Резюмета на научните трудове

на

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за периода09.2021-09.2025

Резюме на дисертационен труд

Трайков В. Катетърна аблация при предсърдно мъждене: процедурни характеристики и роля на структурите, изявяващи тригерна активност във фибрилаторния процес. Аджибадем Сити Клиник Болница Токуда, София 2021.

Предсърдното мъждене (ПМ) се инициира от залпове на високочестотна активност от белодробните (БВ) и други торакални вени. Механизмите на поддържане на ПМ се обясняват най-добре от роторната теория. Катетърната аблация (КА) е утвърден метод за лечение, като използването на обща анестезия (ОА) е честа практика. Настоящата работа цели да проучи процедурните характеристики и резултати при пациенти с ПМ, лекувани с КА с или без ОА и да изясни ролята на тригерните структури за поддържане на ПМ. Разгледани са 193 пациенти с ПМ, лекувани с радиофреквентна (РФ) аблация. Пациентите са разпределени в три групи: група 1 (N=108), при които КА е проведена под ОА, група 2 (N=59), при които КА е проведена със седация и група 3 (N=26), при които е проведена индукция на ПМ за идентификация на тригерните структури. Проведен е и честотен анализ на сигнали в условията на ПМ. Описани са процедурните характеристики и отдалечените процедурни резултати и са идентифицирани предикторите на процедурния успех. При група 1 се установява статистически значимо по-кратка обща продължителност на процедурата, по-кратко рентгеново време, по-ниска рентгенова доза и по-малък брой РФ апликации при по-кратко кумулативно РФ време в сравнение с група 2. В група 3 се установява, че тригерна активност проявява най-често лявата горна БВ и лявата карина. Честотният анализ демонстрира значим честотен градиент от тригерните структури към БВ и останалата част от предсърдията. Честотният градиент демонстрира добра времева стабилност.

ESC European Society of Cardiology
Europace (2025) **00**, euaf149
https://doi.org/10.1093/europace/euaf149
EHRA DOCUMENT
EHRA European Heart Rhythm Association

EHRA perspective on the digital data revolution in arrhythmia management: insights from the association's annual summit

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Abstract

The 2024 European Heart Rhythm Association (EHRA) Summit in Warsaw focused on the digital transformation of arrhythmia management, convening over 130 stakeholders from academia, industry, and policy. This review summarizes the current state (in 2025) and future directions of digital health in arrhythmia care, including remote monitoring (RM) of cardiac implantable electronic devices (CIEDs), mobile health (mHealth), artificial intelligence (AI), and integration into the European Health Data Space (EHDS). RM has become central to CIED follow-up, improving outcomes and reducing healthcare use. However, challenges in reimbursement, workforce adaptation, and data interoperability persist. The absence of standardized data exchange between device vendors and healthcare systems has led to initiatives like the World Forum on CIED follow-up

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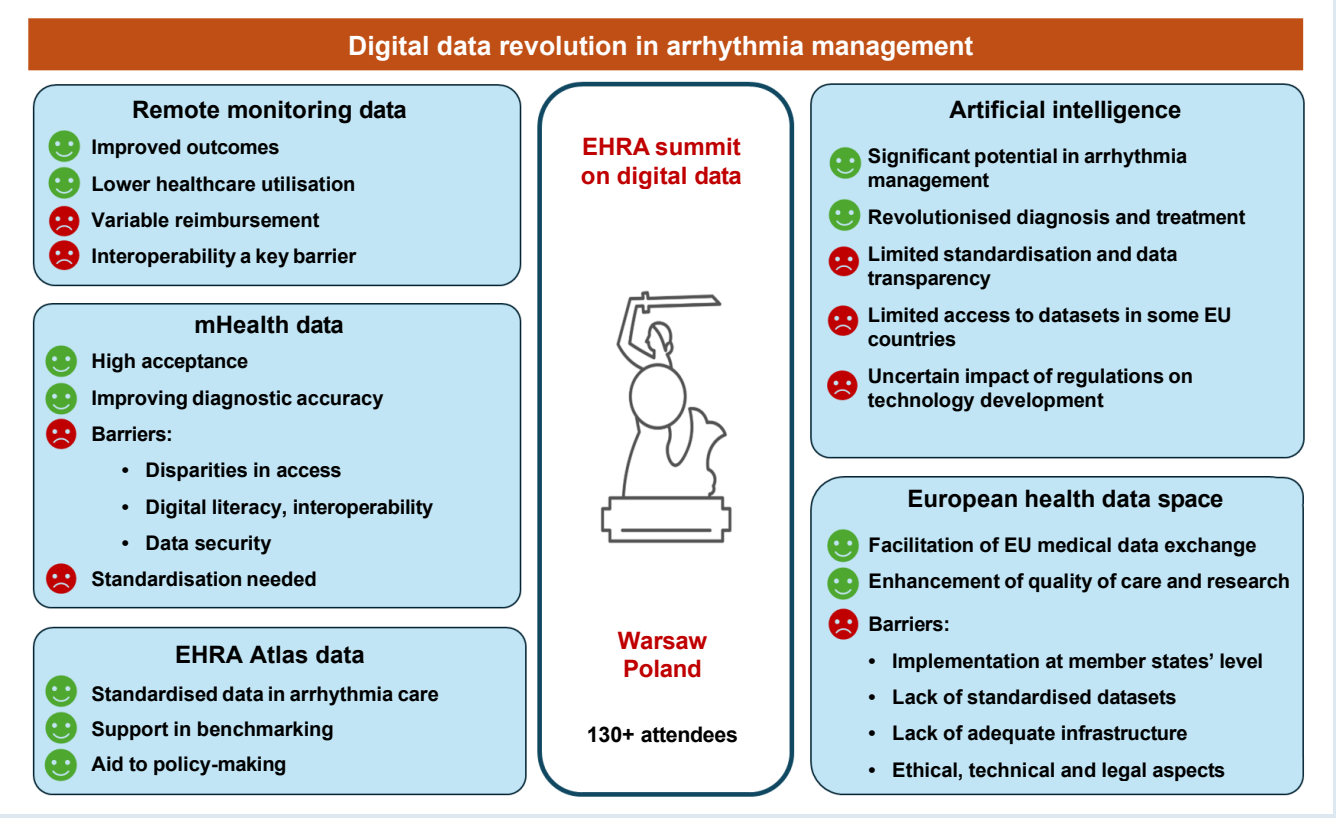
to develop interoperability standards. mHealth tools, including apps and wearable devices, offer accurate arrhythmia detection but face regulatory, digital literacy, and privacy barriers. The EHDS aims to enable cross-border data sharing for personalized care and real-world research, though implementation must address ethical, legal, and infrastructural issues. AI shows promise in prediction, monitoring, and data integration, but lacks standardized, transparent validation. The ESC-EHRA Atlas in Heart Rhythm Disorders supports structured data collection to harmonize and benchmark care across Europe.

Overall, digital innovations, if coupled with regulatory alignment, interoperability standards, and equitable access, have the potential to shift arrhythmia management toward a more predictive, personalized, and efficient model of care.

Graphical Abstract



Keywords Arrhythmia • Digital health • Remote monitoring • CIEDs • Artificial intelligence • mHealth • European Health Data Space • EHRA • Interoperability • Health data integration

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ESC European Society of Cardiology
Europace (2025) **27**, euaf124
https://doi.org/10.1093/europace/euaf124

EHRA DOCUMENT

EHRA European Heart Rhythm Association

Arrhythmia care in ESC member countries: the 2025 ESC-EHRA atlas on heart rhythm disorders

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Received 22 May 2025; accepted after revision 18 June 2025; online publish-ahead-of-print 23 July 2025

Abstract

The ESC-EHRA Atlas on Heart Rhythm Disorders was developed to comprehensively map arrhythmia care across the European Society of Cardiology (ESC) member countries. A survey of National Cardiac Societies, Working Groups, and other EHRA partners in ESC member countries was conducted to gather data from 2023 or the most recently available year on arrhythmia care organization and delivery. In total, 51 ESC member countries actively participated in the study, with a survey completeness rate of 91%. The median number of hospitals performing EP or CIED procedures was 3.3 per million people. The annual median numbers of ablation procedures for heart rhythm disorders, atrial fibrillation, and supraventricular tachycardia per million people were 432, 151, and 136, respectively. The annual median numbers of pacemakers, implantable cardioverter-defibrillators (ICD), and cardiac resynchronization therapy cardioverter-defibrillator (CRT-D) implantations per million people were 739, 195, and 54, respectively. The median number of hospitals performing remote monitoring of CIEDs per million people was 0.5, though this service was unavailable in 15 countries. Two main universal issues emerged among the obstacles to guideline implementation: a lack of heart rhythm allied professionals and general dissatisfaction with the country's reimbursement system. The first edition of the ESC-EHRA Atlas presents up-to-date information on arrhythmia care organization and delivery among ESC member countries and highlights significant discrepancies in patients' access to ESC-guideline-recommended therapies.

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ESC European Society of Cardiology
European Heart Journal (2025) **46**, 1183–1185
https://doi.org/10.1093/eurheartj/ehae916
CardioPulse

Global Spotlights

Bulgarian Society of Cardiology: 50 years on

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'Community is the foundation of success'

This quote by Kirsten Jones highlights the vital role professional communities play in uniting individuals, who share similar goals and face common challenges. National Cardiac Societies (NCSs) exemplify this, bringing together experts in cardiovascular medicine and fostering development and collaboration. As crucial members of the European Society of Cardiology (ESC), NCSs take a major part in disseminating ESC recommendations, guidelines, and initiatives across their respective countries.

