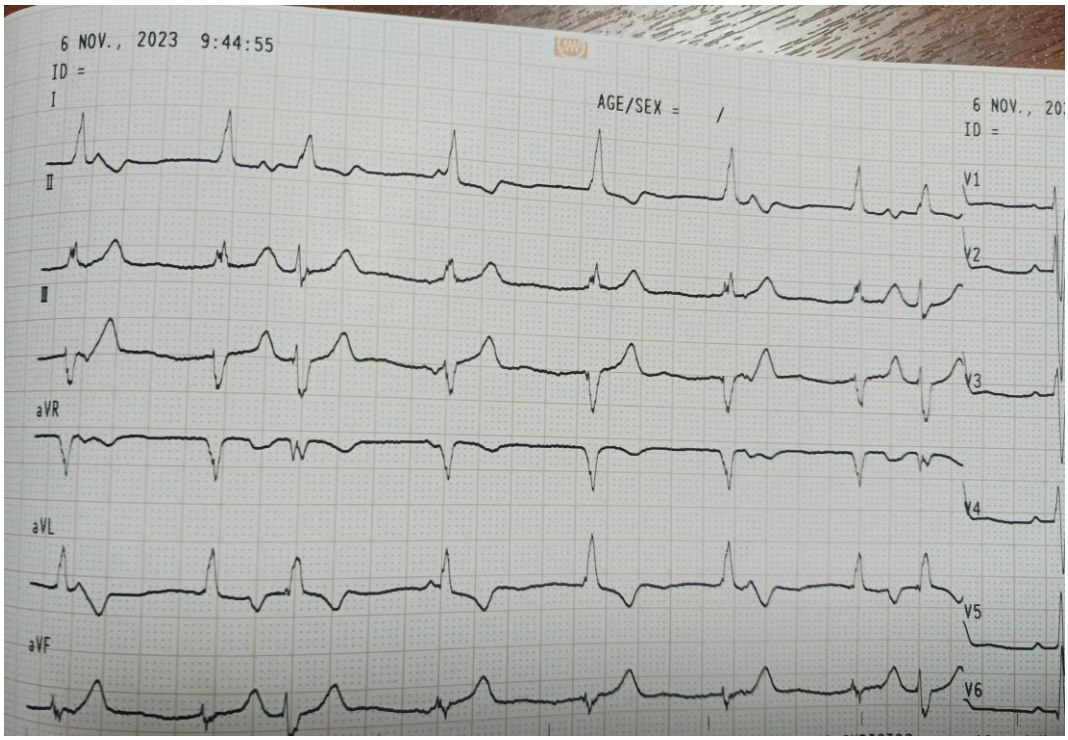
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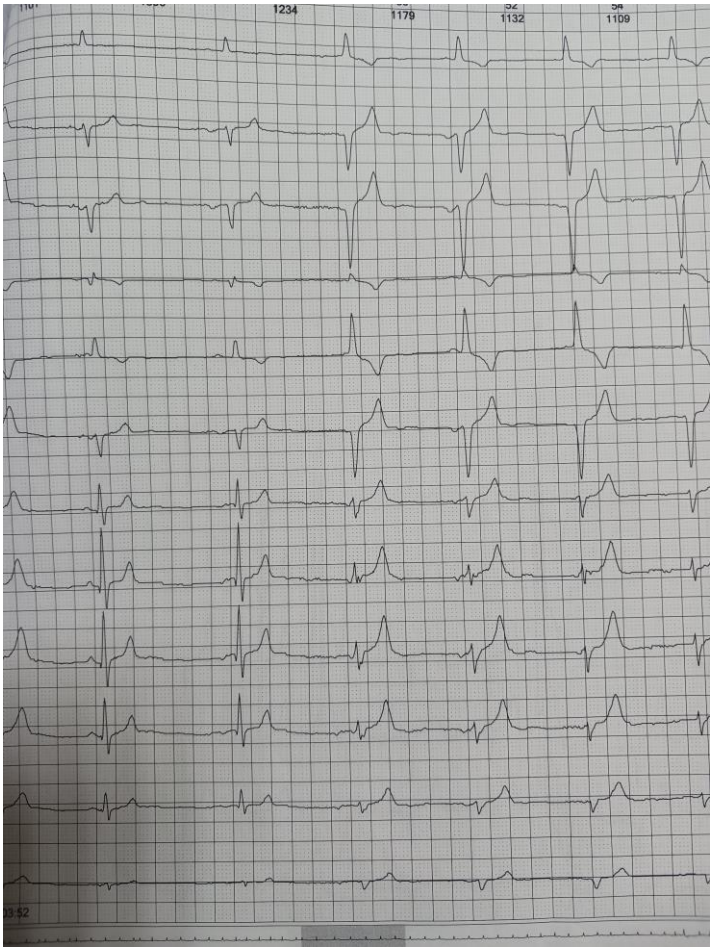