The Bulgarian Society of Cardiology (BSC), a devoted member of the ESC family, has always been dedicated to fight cardiovascular disease (CVD) and promote cardiovascular health in a country which has one of the highest burdens of CVD in Europe.[1]

This year marks the BSC's 50th anniversary, an important milestone to celebrate along the journey but also to look back at BSC's initiation and achievements over the years.

The Bulgarian Society of Cardiology over the years

The BSC traces its origins to the spring of 1974, when the Society of Cardiology and Rheumatology, operating under Bulgaria's Association of Medical Scientific Societies, hosted its first National Conference on Cardiology and Rheumatology. The organizing committee was led by Prof. V. Tsonchev and included pioneering physicians who laid the foundation for the BSC. One of the major focuses of the conference was rheumatic heart disease, then prevalent in the country.

Over the years, the Society of Cardiology and Rheumatology evolved, holding regular meetings and later rebranding as the Bulgarian Society of Cardiology and Rheumatology. A pivotal moment came in 1980 when it joined the ESC NCS family, even while under the constraints of the Iron Curtain. In the challenging post-communist years, the society introduced a structured leadership model, including two-year presidential terms with President-Elect and Past President roles, ensuring continuity and sustainable growth (*Figure 1*). Today, the BSC stands as one of the most advanced medical societies in Bulgaria.

Educational and scientific activities

A key mission of the BSC is to disseminate knowledge. The society actively translates and distributes ESC guidelines in Bulgarian, making them accessible to healthcare professionals and publishing them on its website (bgcardio.org). This ensures delivery of high-quality care, in line with the latest European recommendations.

The BSC prioritizes training young physicians, through symposia and courses, that keep fellows and residents updated on advancements in the field of cardiovascular medicine. It is also actively involved as a partner in preparing the European Exam in Core Cardiology, which an increasing number of young cardiologists and fellows in training pass, with the active support of the BSC. To further support young researchers, the BSC offers research grants, fostering innovation and development within the community.

The BSC organizes diverse scientific events alone or in collaboration with partner societies. These range from topic-focused symposia to large-scale, internationally recognized meetings. The society's biennial National Congress is its flagship event, attracting around 1500 participants and marking the conclusion of each term.

The 18th National Congress of Cardiology

The 18th National Congress of Cardiology, held in October 2024 in Plovdiv, celebrated the end of the 2022–24 term. This event adopted a multidisciplinary approach, incorporating perspectives from gastroenterology, nephrology, neurology, sleep medicine, and psychiatry into cardiovascular medicine. It also addressed important broader topics, such as the legal aspects of medical care in Bulgaria.

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Received: 14 January 2025 | **Accepted:** 23 January 2025

We thank Kataoka and Imamura for their interest in our recently published survey on physician's preferences in the use of novel digital devices in the management of patients with atrial fibrillation (AF) [1, 2].

Our survey shows, that digital devices are beginning to be implemented in clinical practice. We respectfully disagree with Kataoka and Imamura that the debate on the type of monitoring technology is not critical at the moment. Our international group of authors strongly believe that the switch to increased patient involvement, to patient-initiated rhythm monitoring and to telemedical care require physician (and not industry) driven education on the technologies used, recommendations for specific diagnostic pathways, cost-effectiveness analyses and outcome-centered research [3–8].

The clinical scenarios presented in this survey do not aim to give specific recommendations on diagnostic pathways but aim to reflect common clinical scenarios we experience as physicians in daily clinical practice. Diagnostic pathways for these scenarios are reflected in current clinical practice guidelines: There is a clear recommendation to confirm AF in symptomatic

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Linee guida ESC 2024 per la gestione della fibrillazione atriale in collaborazione con la European Association for Cardio-Thoracic Surgery (EACTS)

elaborate dalla task force per la gestione della fibrillazione atriale della Società Europea di Cardiologia (ESC), con il contributo straordinario della European Heart Rhythm Association (EHRA) dell'ESC

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Резюме:

Настоящият труд представя препоръките за поведение при предсърдно мъждене на Европейското Дружество по Кардиология за 2024 година. Разгледани са основните положения относно ролята на коморбидностите и тяхното лечение по отношение на прогресията на аритмията. В етайл са представени принципите на диагностика и лечение на предсърдно мъждене - медикаментозно и немедикаментозно. Дадени са ясни препоръки за поведение в различни клинични сценарии. Всички препоръки са базирани на доказателства, изведени на базата на съществуващите големи проучвания. В графичен вид са представени и основните алгоритми за поведение, което значително улеснява разбирането и приложението им в клиничната практика.

ESC European Society of Cardiology
Europace (2024) **26**, euae298
https://doi.org/10.1093/europace/euae298

STATE OF THE ART REVIEW

Spotlight on the 2024 ESC/EACTS management of atrial fibrillation guidelines: 10 novel key aspects

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Received 9 October 2024; accepted after revision 22 November 2024; online publish-ahead-of-print 24 December 2024

Abstract

Atrial fibrillation (AF) remains the most common cardiac arrhythmia worldwide and is associated with significant morbidity and mortality. The European Society of Cardiology (ESC)/European Association for Cardio-Thoracic Surgery (EACTS) have recently released the 2024 guidelines for the management of AF. This review highlights 10 novel aspects of the ESC/EACTS 2024 Guidelines. The AF-CARE framework is introduced, a structural approach that aims to improve patient care and outcomes, comprising of four pillars: [C] Comorbidity and risk factor management, [A] Avoid stroke and thromboembolism, [R] Reduce symptoms by rate and rhythm control, and [E] Evaluation and dynamic reassessment. Additionally, graphical patient pathways are provided to enhance clinical application. A significant shift is the new emphasis on comorbidity and risk factor control to reduce AF recurrence and progression. Individualized assessment of risk is suggested to guide the initiation of oral anticoagulation to prevent thromboembolism. New guidance is provided for anticoagulation in patients with trigger-induced and device-detected sub-clinical AF, ischaemic stroke despite anticoagulation, and the indications for percutaneous/

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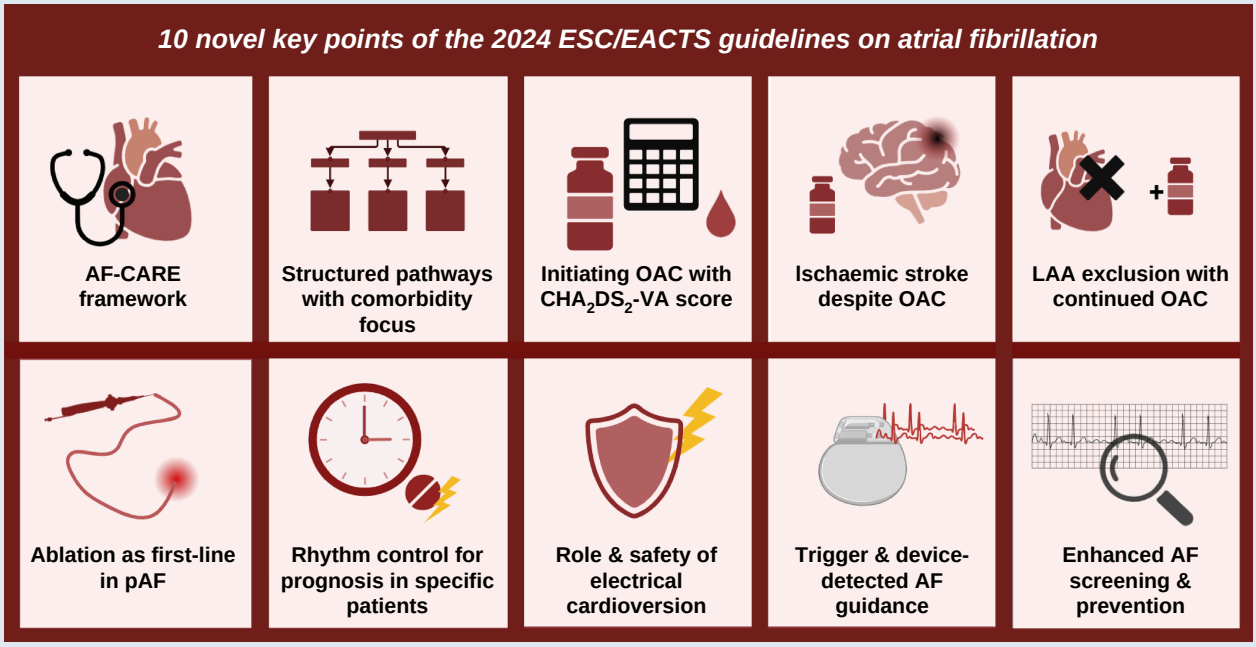
surgical left atrial appendage exclusion. AF ablation is a first-line rhythm control option for suitable patients with paroxysmal AF, and in specific patients, rhythm control can improve prognosis. The AF duration threshold for early cardioversion was reduced from 48 to 24 h, and a wait-and-see approach for spontaneous conversion is advised to promote patient safety. Lastly, strong emphasis is given to optimize the implementation of AF guidelines in daily practice using a patient-centred, multidisciplinary and shared-care approach, with the simultaneous launch of a patient version of the guideline.