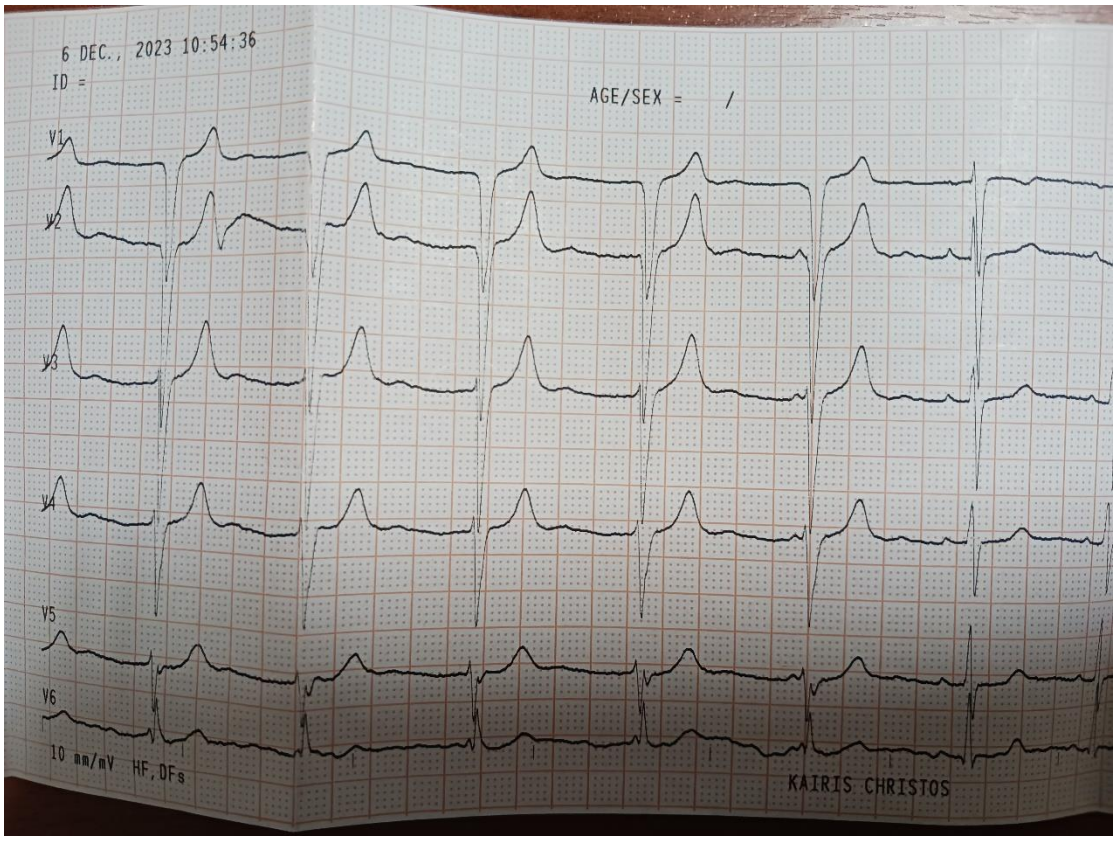
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KAIRIS CHRISTOS

4591 - Corrected QT Interval As A Prognostic Factor In Patients With COVID-19

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Introduction: A number of studies reported various ECG changes in COVID-19 patients, but the problem still has not been fully described. Aim of the study was to investigate prognostic value of corrected QT interval (QTc) in COVID-19 patients.
Methods: We investigated ECG changes in patients with COVID-19 hospitalized in Cardiology Department from October 2020 to June 2021. Inclusion criteria: age ≥ 18 years, confirmed COVID-19 disease. Exclusion criteria: inability to perform standard ECG, prior implantation of pacemaker or cardiac resynchronization therapy. On admission, standard 12-lead ECG was performed using the tele-ECG technique and sent to the telemedicine platform. ECG was analyzed by physicians blinded to clinical characteristics and further outcomes. Demographic, clinical data and laboratory test results have been collected. Information about outcomes such as death at any cause during hospitalization and within 18 months of follow-up have been obtained. Patients were not treated by chloroquine or hydroxychloroquine. Spearman and rank-biserial correlation tests were used for correlation analysis. Logistic regression to evaluate the association between QTc interval and mortality in univariate and multivariable models was used.
Results: Total of 201 patients were included to analysis (133 (66,17%) men vs 68 (33,83%) women, mean age: 67,22 ± 13,39 years). All-cause mortality during hospitalization was 32,84% and within 18 months it was 47,76%. Mean QTc was 456,21±56,31 ms. QTc positively correlated with NT-proBNP (r=0,357; p<0,001), IL-6 (r=0,215; p=0,002), CRP (r=0,147; p=0,039), procalcitonin (r=0,246; p<0,001) and mortality within 18 months (r=-0,238; p=0,004). There was inverse correlation between QTc and LVEF (r=-0,293; p<0,001). In univariate analysis, QTc was associated with mortality within 18 months (OR=1,006; 95% CI: 1,001-1,011; p=0,028), but after multivariable adjustment it was not independently associated (OR=0,998; 95% CI: 0,991-1,006; p=0,652).
Conclusions: In patients with COVID-19, QTc interval correlates with NT-proBNP, markers of inflammation and LVEF, and is associated with increased mortality within 18 months.

4592 - Meta-Analysis On The Diagnostic Performance Of AI In ECG For Hyperkalemia Detection

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Aim: Current advances in Artificial Intelligence (AI) has allowed the development of deep learning algorithms that can detect Hyperkalemia using ECG tracings. The current meta-analysis aims to evaluate the sensitivity, specificity and diagnostic accuracy of different AI models used for hyperkalemia detection. Materials and **Methods**: A systematic search was conducted in PubMed, Scopus, Web of Science, Embase, IEEE Xplore and arXiv to identify eligible studies up to March 2025. Keywords used included: "Artificial Intelligence", "ECG" and "Hyperkalemia". Overall, 9 studies fulfilled the inclusion criteria. The meta-analysis was conducted using a random effects model in R software.
Results: The pooled sensitivity of the AI models was 0.86 (95% CI: 0.80–0.91), with heterogeneity (I^2 = 69.1%), and specificity was 0.75 (95% CI: 0.68–0.81), with heterogeneity (I^2 = 77.7%). The average AUC across studies was above 0.88 (95% CI: 0.84–0.91), indicating high overall diagnostic performance and low heterogeneity (I^2 = 28.2%). The findings suggest that AI models can detect hyperkalemia with a high degree of reliability and consistency. The odds ratios showed DOR of 1.87 (95% CI: 0.82–4.25), suggesting heterogeneity in diagnostic performance between studies. Heterogeneity was very high (I^2 = 98.9%), indicating differences in population, ECG lead placement, or AI model type.
Conclusion: The findings indicate that AI models demonstrate a powerful tool for detecting hyperkalemia with high reliability and consistency. Implementing those models in medical care facilities could assist doctors with early hyperkalemiadiagnosis. However, further studies are needed to validate the results in different clinical settings and ECG equipment.

4593 - Usefulness Of ECG247 Holter Monitor For Detecting Arrhythmias

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Diagnosing of paroxysmal arrhythmias, especially atrial fibrillation is a challenge. Classical 1-3 days Holter ECG is often insufficient.
The ECG247 developed by by Appsens AS, Norway is a medically certified sensor for continuous long-term monitoring of the heart rhythm for assessment of heart rhythm disorders. The sensor with the single use path can monitor rhythm up to 9 days. The ECG247 sensor can be reused for many tests or for several people.
The software uses artificial intelligence advanced algorithms for automatic detection of all serious and common heart rhythm disturbances.
This abstract presents own experiences with ECG247 and shows strengths and weaknesses of this system. The observations are based on monitoring of patients for at least 7 days.
Strong points ECG247:

- easy for use, patient can start monitoring at home comfortable, small path
- event button,
- on-line continuous access to ECG during monitoring,
- user friendly software with color code for different types of rhythm disturbances,
- good quality of recording,
- reliable and sensitive algorithm

Weak points ECG247:

- patient have to use smartfon with ECG247 application,
- only one ECG channel,
- not available reclassification type of arrhythmias,
- not possible changing criteria for detection of arrhythmias,
- absence of full disclosure

Conclusions: ECG247 is useful long term ECG recorder. It provides continuous monitoring with data storage triggered by arrhythmias or ectopic beats. The system have reliable algorithm for arrhythmias detection but also have some limitations.

4594 - Wearable Devices For Quantifying Atrial Fibrillation Burden. A Systematic Review And Bayesian Meta-Analysis

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[1]Department of Interventional Cardiology and Electrophysiology, Evgenidio Hospital, Athens, Greece, [2]Cardiology Department, Athens General Hospital "G. Gennimatas", Athens, Greece, [3]3rd Department of Cardiology, Aristotle University of Thessaloniki, Thessaloniki, Greece, [4]Department of Biomedical Engineering, Medical School, National and Kapodistrian University of Athens, Greece

Introduction: Atrial fibrillation (AF) is the most common supraventricular arrhythmia and is associated with an impaired prognosis. Studies using implantable cardiac monitors suggest that this association is closely linked to AF burden, defined as the percentage of time spent in AF. Consequently, there is a growing need for affordable and comfortable alternative devices, such as wearables, capable of reliably monitoring AF burden in patients with AF.
Material and Methods: Major electronic databases were searched for studies comparing AF burden quantification using wearables and reference ECG- monitoring methods. A Bayesian approach was adopted for the final analysis.
Results: Six studies including a total of 448 patients and 36978 hours of valid simultaneous recordings, were analyzed. Bayesian analysis revealed no statistically significant differences between wearables and reference methods in AF burden quantification. The mean error was 1% (95% CrIs: -4% to 7%, Figure). Similar findings were observed in the subgroup analysis of studies assessing only smartwatches. Between- study heterogeneity was low, and no evidence of publication bias was detected.
Conclusions: Our analysis suggests that AF burden quantification using wearables is comparable to reference ECG- monitoring methods. These findings support the potential role of wearables in clinical practice, particularly for research and prognostic purposes. However, more studies are needed to determine whether the observed statistical equivalence translates to clinical significance, thereby supporting the widespread use of wearables in the assessment of rhythm control therapeutic strategies.

4595 - Assessment Of Incidence Of Fragmented QRS In The Standard Electrocardiogram In Patients With Acute Pulmonary Embolism

Piotr Bienias[1], Olga Dzikowska-Diduch[1], Tomasz Cader[1], Szymon Staneta[1], Katarzyna Dąbrowska[1], Aisha Ou-Pokrzewińska[1], Michał Ciurzyński[1], Piotr Pruszczyk[1]
[1]Department of Internal Medicine and Cardiology with Center for Diagnostics and Treatment of Venous Thromboembolism, Medical University of Warsaw, Warsaw, Poland

Introduction: Various ECG abnormalities are often observed in acute pulmonary embolism (APE). Although ECG is not a sufficient tool for the diagnosis of APE, it may potentially contribute to improving the prognosis assessment in addition to established predictors. The aim of our study was to assess the occurrence of fragmented QRS complexes (fQRS) in APE, which are described not only as being associated with myocardial scarring or fibrosis, but also with conduction disturbances and depolarization.
Material & Methods: In our specialized center we examined 560 patients with confirmed APE. Except routine procedures, ECG was performed immediately after admission to the hospital. fQRS assessment was performed manually according to defined by Das et al. criteria. Subjects with ventricular pacing rhythm (n=7) were excluded for further analysis. For each patients the simplified Pulmonary Embolism Severity Index was calculated. Assessment of APE-related mortality risk (low, intermediate, high) was established due to ESC Guidelines.
Results: Ultimately, 553 patients aged 62.3±18.9 years were included in the study (53.3% women). Sinus rhythm was present in 511 (92.4%), and AF/AFL in 42 (7.6%) patients. Completely normal ECG was found in 133 (24.0%), while ECG with any various abnormalities was found in 420 (76.0%) patients. Detailed results of fQRS occurrence in the studied subgroups are presented in the table. In some patients, different fQRS patterns co-occurred.
Conclusions: Our results confirmed previous observations indicating a high incidence of fQRS in APE, however in our group it was not associated with the disease severity and the early mortality risk.