Graphical Abstract



Overview of 10 novel key points in the 2024 ESC/EACTS Guidelines on the management of atrial fibrillation. AF, atrial fibrillation; LAA, left atrial appendage; OAC, oral anticoagulant; pAF, paroxysmal atrial fibrillation.

Keywords Atrial fibrillation • Management • Guidelines

Introduction

Despite significant advances in prevention, diagnosis, and treatment, atrial fibrillation (AF) remains common and continues to have a large impact on those living with AF, their relatives, and wider society.[1–3] Guidelines for the management of AF intend to maintain a 4-year update cycle, with interim updates targeted every 2 years. The European Society of Cardiology (ESC)/European Association for Cardio-Thoracic Surgery (EACTS) 2024 AF guidelines aim to evaluate and summarize available evidence to assist health professionals in optimizing their diagnostic or therapeutic approach for individual patients with AF.[4] The guideline was developed by a specifically assigned task force representing the ESC and EACTS, with contribution by the European Heart Rhythm Association (EHRA) and endorsement by the European Stroke Organisation. In this iteration of the AF guidelines, 130 recommendations are provided with underpinning evidence from robust clinical research, and a novel structured style is used for each recommendation to aid implementation. In addition, a patient version of the guideline was made available simultaneously (https://www.escardio.org/static-file/Escardio/Guidelines/Documents/ESC-Patient-Guidelines-Atrial-Fibrillation.pdf). This review aims to highlight 10 novel key aspects of the full ESC/EACTS 2024 Guidelines. Further details can be found in the full ESC/EACTS 2024 AF management guidelines.[4]

Principles of AF-CARE approach

The 2024 ESC/EACTS Guidelines on AF introduced the AF-CARE framework, a structured approach to AF management designed to enhance patient-centred care and outcomes.[4,5] AF-CARE builds on previous frameworks,[6,7] organizing care into four key pillars that integrate evidence-based management of AF with individualized patient needs (*Figure 1*). The pillars include: [C] *Comorbidity and risk factor management*, highlighting and bringing to the forefront the need for thorough evaluation and management of comorbidities and risk factors related to AF; [A] *Avoid stroke and thromboembolism*, prioritizing stroke and thromboembolism prevention through appropriate anticoagulation; [R] *Reduce symptoms by rate and rhythm control*, aiming for symptom relief and in specific patient groups adjunctive prognostic benefit; and [E] *Evaluation and dynamic reassessment,* emphasizing the need for a thorough baseline evaluation of patients with AF, including an echocardiogram for all patients with AF where this might guide treatment decisions, followed by continuous modification of care as patients living with AF and its associated comorbidities and risk factors evolve over time.

The systematic and patient-oriented AF-CARE framework serves as a guide that adapts with each patient, promoting a personalized and adaptive approach to AF management. By aligning care with the changing nature of AF and its associated comorbidities and risk factors, the

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Physician Preferences in Using Novel Digital Devices for the Management of Atrial Fibrillation—A DAS-CAM III Survey

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Received: 28 December 2023 | **Revised:** 27 May 2024 | **Accepted:** 18 July 2024

Funding: PTM was supported by National Science Centre, Poland (grant number 2021/05/X/NZ5/01511), Jagiellonian University Medical College, the John Paul II Hospital and the Ministry of Science and Higher Education stipend for outstanding young scientists.

Keywords: atrial fibrillation | digital devices | photoplethysmography | rhythm monitoring | screening | wearables

ABSTRACT

Aim: A recent European Heart Rhythm Association (EHRA) practical guide provides guidance on the use of novel digital devices for heart rhythm analysis using either electrocardiogram (ECG) or photoplethysmography (PPG) technology for the diagnosis of atrial fibrillation (AF). This survey assesses physicians' preferences to use digital devices in patients with possible AF and their impact on clinical decision-making.

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Methods and Results: Participants of the DAS-CAM III initiated and distributed an online survey assessing physician preferences in using digital devices for the management of AF in different clinical scenarios. A total of 505 physicians (median age: 38 [IQR 33–46] years) from 30 countries completed the survey. A third of respondents were electrophysiologists, the others were cardiologists, cardiology residents, or general practitioners. Electrophysiologists were more likely to have experience with both ECG-based (92% vs. 68%, $p < 0.001$) and PPG-based (60% vs. 34%, $p < 0.001$) digital devices. The initial diagnostic approach to each scenario (symptomatic low-risk, symptomatic high-risk, or asymptomatic high-risk patient) was heterogeneous. Electrophysiologists preferred intermittent single-lead ECG monitoring to traditional Holter ECGs to screen for AF. Both electrophysiologists and non-electrophysiologists would rarely use PPG-based devices to diagnose and screen for AF (8.2%–9.8%). Electrophysiologists and non-electrophysiologists use ECG-based technology to confirm PPG-documented tracings suggestive of AF.

Conclusion: While PPG-based digital devices are rarely used for diagnosis and screening for AF, intermittent ECG-based digital devices are beginning to be implemented in clinical practice. More education on the potential of novel digital devices is required to achieve diagnostic pathways as suggested by the EHRA practical guide.

1 | Introduction

Technological advances in digital devices using either electrocardiogram (ECG) or photoplethysmography (PPG) signals to assess heart rate and rhythm have led to a rapid uptake of these devices in clinical practice for arrhythmia diagnosis and remote management of patients with arrhythmias [1–4]. European Society of Cardiology (ESC) guidelines continue to require ECG documentation for the diagnosis of rhythm disorders, including atrial fibrillation (AF). Therefore, devices using ECG technology remain the gold standard for arrhythmia detection. However, PPG-based consumer-facing technology (e.g., smartphones, smartwatches) offers the advantages of wide availability, ease of use, and ability to perform continuous monitoring (e.g., by a smartwatch) [5–7]. Although PPG-based digital devices and accompanying algorithms have been validated for AF detection and heart rate assessment during sinus rhythm and AF, the uptake of PPG-based devices into clinical practice remains limited [4, 8–10]. In 2020, the wEHRAbles surveys demonstrated that clinicians are aware of novel digital devices and that they are used in routine clinical practice, but ECG-based devices are used almost exclusively in preference to PPG-based devices [3, 4]. In 2022, the European Heart Rhythm Association (EHRA) published a practical guide for the use of digital devices for arrhythmia management [1]. This guide stated that both PPG- and ECG-based digital devices can be used for arrhythmia detection in symptomatic patients in both AF screening and AF management. Despite increasing evidence for PPG-based devices, current physician preferences in using novel digital devices for the management of AF are unknown.

The Diploma of Advanced Studies in Cardiac Arrhythmia Management III (DAS-CAM III) participants initiated and conducted a survey to assess how physicians use digital devices in patients with possible AF and to identify the impact of data derived from ECG- and PPG-based digital devices on clinical decision-making.

2 | Materials and Methods

An online questionnaire consisting of 22 questions was distributed by EHRA DAS-CAM III participants via their networks as well as via social media platforms (Twitter, LinkedIn, and Facebook). The questionnaire included questions on demographics (age, location, and current profession), experience with ECG- and PPG-based rhythm monitoring devices, and three specific patient scenarios. The scenarios, described in Table 1, included (1) a symptomatic low-risk patient (a 45-year-old male with CHA_2DS_2-VASc = 0 with a rapid heartbeat twice per week), (2) an asymptomatic high-risk patient (a 70-year-old female with hypertension and type II diabetes mellitus [CHA_2DS_2-VASc = 4]), and (3) a symptomatic high-risk patient (a 70-year-old female patient with hypertension and type II diabetes mellitus [CHA_2DS_2-VASc 4] with episodes of rapid heartbeat twice per week). Participants could

TABLE 1 | Case scenarios.

	Case 1: Symptomatic low-risk patient	Case 2: Asymptomatic high-risk patient	Case 3: Symptomatic high-risk patient
Gender	Male	Female	Female
Age (years)	45	70	70
Reason for consultation	Palpitations	Regular follow-up	Palpitations
Comorbidities	None	Hypertension, type II diabetes mellitus	Hypertension, type II diabetes mellitus
Symptoms	Rapid heartbeat 2×/week	None	Rapid heartbeat 2×/week
CHA_2DS_2-VASc	0	4	4

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Ablation of Supraventricular Arrhythmias With as Low as Reasonably Achievable X-Ray exposure (AALARA)

Results of Prospective, Observational, Multicenter, Multinational, Open-Label *Registry Study* on Real World Data Using Routine Ensite 3D Mapping During SVT Ablation

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Received: 9 July 2024 | **Revised:** 15 August 2024 | **Accepted:** 4 September 2024

Funding: The AALARA study is funded by Abbott Medical. The funder had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Keywords: 3D mapping | catheter ablation | fluoroscopy | interventional electrophysiology | zero radiation

ABSTRACT

Introduction: The reduction of fluoroscopic exposure during catheter ablation of supraventricular arrhythmias is widely adopted by experienced electrophysiology physicians with a relatively short learning curve and is becoming the standard of care in many parts of the world. While observational studies in the United States and some parts of Western Europe have evaluated the minimal fluoroscopic approach, there are scarce real-world data for this technique and the generalizability of outcomes in other economic regions.