4596 - The Use Of Online ECG - Telemonitoring During Labor In Patients With Frequent Ventricular Ectopy

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[1]*Almazov National Medical Research Center, St. Petersburg, Russia*

Information on the behavior of ventricular arrhythmias, their tendency to progression at different stages of labor, is absent, despite the fact that this information can influence the choice of tactics for managing labor.
Objective: To evaluate the behavior of ventricular arrhythmia in pregnant women with frequent rhythm disturbances at different stages of labor.
Material and methods: The study included 20 pregnant women with frequent ventricular arrhythmia aged 30.8±9 years, who delivered in the period from 2023 to 2025 years. Frequent ventricular arrhythmia was defined as 30 or more ventricular ectopic beats per hour of 24-hour Holter monitoring and/or daily premature ventricular complex burden of 10% or more according to Holter monitoring data.
Results: In the third trimester the daily premature ventricular complex burden was 10% in 15 pregnant women (75%) and more than 10% in 5 pregnant women (25%). Structural heart disease was absent. The patients delivered at 36-40 weeks of gestation. 12 patients (60%) delivered vaginally. In the first and second stages of labor, they had only single ventricular ectopic complexes, i.e. 17±5/hour, without progression. Progression of ventricular arrhythmia was registered in 4 patients in the third stage of labor - the number of single ventricular ectopic complexes increased and paired ventricular ectopic complexes appeared; in 8 patients ventricular arrhythmias decreased by 2 or more times; in 2 patients it did not change. Cesarean section was performed in 8 (40%) patients, 7 of them for obstetric indications, and in 1 case the tactics of labor management were changed due to the registered progression of ventricular arrhythmia in the first period to frequent constantly recurring unstable ventricular tachycardia (5-8 complexes), which led to a decrease in the left ventricular ejection fraction. During the cesarean section, all 8 patients showed a significant decrease in the number of ventricular arrhythmia - by 2 or more times ($p<0.05$). All newborns had a high score on the Apgar scale (7-8 points).
Conclusion: 1. In most pregnant women with frequent ventricular ectopy without structural heart disease, rhythm disturbances did not progress during labor. 2. Online ECG -telemonitoring during labor helps in timely diagnosis of arrhythmia progression (including life-threatening forms), which can play an important role in deciding whether to change the method of delivery.

4597 - Comparative Study Of The Effects Of Left Ventricular Pacing Compared To Biventricular Pacing On Indices Of Cardiac Function And Clinical Status Of Heart Failure Patients (READAPT Study)

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Introduction: Nonresponse to cardiac resynchronization therapy has been related with right ventricular dysfunction. Preferential left ventricular pacing (pLVP) can overcome iatrogenic right ventricular dysfunction by achieving left ventricle resynchronization.
Methods: In the READAPT study we evaluated the effects of a pLVP algorithm (AdaptivCRT®, Medtronic, Dublin, Ireland) on 125 heart failure patients (all Caucasians, 78% male; 65 +/- 8 years old; 47% ischemic cardiomyopathy; 41% diabetics; NYHA II-III) following randomization to standard biventricular pacing (BiV) and pLVP, on echocardiographic and cardiopulmonary exercise test (CPET) indices of functional status, as well as a self-reported quality of life questionnaire. The follow-up consisted of 6 and 12-months visits.
Results: Significant comparative effects of pLVP over optimized BIV were noted regarding RV systolic velocity in TDI even from 12-months from baseline (6% increase, p=0.04); while end-systolic diameter of left ventricle was decreased by 4% in 6-months in pLVP group (p=0.01), while no significant difference was observed in BiV group. Left ventricular systolic longitudinal strain was improved in 12 months in pLVP group compared to BiV group (p- for interaction =0.001). Additionally, in CPET pLVP group showed improved VO2 max at 12 months (p=0.011) compared to the BiV group; while all other cardiorespiratory indices showed borderline significant changes at 12 -months.
Conclusions: In the preliminary findings of READAPT study, it seems that pLVP is associated with improved VO2 max in CPET, right ventricular function and end-systolic volume at 6 and 12-months of follow-up, over echo-optimized BiV.

4599 - High-Frequency Spectral Entropy: Novel Metric For Non-Invasive Assessment Of Left Atrial Fibrosis From Single-Lead Electrocardiogram

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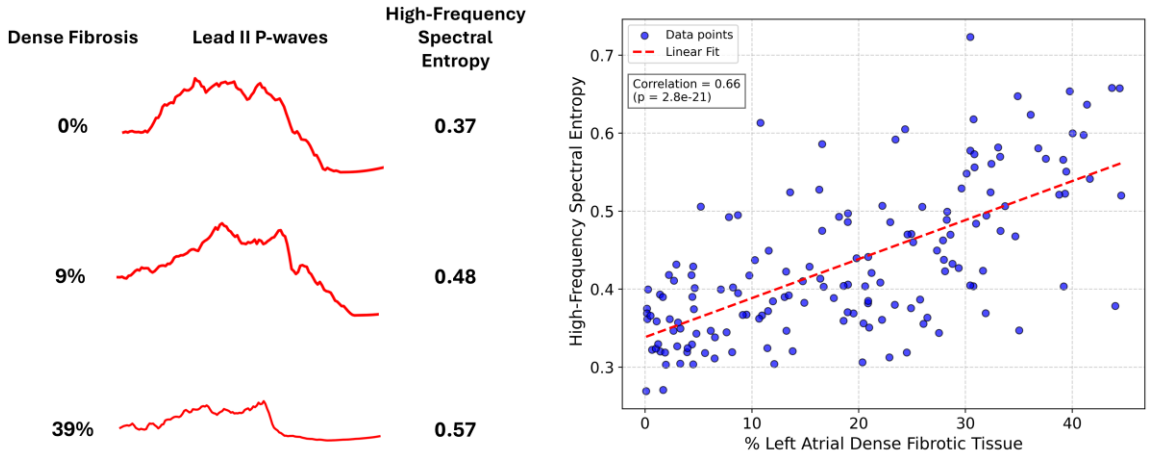
[1]*King's College London, London, United Kingdom*

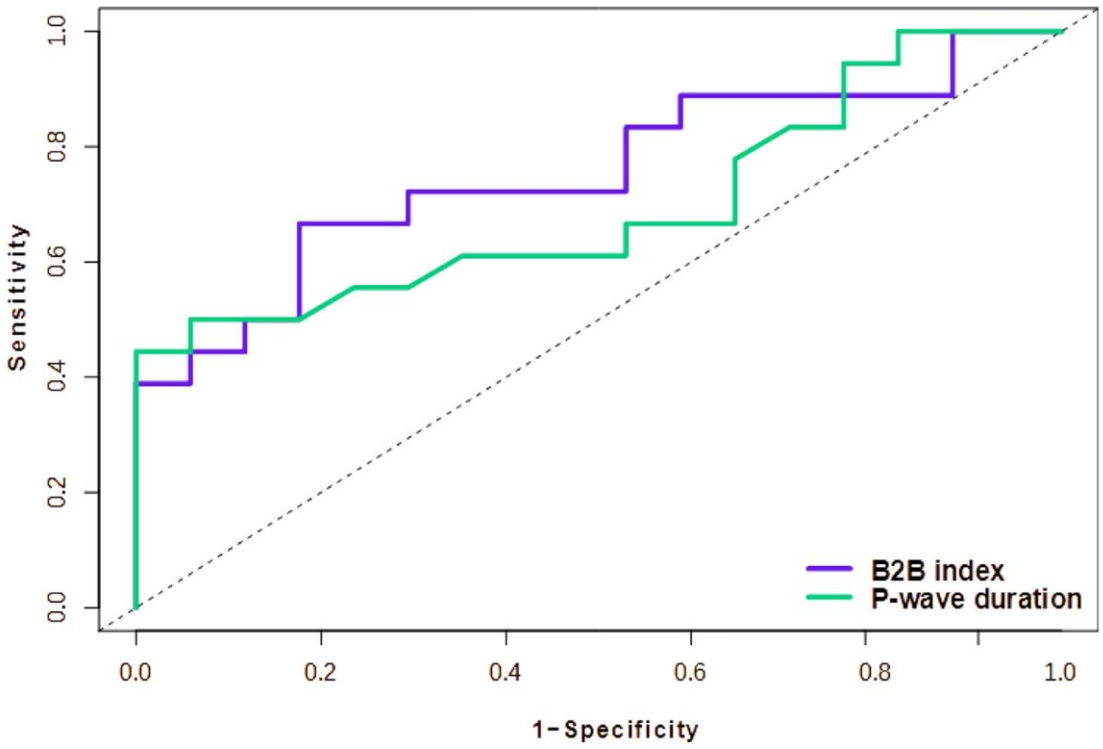
Introduction: Atrial fibrillation (AF) is the most prevalent cardiac arrhythmia worldwide, significantly increasing the risk of stroke, heart failure, and dementia. Left atrial (LA) fibrosis has a critical effect on AF progression and treatment outcomes. Currently, cardiac magnetic resonance (CMR) imaging is the only non-invasive method for assessing LA fibrosis, but its high cost and limited accessibility restrict widespread use. Electrocardiogram (ECG) is an affordable and widely available tool for evaluating cardiac function and characteristics. We propose a novel ECG-derived metric, high-frequency spectral entropy (HFSE), to assess the extent of LA fibrosis.
Methods: In-silico simulations were conducted using 90 LA mesh models derived from CMR images. An additional 67 models with augmented fibrotic content were generated to increase the dataset. Atrial activity was simulated by solving the monodomain equation with the Courtemanche-Ramirez-Nattel cellular model. Lead II P-waves were computed after registering each LA model to an idealised torso using the infinite volume conductor method. HFSE was computed by modifying the Shannon entropy of the power spectrum (spectral entropy) to emphasise higher frequencies through weighting.
Results: HFSE of the P-wave correlates with the distribution of fibrotic tissue, with higher HFSE being characteristic of a greater degree of dense fibrotic tissue (see Figure). Results demonstrate a strong positive correlation (r = 0.66, p = 2.8e-21) between lead II P-wave HFSE and the percentage of dense LA fibrosis.
Conclusion: This study presents a novel non-invasive ECG-based metric for assessing LA fibrosis, offering a potentially cost-effective and scalable alternative to the current imaging state-of-the-art.