Method: The AALARA study is a prospective, observational, multicenter, and multinational open-label study. Patients were recruited from 13 countries across Central Eastern Europe, North and South Africa, the Middle East, and the CIS (Commonwealth of Independent States), with different levels of operator expertise using minimal fluoroscopic exposure techniques. Data on radiation exposure, procedural success, complications, recurrence, and quality of life changes were collected and analyzed.

Abbreviations: ACC, American College of Cardiology; AHA, American Heart Association; ALARA, as low as reasonably achievable; AVNRT, Atrio Ventricular Node Reentrant Tachycardia; CTI, Cavo Tricuspid Isthmus; EP, electrophysiological; ESC, European Society Cardiology; HRS, Heart Rhythm Society; NYHA, New York Heart Association; SVT, supraventricular tachycardia.

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Result: A total of 680 patients were enrolled and followed for 6 months. The majority were ablation naïve with the commonest arrhythmia ablated being typical AVNRT (58%) followed by Atrial Flutter (23%). Zero fluoroscopy exposure was observed in almost 90% of the cases. Fluoroscopy was most commonly used during the ablation phase of the procedure. We observed a high acute success rate (99%), a low complication rate (0.4%), and a 6-month recurrence rate of 3.8%. There was a significant improvement in the patient's symptoms and quality of life as measured by patient global assessment.
Conclusion: The routine use of a 3D mapping system during right-sided ablation was associated with low radiation exposure and associated with high acute success rate, low complications, and recurrence rate along with significant improvement in quality of life. The data confirm the reproducibility of this approach in real-world settings across different healthcare systems, and operator experience supporting this approach to minimize radiation exposure without compromising efficacy and safety.
Trial Registration: NCT04716270

1 | Introduction

Catheter ablation is the gold standard electrophysiological (EP) treatment of symptomatic and recurrent supraventricular tachycardia (SVT), supported by guidelines from the European Society of Cardiology (ESC), American College of Cardiology (ACC), American Heart Association (AHA), and Heart Rhythm Society (HRS). The success rate of these procedures is greater than 90% [1, 2].

Conventionally, radiofrequency catheter ablation of SVT was performed under fluoroscopic guidance to visualize catheter position and movements [3]. As a result, this is associated with ionizing radiation exposure, affecting both the medical staff and the patient [4–6]. Moreover, wearing a lead apron is associated with musculoskeletal disorders, further increasing the occupational hazard [7, 8].

Utilizing the "ALARA" (as low as reasonably achievable) principle includes technological, physical, and organizational measures that are meant to decrease the amount of ionizing radiation [9–11]. The use of a "near zero," and zero fluoroscopic approach in SVTs' treatment has been thoroughly investigated within the past few years [12–17]. Most of the available data come from single-center experiences and few randomized studies. While observational studies in the United States and some parts of Western Europe have evaluated the minimal fluoroscopic approach, there are scarce real-world data for this technique and the generalizability of outcomes in other economic regions. Our current study ("arrhythmias with as low as reasonably achievable X-ray exposure [AALARA]") aims to provide real-world multicenter evidence on the use of EnSite mapping system for catheter ablation of right-sided SVTs in the region out of Western Europe/United States (Central East Europe, North and South Africa, the Middle East, and the Commonwealth Independent States).

2 | Methods

2.1 | Study Design

The AALARA study is a prospective, observational, multicenter, and multinational open-label study, with patients recruited from sites in 13 countries: Bahrain, Bulgaria, Czech Republic, Hungary, Kazakhstan, Morocco, Russia, Serbia, Slovakia, South Africa, Tunisia, United Arab Emirates, and Ukraine. The study was approved by the ethics committee at Mohammed Bin Khalifa Specialist Cardiac Centre (BDF/R&REC/2020-504) and the medical ethics committees of all participating sites and was conducted in accordance with the principles of the Declaration of Helsinki. The Mohammed Bin Khalifa Specialist Cardiac Centre, Riffa, Kingdom of Bahrain, is the legal sponsor, and responsible for developing, implementing and managing the study in accordance with the protocol and all applicable laws and regulations.

A clinical research organization (CRO Dr. med Kottmann GmbH & Co. KG, Hamm, Germany) has been appointed to manage regulatory submissions, the creation of the study database, monitoring of the sites, project management, data management, and statistical analysis. The trial protocol was described previously [18]. The study started in May 2021 and the last patient was enrolled in May 2023. All drafts of this manuscript were written by the first and last author, with review and edits by the other authors.

2.2 | Patients

After providing written informed consent, consecutive adult patients with right-sided SVT with an indication of EP catheterization were enrolled in the study. The details of the inclusion and exclusion criteria were previously described [18]. Patients ≥ 18 years of age who are willing to provide written informed consent were included. Exclusion criteria included pregnancy, life expectancy of less than 1-year, complex congenital heart disease, presence of cardiac implantable electronic devices, and known pathological venous access to the heart. Patients with left-sided arrhythmia or substrate were excluded from analysis.

2.3 | Study Procedure

After obtaining vascular access, diagnostic catheters were introduced in the right atrium to create the right atrial (and right ventricular, if necessary) geometry and map the coronary sinus using the EnSite Precision mapping system allowing non-fluoroscopic positioning of catheters in all cases. After that, impedance calibration and compensation for respiratory movements were performed. From then on, the EP study, subsequent catheter manipulation, and ablation were carried out according to the respective guidelines and local standards. The mapping system

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Balkan Med J 2024;41:442-57

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Takotsubo Syndrome: An International Expert Consensus Report on Practical Challenges and Specific Conditions (Part-2: Specific Entities, Risk Stratification and Challenges After Recovery)

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Received: September 18, 2024 **Accepted:** September 26, 2024 **Available Online Date:** October 17, 2024 • **DOI:** 10.4274/balkanmedj.galenos.2024.2024-9-99

Available at www.balkanmedicaljournal.org

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Cite this article as: Yalta K, Madias JE, Kounis NG, Y-Hassan S, Polovina M, Altay S, Mebazaa A, Yilmaz MB, Lopatin Y, Mamas MA, Gil RJ, Thamman R, Almaghraby A, Bozkurt B, Bajraktari G, Fink T, Traykov V, Manzo-Silberman S, Mirzoyev U, Sokolovic S, Kipiani ZV, Linde C, Seferovic PM. Takotsubo Syndrome: An International Expert Consensus Report on Practical Challenges and Specific Conditions (Part-2: Specific Entities, Risk Stratification and Challenges After Recovery). Balkan Med J.; 2024; 41(6):442-57.

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ABSTRACT

Takotsubo syndrome (TTS) still remains as an enigmatic phenomenon. In particular, long-term challenges (including clinical recurrence and persistent symptoms) and specific entities in the setting of TTS have been the evolving areas of interest. On the other hand, a significant gap still exists regarding the proper risk-stratification of this phenomenon in the short and long terms. The present paper, the second part (part-2) of the consensus report, aims to discuss less well-known aspects of TTS including specific entities, challenges after recovery and risk-stratification.

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Takotsubo Syndrome: An International Expert Consensus Report on Practical Challenges and Specific Conditions (Part-1: Diagnostic and Therapeutic Challenges)

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Received: September 18, 2024 **Accepted:** 26 Sep, 2024 **Available Online Date:** October 17, 2024 • **DOI:** 10.4274/balkanmedj.galenos.2024.2024-9-98

Available at www.balkanmedicaljournal.org

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Cite this article as: Yalta K, Madias JE, Kounis NG, Y-Hassan S, Polovina M, Altay S, Mebazaa A, Yilmaz MB, Lopatin Y, Mamas MA, Gil RJ, Thamman R, Almaghraby A, Bozkurt B, Bajraktari G, Fink T, Traykov V, Manzo-Silberman S, Mirzoyev U, Sokolovic S, Kipiani ZV, Linde C, Seferovic PM. Takotsubo Syndrome: An International Expert Consensus Report on Practical Challenges and Specific Conditions (Part-1: Diagnostic and Therapeutic Challenges). Balkan Med J.; 2024; 41(2):421-41.

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ABSTRACT

In the recent years, there has been a burgeoning interest in Takotsubo syndrome (TTS), which is renowned as a specific form of reversible myocardial dysfunction. Despite the extensive literature available on TTS, clinicians still face several practical challenges associated with the diagnosis and management of this phenomenon. This potentially results in the underdiagnosis and improper management of TTS in clinical practice. The present paper, the first part (part-1) of the consensus report, aims to cover diagnostic and therapeutic challenges associated with TTS along with certain recommendations to combat these challenges.

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ESC European Society of Cardiology

European Heart Journal (2024) **45**, 3707–3717
https://doi.org/10.1093/eurheartj/ehae539

FASTTRACK – CLINICAL RESEARCH
Arrhythmias

Gender and contemporary risk of adverse events in atrial fibrillation

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Received 26 February 2024; revised 25 April 2024; accepted 8 August 2024; online publish-ahead-of-print 1 September 2024

See the editorial comment for this article 'CHA$_2$DS$_2$-VASc or a non-sex score (CHA$_2$DS$_2$-VA) for stroke risk prediction in atrial fibrillation: contemporary insights and clinical implications', by G.Y.H. Lip *et al.*, https://doi.org/10.1093/eurheartj/ehae540.

Abstract

Background and Aims The role of gender in decision-making for oral anticoagulation in patients with atrial fibrillation (AF) remains controversial.