4601 - Relationship Of Beat-To-Beat P-Wave Index To Left Atrial Low-Voltage Areas In Patients With Paroxysmal Atrial Fibrillation

Dimitrios Tachmatzidis[1], Antigoni Sakellaropoulou[2], Georgios Giannopoulos[1], Konstantinos Letsas[2], Antonios Antoniadis[1], Dimitrios Asvestas[2], Dimitrios Filos[3], Panagiotis Mililis[2], Michael Efremidis[2], Ioanna Chouvarda[3], Vassilios Vassilikos[1]
[1]3rd Department of Cardiology, School of Medicine, Aristotle University of Thessaloniki, Greece, [2]2nd Department of Cardiology, Laboratory of Cardiac Electrophysiology, Evangelismos General Hospital, Athens, Greece, [3]Laboratory of Computing, Medical Informatics and Biomedical Imaging Technologies, School of Medicine, Aristotle University of Thessaloniki, Greece

Introduction: Atrial fibrillation (AF) is associated with left atrial (LA) fibrosis. The beat-to-beat (B2B) index—a non-invasive marker derived from P-wave morphology and wavelet analysis—has demonstrated predictive value for AF incidence and recurrence. This study investigates whether this index correlates with the extent of LA low-voltage areas (LVAs).
Material & Methods: Patients with symptomatic paroxysmal AF without evident structural remodeling who were scheduled for pulmonary vein isolation were enrolled. High-density voltage maps identified low-voltage areas (LVAs <0.5 mV), with patients stratified by small vs. large LVAs. The B2B index, alongside conventional P-wave characteristics such as P-wave duration, was compared between these groups.
Results: Among the 35 included patients (87% male, median age 62 years), the median LVA was 7.7 cm^2 [4.4–15.8], representing 5.6% [3.3–12.1] of the total LA endocardial surface. Patients with large LVAs demonstrated significantly higher B2B index values (0.65 [0.56-0.77] vs 0.57 [0.52-0.59], p=0.009) and longer P-wave durations (146 ms [123-165] vs 135 ms [121-141], p=0.048). The B2B index had superior predictive value for large LVAs (c-statistic 0.75, p=0.006) compared to P-wave duration (c-statistic 0.70, p=0.013). In multivariable adjustment, the first maintained independent predictive value (p=0.04) while the later became non-significant (p=0.08), with the combined model achieving excellent discrimination (c-statistic 0.81).
Conclusions: In patients with paroxysmal AF, B2B P-wave analysis emerges as a valuable non-invasive marker for detecting LA LVAs, reflecting underlying fibrosis. These findings provide a pathophysiological basis for the B2B index's potential clinical utility as a decision-making tool.


Sensitivity
1-Specificity
0.0
0.2
0.4
0.6
0.8
1.0
B2B index
P-wave duration

4602 - Exercise-Induced Monomorphic Ventricular Tachycardia In A Heterozygous Ryanodine Receptor Type 1 (RyR1) Mutation Carrier Without Structural Heart Disease