Methods The population cohort study used electronic healthcare records of 16 587 749 patients from UK primary care (2005–2020). Primary (composite of all-cause mortality, ischaemic stroke, or arterial thromboembolism) and secondary outcomes were analysed using Cox hazard ratios (HR), adjusted for age, socioeconomic status, and comorbidities.

Results 78 852 patients were included with AF, aged 40–75 years, no prior stroke, and no prescription of oral anticoagulants. 28 590 (36.3%) were women, and 50 262 (63.7%) men. Median age was 65.7 years (interquartile range 58.5–70.9), with women being older and having other differences in comorbidities. During a total follow-up of 431 086 patient-years, women had a lower adjusted primary outcome rate with HR 0.89 vs. men (95% confidence interval [CI] 0.87–0.92; $P < .001$) and HR 0.87 after censoring for oral anticoagulation (95% CI 0.83–0.91; $P < .001$). This was driven by lower mortality in women (HR 0.86, 95% CI 0.83–0.89; $P < .001$). No difference was identified between women and men for the secondary outcomes of ischaemic stroke or arterial thromboembolism (adjusted HR 1.00, 95% CI 0.94–1.07; $P = .87$), any stroke or any thromboembolism (adjusted HR 1.02, 95% CI 0.96–1.07; $P = .58$), and incident vascular dementia (adjusted HR 1.13, 95% CI 0.97–1.32; $P = .11$). Clinical risk scores were only modest predictors of outcomes, with CHA$_2$DS$_2$-VA (ignoring gender) superior to CHA$_2$DS$_2$-VASc for primary outcomes in this population (receiver operating characteristic curve area 0.651 vs. 0.639; $P < .001$) and no interaction with gender ($P = .45$).

Conclusions Removal of gender from clinical risk scoring could simplify the approach to which patients with AF should be offered oral anticoagulation.

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Structured Graphical Abstract

Key Question

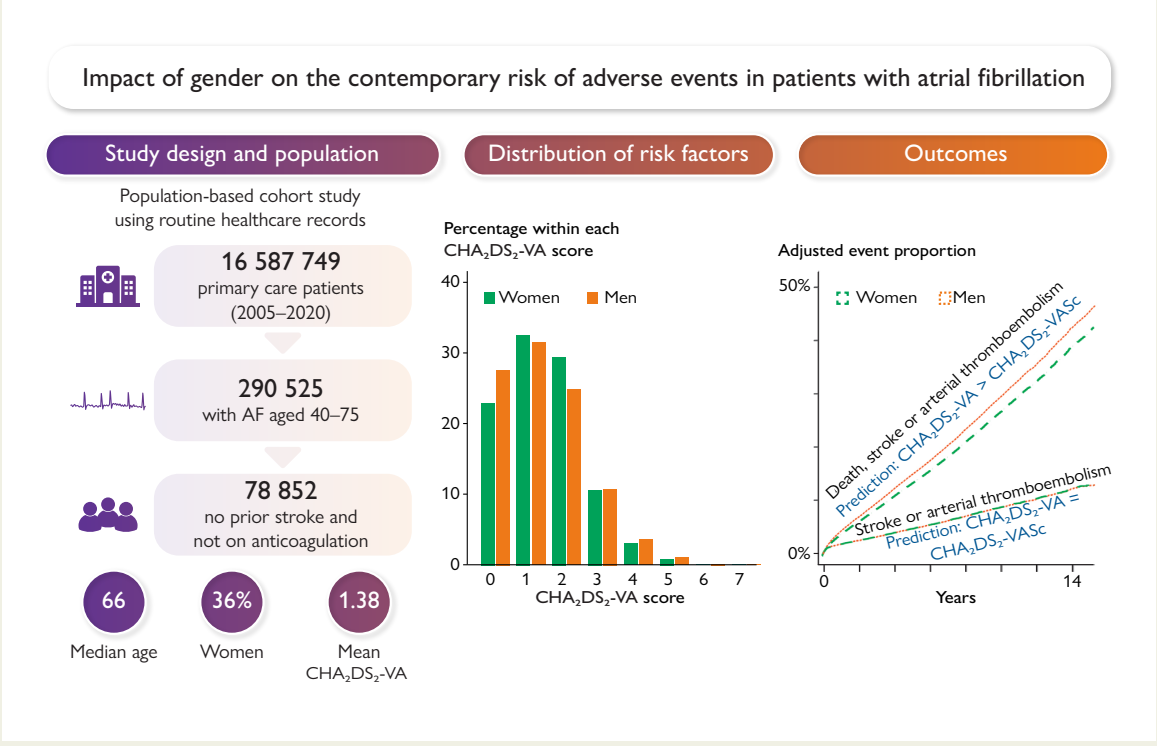
Should gender be used in current clinical practice to decide which patients with atrial fibrillation (AF) need oral anticoagulation?

Key Finding

Women had a lower rate of the composite of death, stroke and embolism, and no difference compared to men for stroke/embolism or vascular dementia, after accounting for confounding factors.

Take Home Message

Removal of gender from risk stratification in AF could simplify the identification of patients who should be offered oral anticoagulation.



The impact of gender on adverse events in patients with atrial fibrillation (AF) based on a population cohort study using electronic healthcare records from UK primary care (2005–20).

Keywords Atrial fibrillation • Gender • Women • Sex • Stroke • Thromboembolism

Introduction

Atrial fibrillation (AF) remains a common, costly, and high-morbidity condition impacting patients across the whole spectrum of healthcare. The high and ultimately preventable risk of stroke and other thromboembolic events associated with AF[1] has driven the generation of clinical risk scores to help determine which patients would benefit from oral anticoagulation. These range from simple clinical classification systems, which have dominated routine practice,[2,3] to more complex algorithms[4] and the use of biomarkers.[5] However, most clinical risk scores have broadly similar performance and may not accurately predict those that will go on to suffer from strokes, may not account for the use of direct oral anticoagulants (DOACs), and ignore other thromboembolic outcomes, such as vascular dementia.

A further challenge with AF risk scores has been their inclusion of gender as a risk stratifier. Higher rates of stroke in women with AF have been reported in historical data,[6] although this is likely confounded by the contribution of other risk factors. This includes older age and lower anticoagulation rates in women and higher mortality in men, which is a competing risk for stroke. More recently, gender has been reconsidered as a risk modifier;[7,8] however, international guidelines vary considerably (*Figure 1*; Supplementary data online, *Table S1*). The inclusion of gender in risk scores has typically been circumvented by using different risk cut-offs for each gender, for example, a CHA_2DS_2-VASc score of 2 for men, but 3 for women, to qualify for a class I indication for oral anticoagulation.

This population cohort study was performed to address a key evidence gap in patients with AF, where gender plays a role in the decision for anticoagulation. The study specifically excluded those with prior stroke or age ≥75 years where there is strong confounding of clinical outcomes and guideline-recommended indication for oral anticoagulation, irrespective of the patient's gender. The aim of this study was to provide real-world evidence on the value of gender for risk stratification in contemporary patients with AF where anticoagulation is being considered.

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ESC European Society of Cardiology
European Heart Journal (2024) **45**, 3314–3414
https://doi.org/10.1093/eurheartj/ehae176

2024 ESC Guidelines for the management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS)

Developed by the task force for the management of atrial fibrillation of the European Society of Cardiology (ESC), with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC.
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Patient Forum

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All experts involved in the development of these guidelines have submitted declarations of interest which are reported in a supplementary document to the guidelines. See the *European Heart Journal* online or www.escardio.org/guidelines for supplementary documents as well as evidence tables.

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Keywords Guidelines • Atrial fibrillation • AF-CARE • Comorbidity • Risk factors • Anticoagulation • Rate control • Rhythm control • Cardioversion • Antiarrhythmic drugs • Catheter ablation • AF surgery • Evaluation • Stroke • Thromboembolism

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Резюме:

Настоящият труд представя препоръките за поведение при предсърдно мъждене на Европейското Дружество по Кардиология за 2024 година. Разгледани са основните положения относно ролята на коморбидностите и тяхното лечение по отношение на прогресията на аритмията. В етайл са представени принципите на диагностика и лечение на предсърдно мъждене - медикаментозно и немедикаментозно. Дадени са ясни препоръки за поведение в различни клинични сценарии. Всички препоръки са базирани на доказателства, изведени на базата на съществуващите големи проучвания. В графичен вид са представени и основните алгоритми за поведение, което значително улеснява разбирането и приложението им в клиничната практика.