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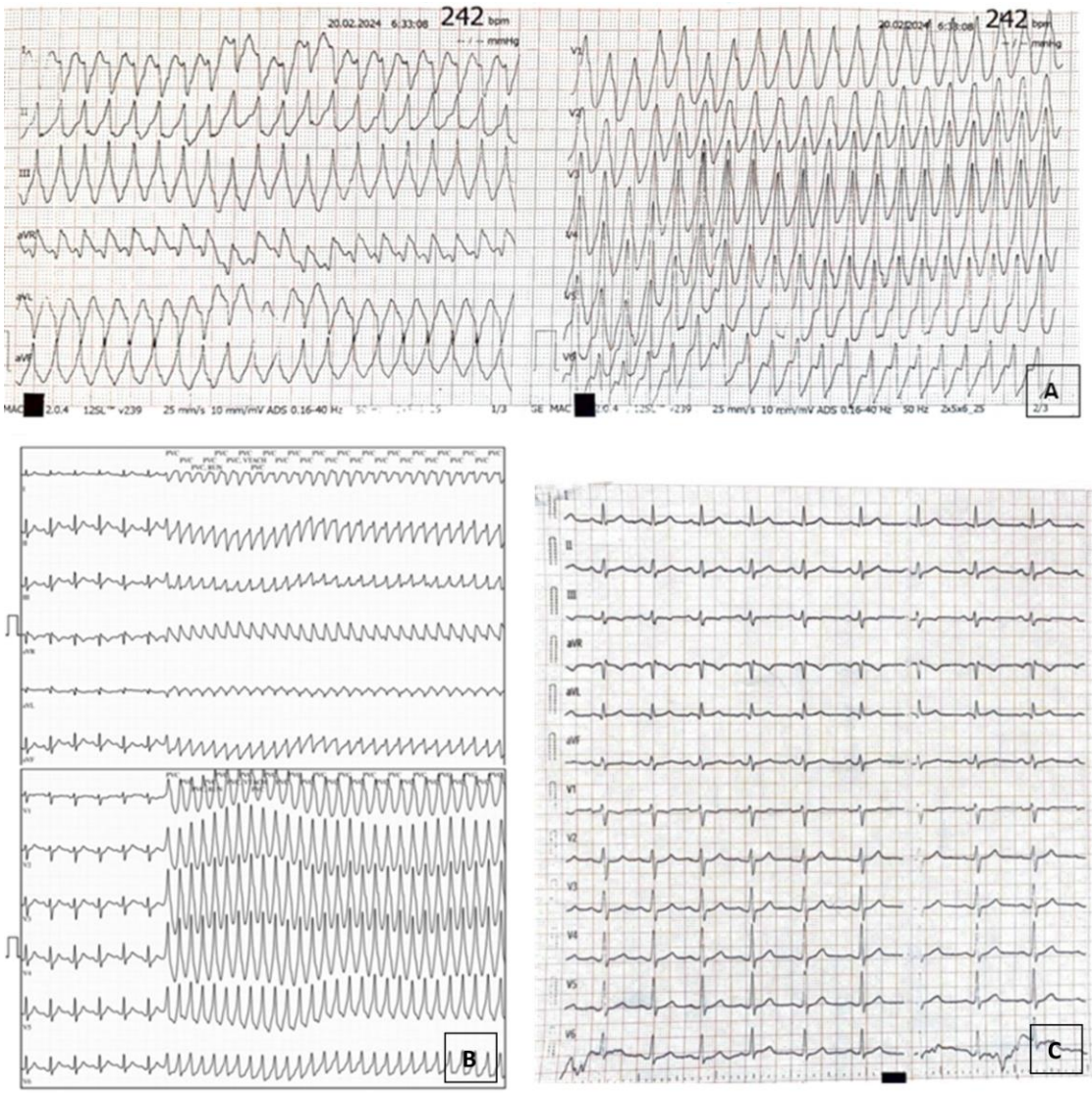
Case Presentation: A 43-year-old male patient was admitted due to broad complex regular tachycardia with RBBB morphology and inferior axis and heart rate of 242 bpm during exercise stress test (Fig.1A). He was complaining of exercise-induced syncopal episodes, but his medical history was otherwise unremarkable. Resting ECG (Fig.1C), cardiac ultrasound and coronary angiogram were unremarkable. Electrocardiographic telemetry did not reveal any arrhythmias. A cardiac MRI showed no specific abnormalities or LGE. An exercise stress test was repeated in the hospital setting which induced the same tachycardia (Fig.1B). Electrophysiological study was performed to provoke the tachycardia and exclude supraventricular arrhythmias. Programmed ventricular stimulation with iv isoprenaline also resulted in a regular monomorphic wide complex tachycardia that required DC cardioversion due to hemodynamic compromise. Eventually, a single-chamber ICD was implanted.
The genetic workup revealed a mutation of the RYR1 gene, which is frequently related to skeletal muscle abnormalities and malignant hyperthermia, whereas catecholaminergic polymorphic ventricular tachycardia (CPVT) is mostly associated with RYR2.
The patient was started on bisoprolol and was given instructions to avoid strenuous exercise. He remains under cardiac imaging surveillance, in order to promptly identify any progression to cardiomyopathy.
Conclusion: This is an uncommon case of monomorphic VT on exercise. The clinical presentation was suggestive of CPVT, however there was no polymorphic or bidirectional morphology, which is the hallmark of the disease. The mutation we identified is not linked to CPVT; however, studies have recently revealed a connection between RYR1 and cardiomyopathies or arrhythmias. Moreover, CPVT has been found to cause monomorphic VT on exercise in atypical cases similar to our patient.


242 bpm
242 bpm
A
B
C

4603 - Vascular Access For Biventricular Pacemaker/Cardioverter-Defibrillator Implantation

Stavros Vergopoulos[1], Georgios Giannopoulos[1], Vaios Schismenos[1], Prokopios Mamolis[1], Sotirios Chiotis[1], Ioannis Anagnostopoulos[2], Sonia Konstantinidou[1], Aikaterini Zgouridou[1], Maria Mountourli[1], Spyridon Deftereos[2], Vasileios Vassilikos[1]
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Background: Vascular access for transvenous lead implantation is a key step of device implantation, associated with risks for clinically significant complications.
Methods: Data from prospectively followed patients undergoing first-time implantation of a biventricular pacemaker or defibrillator (CRT-P/D) were analyzed. The primary outcome measure included i) any complication at the index procedure necessitating prolonged hospitalization or re-hospitalization and ii) any complication leading to lead or generator revision, repositioning or explantation. Two approaches were compared: cephalic cut-down and subclavian puncture, if necessary (Group 1) versus axillary venous puncture (Group 2).
Results: 422 patients, 59% male, were included (median age 72, interquartile range 62-80), with 267 patients in Group 1 and 155 in Group 2. There were no significant between-group differences in baseline characteristics, including age, sex, BMI, and indication. Over a median follow-up of 4 years (interquartile range 40-54 months), the overall crude event rate was 9.4% and 6.5% in Groups 1 and 2, respectively (Mantel-Haenszel p=0.38). In the time-dependent analysis, the K-M event-free survival curves separated early on, but reconverged at about 4 years (Log rank p 1.3, p=0.26) (see Fig). During the first 2 years of follow-up, event-free survival was higher in the axillary-access-only group (Log rank 5.3, p-0.02).
Conclusions: An axillary-puncture-only approach for venous access for CRT-P/D implantation was not different - in terms of a composite clinical endpoint – in the long-term to a cephalic/subclavian approach. However, considering that any differences between approaches will tend to dissipate with time (due to competing risks), the finding that in the first 2 years axillary access was associated with a lower event risk may be of clinical importance.