ESC European Society of Cardiology
Europace (2024) **26**, euae108
https://doi.org/10.1093/europace/euae108
EHRA DOCUMENT
EHRA European Heart Rhythm Association

Pre- and post-procedural cardiac imaging (computed tomography and magnetic resonance imaging) in electrophysiology: a clinical consensus statement of the European Heart Rhythm Association and European Association of Cardiovascular Imaging of the European Society of Cardiology

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Received 10 April 2024; accepted after revision 11 April 2024; online publish-ahead-of-print 14 May 2024

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Abstract

Imaging using cardiac computed tomography (CT) or magnetic resonance (MR) imaging has become an important option for anatomic and substrate delineation in complex atrial fibrillation (AF) and ventricular tachycardia (VT) ablation procedures. Computed tomography more common than MR has been used to detect procedure-associated complications such as oesophageal, cerebral, and vascular injury. This clinical consensus statement summarizes the current knowledge of CT and MR to facilitate electrophysiological procedures, the current value of real-time integration of imaging-derived anatomy, and substrate information during the procedure and the current role of CT and MR in diagnosing relevant procedure-related complications. Practical advice on potential advantages of one imaging modality over the other is discussed for patients with implanted cardiac rhythm devices as well as for planning, intraprocedural integration, and post-interventional management in AF and VT ablation patients. Establishing a team of electrophysiologists and cardiac imaging specialists working on specific details of imaging for complex ablation procedures is key. Cardiac magnetic resonance (CMR) can safely be performed in most patients with implanted active cardiac devices. Standard procedures for pre- and post-scanning management of the device and potential CMR-associated device malfunctions need to be in place. In VT patients, imaging—specifically MR—may help to determine scar location and mural distribution in patients with ischaemic and non-ischaemic cardiomyopathy beyond evaluating the underlying structural heart disease. Future directions in imaging may include the ability to register multiple imaging modalities and novel high-resolution modalities, but also refinements of imaging-guided ablation strategies are expected.

Keywords Cardiac computed tomography • Cardiac magnetic resonance imaging • Imaging-guided ablation • Imaging-aided ablation • Atrial fibrillation • Catheter ablation • Ventricular tachycardia • Active cardiac devices • Complications • Oesophago-atrial fistula

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REVIEW

Stronger together: The impact of Joint Advocacy efforts for European Union and National Cardiovascular Health Plans

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DOI: 10.33963/v.phj.102281

Received:
July 26, 2024

Accepted:
August 26, 2024

Early publication date:
August 27, 2024

EUROPEAN SOCIETY OF CARDIOLOGY ADVOCACY AND EU CARDIOVASCULAR HEALTH PLAN

Despite the decline in cardiovascular disease (CVD) mortality in many countries, CVDs remain the most common cause of death within the European Union (EU), comprising 37% of all deaths [1]. More than 60 million people are living with CVD in the EU, roughly 1 in 10 Europeans. The burden associated with CVD is enormous for healthcare systems, society, and for patients and their families. In 2021, in addition to the human costs, CVD was estimated to cost the EU €282 billion [2]. In addition to mortality, morbidity, and costs, the experience of a heart attack or stroke can also have a profound and lasting impact on the quality of life of those affected, as well as their families or caregivers. CVD is very often perceived as a "lifestyle" disease related to modifiable risk factors, such as tobacco use, harmful alcohol intake, an unhealthy diet, and physical inactivity, for which the individuals themselves are to blame. However, many risk factors lie outside the individual's control. Therefore, the issue is much more complex and requires population-level policy interventions and a mindset shift. Many of the modifiable risk factors associated with CVD are also risk factors for certain cancers, and yet cancer and cancer treatment are viewed very differently by laypeople and policymakers. Another common misperception is that CVD is limited to older people. CVD heavily impacts people of all age groups and is the leading cause of mortality in people under 65 years in Europe [3]. While CVDs can occur at any age, their risk and prevalence increase in older people, which is particularly relevant given Europe's aging population. The population aged 65 years or older is predicted to increase significantly in the EU, rising from 90.5 million at the start of 2019 to an estimated 130 million by 2050 [4], and there will be corresponding increases in CVD incidence and its associated burden.

Furthermore, this burden is spread unevenly over Europe. Tremendous inequalities remain in patient access to appropriate cardiovascular (CV) care within and across EU countries. CVD accounts for 50%–60% of all deaths in the Baltic States and Romania, almost two-thirds (65%) in Bulgaria, but in contrast, fewer than one-quarter of all deaths in France (24%) and Denmark (22%) [4]. The higher incidence, prevalence, and disability in lower-income countries confirm the close correlation between health and wealth [5]. In addition, significant sex inequity persists in

Current Cardiology Reports
https://doi.org/10.1007/s11886-023-01997-1

GLOBAL CARDIOVASCULAR HEALTH (L SPERLING AND D GAITA, SECTION EDITORS)

Cardioneuroablation for the Treatment of Vasovagal Syncope: Current Status and Impact on Quality of Life

Vassil Traykov[1] · **Tchavdar Shalganov**[2]

Accepted: 8 November 2023
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Abstract

Purpose of Review Vasovagal syncope (VVS) is a common entity causing transient loss of consciousness and affecting quality of life. Guideline-recommended therapy involves conservative measures and pacing in selected patients. Cardioneuroablation (CNA) targeting the ganglionated plexi in the heart has been shown to reduce excessive vagal excitation, which plays a major role in the pathophysiology of VVS and functional bradycardia.

Recent Findings The introduction of CNA has fueled research into its value for the treatment of VVS. Multiple observational studies and one randomized trial have demonstrated the safety and efficacy of CNA and the positive impact on quality of life. This review describes the rationale and CNA procedural techniques and outcomes. Patient selection and future directions have also been described.

Summary Cardioneuroablation is a promising treatment for patients with recurrent VVS and functional bradycardia. Further large-scale randomized studies are needed to further verify the safety and efficacy of this approach.

Keywords Cardioneuroablation · Vasovagal syncope · Functional bradycardia

Introduction

Vasovagal syncope (VVS) is the most common type of reflex syncope affecting patients at any age [1–3]. It is caused by bradycardia of sudden onset, hypotension, or a combination of the two resulting from hypervagotonia. Referred to as the common faint, VVS is usually a benign condition. However, in some patients, the sudden onset without premonitory symptoms may result in injury and frequent syncopal episodes associated with impaired quality of life [4].

Treatment strategies for VVS include physical counterpressure maneuvers, increased salt and water intake, and drug therapy with fludrocortisone and midodrine, all of which are recommended with a low class of recommendation [3]. The possible reason for that is these interventions' disappointing results [5•]. In the current guidelines of the European Society of Cardiology, dual-chamber pacing (DDD) is recommended in patients older than 40 years with severe, unpredictable, and recurrent syncope with documented asystole [6]. However, there is no firm evidence of benefit of cardiac pacing in patients younger than 40 years.

Cardioneuroablation (CNA) has emerged as a strategy for treating conditions associated with increased vagal tone–VVS, functional AV block, and sinus node dysfunction [7, 8, 9••]. Although studied mainly in non-randomized patient cohorts and in only one randomized controlled trial, this treatment seems to be a promising therapy for patients with these conditions.

This narrative review will summarize the rationale and available techniques for CNA, focusing on endpoints. It will also cover the evidence for benefit and pitfalls of this therapeutic approach. The impact of CNA on quality of life will also be reviewed.

Rationale for Cardioneuroablation

Pathophysiology of Vasovagal Syncope

VVS is the most common type of reflex syncope. It is the result of an abnormal autonomic reflex and the inability

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Published online: 20 November 2023

frontiers | Frontiers in Cardiovascular Medicine

TYPE Case Report
PUBLISHED 14 September 2023
DOI 10.3389/fcvm.2023.1251874

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OPEN ACCESS

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RECEIVED 02 July 2023
ACCEPTED 31 August 2023
PUBLISHED 14 September 2023

CITATION
Traykov V, Marchov D, Martinov E, El Abbady A, Gelev V and Dichtl W (2023) Ongoing substrate-driven atrial fibrillation "boxed" in the left atrial posterior wall with ablation: a case report.
Front. Cardiovasc. Med. 10:1251874.
doi: 10.3389/fcvm.2023.1251874

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Ongoing substrate-driven atrial fibrillation "boxed" in the left atrial posterior wall with ablation: a case report

Vassil Traykov[1]*, Daniel Marchov[1], Emiliyan Martinov[1], Asmaa El Abbady[2], Valeri Gelev[1] and Wolfgang Dichtl[3]

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Patients undergoing valve surgery for rheumatic heart disease are expected to develop significant atrial arrhythmogenic substrates outside of the pulmonary veins, which sometimes require complex ablation techniques for the treatment of symptomatic arrhythmias. We describe, herein, the case of a 76-year-old male undergoing endocardial ablation for the treatment of symptomatic persistent atrial fibrillation which developed after aortic and mitral valve replacement with a simultaneous tricuspid ring annuloplasty. Following pulmonary vein isolation, the patient's atrial fibrillation was converted into cavotricuspid isthmus-dependent atrial flutter. After a successful cavotricuspid isthmus ablation, the arrhythmia reverted back to a left atrial tachyarrhythmia originating from the posterior wall. A linear left atrial lesion led to the electrical isolation of a large area, which included the posterior wall, as well as the containment of the ongoing fibrillatory activity, while sinus rhythm was restored in the rest of the atria. In conclusion, successful left atrial posterior wall isolation can be achieved in the setting of severe scarring due to previous atriotomy by creating a linear lesion on the atrial roof, in conjunction with pulmonary vein isolation, sparing the patient from requiring bottom-line ablation, and avoiding possible esophageal injury. Such compartmentalization of the left atrium may effectively contain local fibrillatory activity, while allowing for the restoration of sinus rhythm.