4604 - Evaluation of QRSD × Tpeak-Tend(c) / QRSd × QTm(c) for Ventricular Arrhythmia Risk Stratification in Heart Failure Patients with ICD/CRT-D

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Background: Risk stratification for ventricular arrhythmias (VAs) remains a major challenge in HFrEF patients.
Aim: This study aimed to evaluate a novel electrocardiographic index, QRSD × Tpeak-Tend(c) / QRSd × QTm(c), in relation to VA events during the first year after ICD/CRT-D implantation in patients with HFrEF.
Materials & Methods: We retrospectively analyzed HFrEF patients with ICD/CRT-D implantation. QRS duration (QRSd), Tpeak-Tend, and QT intervals were measured in lead V5. For QRSd ≥ 120 ms, Bogossian's formula was used to calculate the modified QT (QTm). Tpeak-Tend and QTm were corrected using Fridericia's formula, yielding Tpeak-Tend(c) and QTm(c). QRS dispersion (QRSD) and QT dispersion (QTD) were calculated, and QRSD × Tpeak-Tend(c) / QRSd × QTm(c) was derived.
Results: The 139 patients were divided into two groups based on VA event occurrence during the one-year follow-up. VA events occurred in 22 (15.8%) patients; 117 (84.2%) had no events. LASSO regression identified 13 predictors explaining 50.5% of model deviance ($\lambda = 0.0214$). Backward stepwise selection retained seven predictors. Firth's penalized logistic regression showed that QRSD × Tpeak-Tend(c) / QRSd × QTm(c) (OR 3.85, $p < 0.001$), RBBB, IVCD, and serum sodium were significantly associated with VA events. QTD, LAFB, and serum potassium were not statistically significant but remained in the model. The model showed excellent discrimination (AUC = 0.95), good calibration (Hosmer-Lemeshow $p = 0.936$), and strong predictive accuracy (Brier score = 0.060).
Conclusions: QRSD × Tpeak-Tend(c) / QRSd × QTm(c) was independently associated with VA events and may enhance risk stratification in this high-risk population.

4605 - Transvenous Cardiac Implantable Electronic Device (CIED) Removal: The 7-Year Experience Of The Largest Centre In Cyprus, With A Focus On CIED-Related Infections

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Introduction: The Nicosia General Hospital, with its dedicated multidisciplinary team, is the largest tertiary institution, and the only centre in the country to incorporate excimer laser technology for transvenous Cardiac Implantable Electronic Device (CIED) removal. This dataset refers to our 7-year experience, with a focus on CIED-related infections.
Methods: Retrospective analysis of multiple patient records by 4 independent reviewers.
Results: From August 2018 to March 2025, 45 procedures were performed (12 explants, 33 extractions), in 42 patients (38 males, 4 females, mean age 73.7 years). In all but 2 patients, the indication was CIED-related infection. Pocket dehiscence was the commonest presentation, signifying lack of early identification (endocarditis encountered in 27% of cases, sepsis in 7% of cases). Staphylococcus species were the main isolates (20% S.epidermitis, 12% MSSA, 5% MRSA), though in 51% of cases no microbe was cultured. The commonest patient comorbidity was diabetes. A total of 92 leads were removed (61% pace/sense, 26% defibrillation, 13% left ventricular leads), with median lead age of 6 months (range 1-26 months) for explants, and 6 years (range 1-19 years) for extractions. The average hospital stay was 33 days. Serious, peri-procedural complications included 1 death due to superior vena caval tear (2.2% procedural risk). Long-term follow-up revealed one-month mortality at 9.5%. Five patients (12%) did not proceed with re-implantation (patient choice and/or absence of original indication).
Conclusions: This formal reporting from Cyprus highlights a relatively low peri-procedural risk, whilst emphasizing the need for expanding this registry on a national reporting basis.

4606 - Utilization Of Preprocedural Electrocardiographic Tracings By A Deep Machine Learning Model To Detect Atrial Fibrillation Recurrence After Catheter Ablation

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Background: Catheter ablation for pulmonary vein isolation (PVI) is the most effective rhythm control treatment in patients with atrial fibrillation (AFib). However, considering that PVI is a procedure which is associated with a low but non-zero risk of serious complications and 1-year rates of sinus rhythm maintenance not exceeding 60-70% in most studies, models which could reliably predict the risk of recurrence post-PVI would be clinically useful. The aim of this work was to predict which patients are prone to recurrence after PVI by machine learning models, utilizing preoperative electrocardiographic (ECG) and clinical data.
Methods: We analyzed data from prospectively followed-up patients undergoing PVI for paroxysmal AFib. We used pre-procedural 5.9-min ECG recordings in sinus rhythm (3 orthogonal leads, at 1000Hz). We implemented a previously described deep machine learning model, specifically a convolutional neural network (CNN), applying window sliding as a data augmentation method, using a window of 4000 samples. For comparison, we assessed 44 clinical variables using a machine learning algorithm (shallow machine learning), specifically recursive feature elimination with XGBoost and 10-fold cross-validation.
Results: 123 patients scheduled for PVI were included. 52 had AFib recurrence within 1-year from the index procedure (42%). Among the initial 44 feature vectors inputted in the XGBoost model, left atrial volume and presence of metabolic syndrome were the most significant in terms of predictive value, achieving an accuracy of 0.70. On the other hand, the deep learning CNN achieved a higher classification accuracy of 0.82, utilizing only the preprocedural patient ECGs (see Table).
Conclusion: Deep learning artificial intelligence models may utilize the predictive information contained in ECGs and, thus, help in categorizing patients scheduled for PVI according to their risk for post-ablation recurrence. This could be of use in personalizing decisions regarding PVI in patients with an indication for this procedure.

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