KEYWORDS

posterior wall, box lesion, independent tachycardia, ablation, case report

Introduction

Pulmonary vein isolation (PVI) is the mainstay of atrial fibrillation (AF) ablation. At present, it is unclear whether or not the ablation of additional substrates targeting electrical isolation in other atrial areas, such as the left atrium (LA) or left atrial posterior wall (LAPW), provides the same benefit, as no randomized clinical trials have shown improved benefits (1, 2). Macroreentrant atrial arrhythmias can occur late after mitral valve replacement due to the scarring associated with atriotomy. Extensive scarring may also occur in remote areas of the LA, particularly in patients with a history of rheumatic heart disease (3). The case report presented herein describes the case of a patient with a long history of AF, who underwent mitral and aortic valve replacement in conjunction with tricuspid ring annuloplasty for the treatment of rheumatic valvular heart disease. The patient underwent a successful isolation of a large low-voltage area of the LAPW

BMJ Open

Routine use of a 3D mapping system in the ablation of supraventricular arrhythmias with as low as reasonably achievable X-ray exposure (AALARA): protocol for a prospective, observational, multicentre, multinational, open-label registry study

Nandor Szegedi,[1] Evgeniy Kropotkin,[2] Vassil Traykov,[3] Ayan Abdrakhmanov,[4] Faizel Lorgat,[5] Oleg Sapelnikov,[6] Stefanie Simons,[7] Mohammad I Amin [8]

To cite: Szegedi N, Kropotkin E, Traykov V, *et al*. Routine use of a 3D mapping system in the ablation of supraventricular arrhythmias with as low as reasonably achievable X-ray exposure (AALARA): protocol for a prospective, observational, multicentre, multinational, open-label registry study. *BMJ Open* 2023;**13**:e072181. doi:10.1136/bmjopen-2023-072181

► Prepublication history for this paper is available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2023-072181).

Received 27 January 2023
Accepted 18 July 2023

Check for updates

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ABSTRACT

Introduction The reduction of fluoroscopic exposure during catheter ablation of supraventricular arrhythmias is widely adopted by experienced electrophysiology physicians with a relatively short learning curve and is becoming standard of care in many parts of the world. While observational studies in the USA and some parts of Western Europe have evaluated the minimal fluoroscopic approach, there are scarce real-world data for this technique and generalisability of outcome in other economic regions.

Methods and analysis The arrhythmias with as low as reasonably achievable X-ray exposure study is a prospective, observational, multicentre and multinational open-label registry study. Up to 700 patients undergoing catheter ablation for right-sided supraventricular arrhythmias (according to national guidelines) will be enrolled for the routine use of the EnSite Precision 3D mapping system. Participating sites are distributed in 13 countries from Central Eastern Europe, North and South Africa, the Middle East and the CIS (Commonwealth of Independent States), with different levels of expertise using minimal fluoroscopic exposure techniques. After electrophysiological procedure, patients will be followed up for 6 months either in-clinic or via telephone interview. Patients will be asked to complete a study questionnaire at enrolment and 6 months after the invasive procedure to assess quality of life changes secondary to the procedure. The study's primary objective is to describe ionising radiation exposure during catheter ablation when the EnSite Precision 3D mapping system is used in supraventricular tachycardia ablation. The study's secondary objective is to assess the safety and efficacy of this method. Furthermore, fluoroscopy timing, total procedure time, success rate and complications will be reported.

Ethics and dissemination The study was approved by the ethics committee at Mohammed Bin Khalifa Specialist Cardiac Centre (BDF/R&REC/2020-504) and the medical ethics committees of all participating sites. Participants will be required to provide informed consent before enrolment in the study. The study results will be published and presented at conferences.

Trial registration number NCT04716270

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Multinational observational registry study in Central Eastern Europe, Africa, the Middle East and CIS to investigate real-world outcomes of low fluoroscopy ablation treatment in right-sided supraventricular tachycardia.
⇒ Six months follow-up.
⇒ Independent data entry in electronic case report form.
⇒ Unblinded non-comparative study.

INTRODUCTION

Catheter ablation is used extensively in the electrophysiological (EP) management of symptomatic and recurrent supraventricular tachycardia (SVT).[1] In this procedure, thermal injury of arrhythmogenic substrates is delivered by EP catheter. Patient-reported outcome measures consistently demonstrate that patients experience significant improvements in their quality of life following ablation.[2–5]

Current guidelines from European Society Cardiology (ESC), American College of Cardiology (ACC), American Heart Association (AHA), and Heart Rhythm Society (HRS) support catheter ablation as a modality of choice for long-term treatment of different types of SVTs (recommendation class I).[1 6]

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Check for updates

Received: 1 September 2022 | Revised: 10 April 2023 | Accepted: 28 April 2023

DOI: 10.1002/joa3.12870

Journal of Arrhythmia Open Access WILEY

ORIGINAL ARTICLE

Endocardial, epicardial, and right atrial approach for catheter ablation of premature ventricular contractions from the inferoseptal process of the left ventricle

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Abstract

Background: Inferoseptal process of the left ventricle (ISP-LV) might be a source of idiopathic ventricular arrhythmias. In these cases, ectopic foci are accessible from the LV endocardium, epicardially from the middle cardiac vein as well as from the right atrium (RA). This study reports a series of patients with premature ventricular contractions (PVCs) arising from the ISP-LV that were successfully ablated following access from different structures.

Methods and Results: Five patients (4 males, age 61 ± 12.8 years) with PVCs arising from the ISP-LV were successfully ablated using three different approaches for ablation—endocardial, epicardial (through coronary sinus or its branches), and RA approaches. Endocardial LV mapping, RA, and coronary sinus (CS) mapping were performed in all five cases. PVCs demonstrated RBBB or LBBB-like morphology and left superior axis. The three patients ablated endocardially had a maximum deflection index (MDI) of 0.36, 0.43, and 0.54, whereas in the remaining 2 patients, MDI was 0.57 and both demonstrated QS morphology in the inferior leads. Local activation time at the successful ablation site was 35 ± 8.9 (26–55) msec pre-QRS. Pacemapping at the successful ablation site resulted in a good (11/12) or perfect (12/12) QRS match in all cases. Three of the patients demonstrated frequent monomorphic PVCs of another morphology suggesting a remote exit site. All patients remained arrhythmia-free after a mean follow-up of 21 ± 15 (6–36) months.

Conclusion: Successful ablation of PVCs from ISP-LV may require access from the CS or even RA apart from LV endocardial approach. Not infrequently patients demonstrate additional PVC foci.

KEYWORDS
catheter ablation, crux arrhythmias, Inferoseptal left ventricular process, premature ventricular contraction

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Clinical Medicine

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Editorial

Fever-Induced Brugada Sign: Clue for Clinical Management with Non-Negligible Risk of Sudden Cardiac Death

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Brugada syndrome (BrS) is a primary electrical disease predisposing to ventricular tachyarrhythmias and sudden cardiac death [1]. The optimal diagnostics and risk stratification in patients suspected of having BrS are challenging [2]. A type 1 Brugada electrocardiogram (ECG) pattern is observed in about 2% of patients with fever and is also described in pediatric inflammatory multisystem syndrome related to COVID-19 [3,4]. The current European Society of Cardiology (ESC) guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death indicate the necessity to exclude Brugada phenocopies while making a diagnosis of BrS [5]. These guidelines highlight the lower specificity of the type 1 Brugada ECG pattern observed during the sodium channel blocker test or fever [5], but it should be mentioned that these induced Brugada ECG patterns are not considered a BrS phenocopy. In these conditions, genetic testing may be considered, according to a recent expert consensus statement on the state of genetic testing for cardiac diseases [6].

In the Journal of Clinical Medicine Special Issue "New Frontiers in Electrocardiography, Cardiac Arrhythmias, and Arrhythmogenic Disorders", Tsai et al. [7] described a long-term follow-up of a cohort of patients with a fever-induced type 1 Brugada ECG pattern. They included 18 asymptomatic patients without a spontaneous type 1 BrS ECG pattern and no family history of sudden death and 3 symptomatic individuals (two had previous syncopal episodes, while one had aborted sudden cardiac arrest). In the mean follow-up almost 10 years later, none of the asymptomatic patients experienced ventricular arrhythmic events. At the same time, all symptomatic patients experienced cardiac events, including implantable cardioverter-defibrillator therapies (shocks for new arrhythmic events) or sudden death.

Notably, Mizusawa et al. [8] reported the risk of arrhythmic events in patients with fever-induced BrS type 1 ECGs in a relatively large, multicenter, retrospectively collected cohort. In their cohort, the arrhythmic event rate was 3.0%/year in patients with a history of ventricular fibrillation, 1.3%/year in patients with a history of syncope, and 0.9%/year in asymptomatic patients. These results, while possibly derived from a more selected population, emphasize that the risk associated with fever-induced type 1 Brugada ECG is

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Citation: Bijak, P.; Traykov, V.B.; Sabbag, A.; Conti, S.; Sohns, C.; Matusik, P.T. Fever-Induced Brugada Sign: Clue for Clinical Management with Non-Negligible Risk of Sudden Cardiac Death. *J. Clin. Med.* **2023**, *12*, 3503. https://doi.org/10.3390/jcm12103503

Received: 24 April 2023
Accepted: 9 May 2023
Published: 16 May 2023

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not negligible (compared to the incidence of sudden cardiac death in the general population of 0.03–0.1%/year [9]).

Moreover, in their paper, Tsai et al. [7] noted that there was an increase in heart rate and a significant shortening of the PR interval during periods of fever. In contrast, QRS duration and QTc intervals were not different during fever, compared to ECGs recorded without this condition in both asymptomatic and symptomatic patients. These data are consistent with the observations of Mizusawa et al. [8]. Interestingly, Mizusawa et al. [8] additionally observed that PR interval, QRS duration, and QTc interval prolonged during the sodium channel blocker challenge, suggesting different mechanisms implicated in their induction.

The association between fever and ECG pattern may be particularly important in light of evidence for inflammation in the right ventricular outflow tract of BrS patients, which may trigger ventricular arrhythmias in predisposed hearts [10].

It should be mentioned that a fever-induced type 1 Brugada ECG pattern may be awarded 3 points in the proposed Modified Shanghai scoring system for the diagnosis of BrS, compared to 3.5 points for a spontaneous type 1 Brugada ECG pattern and 2 points for a sodium channel blocker-induced Brugada type 1 ECG pattern (all at nominal or high leads) [6]. Moreover, the panel of experts for the recent ESC guidelines recommends that an induced type 1 ECG pattern requires other clinical characteristics, including arrhythmic syncope, polymorphic ventricular tachycardia or ventricular fibrillation, and consistent family history to diagnose BrS, contrary to spontaneous type 1 Brugada ECG pattern in patients without other heart diseases [5].

Thus, in line with current ESC guidelines [5], we consider a close follow-up with general recommendations (among others: avoidance of drugs and other substances listed on http://www.brugadadrugs.org (accessed on 24 April 2023) and treatment of fever with antipyretic drugs) of asymptomatic (no arrhythmic syncope/nocturnal agonal respiration) patients with fever-induced type 1 Brugada ECG pattern without documented ventricular arrhythmia and with negative family history (both of BrS and sudden death < 45 years) as the most reasonable approach to clinical management.

Author Contributions: Conceptualization, P.T.M.; writing—original draft preparation, P.B. and P.T.M.; writing—review and editing, V.B.T., A.S., S.C. and C.S.; supervision, P.T.M.; funding acquisition, P.T.M. All authors have read and agreed to the published version of the manuscript.

Funding: P.T.M. is supported by the National Science Centre, Poland (grant number 2021/05/X/NZ5/01511); the Jagiellonian University Medical College; the John Paul II Hospital; and the Ministry of Science and Higher Education stipend for outstanding young scientists.

Acknowledgments: This paper is a result of close clinical and scientific collaboration during a Diploma of Advanced Studies in Cardiac Arrhythmia Management (DAS-CAM). For the purpose of Open Access, the authors have applied a CC-BY public copyright license to any Author Accepted Manuscript (AAM) version arising from this submission.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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Physica Medica 108 (2023) 102572

Contents lists available at ScienceDirect

Physica Medica

journal homepage: www.elsevier.com/locate/ejmp

Original paper

Proposing national diagnostic reference levels for electrophysiology studies and catheter ablation procedures in Bulgaria

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ARTICLE INFO

Keywords:
National Diagnostic Reference Levels (NDRL)
Electrophysiological Study
Catheter Ablation

ABSTRACT

Introduction: The implementation of diagnostic reference levels (DRLs) is an essential tool for optimisation of the routine practice, better management of patient exposure while maintaining sufficient image quality. National DRLs for electrophysiology (EP) procedures are not available in our country.
Purpose: The main purpose of the study was to propose, for first time in Bulgaria, national DRLs (NDRLs) for EP studies and ablation procedures of two different levels of complexity. The proposed DRLs can be later used to establish NDRLs by the national authority with regulatory functions related to medical exposure.
Method: A retrospective study was done with the three highest volume Bulgarian EP centers, where over 95 % of all cardiac ablations were performed. Data were extracted from the electronic registry for invasive electrophysiology BG-EPHY. Independently of the proposed NDRLs, we also compared the air kerma-area product (KAP) between the participating centers for procedures of the same level of complexity.
Results: The proposed NDRL in terms of KAP were: 5.2 Gy.cm^2 for diagnostic EP studies, 25.5 Gy.cm^2 for simple ablations, and 52.1 Gy.cm^2 for complex ablations. There was a significant variation in KAP for procedures with the same degree of complexity within each center.
Conclusion: This study is the first to propose NDLRs for EP studies and ablation procedures of two levels of complexity in Bulgaria. The results identified EP procedures requiring further optimization of patient protection and provided a basis for future comparisons and standardization with further investigations on the topic. The proposed NDRLs are recommended to be used for better management of radiation exposure during EP procedures of different levels of complexity.

1. Introduction

Cardiac rhythm disorders have been intensively studied in the last 3 decades and the number of performed interventional cardiac electrophysiology (EP) procedures per year has been increasing exponentially worldwide [1]. Some of the routinely performed fluoroscopically guided EP procedures are complex and might require prolonged fluoroscopy times. Special attention is required in order to minimize the probability for potential radiation-induced effects, such as skin injury, or lower the risk of cardiovascular tissue reactions and life-time malignancy [2]. The new technological advances, and their proper use, such as systems for non-fluoroscopic navigation and three-dimensional electroanatomic mapping (EAM), reduced number of cine images, noise suppression and proper choice of exposure parameters, may significantly decrease patient and medical staff exposure.

The implementation of diagnostic reference levels (DRLs) is an essential tool for optimisation of the routine practice, better management of patient exposure while maintaining sufficient image quality. National DRLs (NDRLs) are used to identify practices leading to higher patient exposure for a given type of radiological procedure for group of standard-sized patients (70 ± 20 kg), but not for individual patient doses [3]. NDRLs are also used as an indicator for the typical practice for a

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https://doi.org/10.1016/j.ejmp.2023.102572
Received 27 October 2022; Received in revised form 16 March 2023; Accepted 18 March 2023
Available online 28 March 2023
1120-1797/© 2023 Associazione Italiana di Fisica Medica e Sanitaria. Published by Elsevier Ltd. All rights reserved.

ESC European Society of Cardiology

Europace (2023) **25**, 185–198
https://doi.org/10.1093/europace/euac144

POSITION PAPER

Searching for atrial fibrillation: looking harder, looking longer, and in increasingly sophisticated ways. An EHRA position paper

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Received 26 July 2022; online publish-ahead-of-print 18 October 2022

Keywords Atrial fibrillation • Asymptomatic atrial fibrillation • AF screening • AF screening devices • AF populations at risk • Patient's benefits of AF screening

Rationale and aims for long-term atrial fibrillation screening/search

Atrial fibrillation (AF) is the most common clinical arrhythmia with substantial health and socioeconomic impact on healthcare.[1] The number of people affected by this condition was estimated to be 33.5 million in 2010, with an increasing prevalence and incidence over the coming years.[2] In 2017, there were 37.6 million [95% confidence interval (CI): 32.5–42.6 million] individuals with AF/atrial flutter globally.[3] The estimated number of subjects with AF in 2030 in Europe will be 14–17 million, and the number of new cases of AF per year at 120 000–215 000.[4] Atrial fibrillation is independently associated with increased mortality and morbidity from complications such as ischaemic stroke, dementia, and cognitive dysfunction.[5] Oral anticoagulation can significantly reduce the risk of stroke, dementia, and death.[6] As a part of a holistic or integrated approach to AF care, it is associated with improved outcomes[7–9] and is advocated in guidelines.[10,11]

In many patients, AF can be asymptomatic, and the diagnosis is established after the appearance of a complication typically associated

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REVIEW

Infections of cardiac implantable electronic devices: Epidemiology, mechanisms, and preventive measures

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DOI: 10.33963/v.kp.97249

Received:
August 10, 2023

Accepted:
September 3, 2023

Early publication date:
September 3, 2023

ABSTRACT

Cardiac implantable electronic device (CIED) infections represent a complication associated with high morbidity and mortality. Despite enormous efforts to prevent them, the rates of infections continue to rise out of proportion to the reported increase in CIED implantation rates. Following extensive research of various prevention strategies and new technologies, several organizations have issued recommendations and consensus papers covering this topic. Our narrative review aims to provide a summary of the existing preventive strategies put forward by the European Heart Rhythm Association consensus and European Society of Cardiology guidelines and introduce the most recent developments in the field, including optimized surgical site management and appropriate periprocedural antithrombotic drug use. It also provides an overview of epidemiology, mechanisms, risk factors, and risk stratification approaches. It focuses on the pre-, intra-, and postprocedural actions that should be taken to mitigate CIED infection risks. Future directions in the prevention of CIED infections have also been addressed.

Key words: cardiac implantable electronic device, defibrillator, epidemiology pacemaker, infection, prevention, risk

INTRODUCTION

Following the first reports on cardiac pacemakers published in the late 1950s and the subsequent development of implantable cardioverter-defibrillators (ICD) in the 1980s, cardiac implantable electronic devices (CIEDs) have become the standard of care in managing cardiac rhythm and conduction disturbances. Published data show a constant increase in the numbers and complexity of CIED implantations worldwide [1]. This growth has been accompanied by an increasing rate of complications, especially with the wider introduction of cardiac resynchronization therapy pacemakers (CRT-P) and defibrillators (CRT-D) [2]. The rate of CIED infections has been shown to increase out of proportion to the reported rise in device implantation [1, 3]. The possible causes are the increasing CIED complexity, comorbidities, and longer life expectancy. On the other hand, CIED infections represent an essential factor for increased morbidity and mortality among CIED recipients [4]. From an economic perspective, CIED infection management puts a significant financial burden on healthcare systems due to additional treatment, prolonged hospital stays, and reinterventions [5–7].

Despite various preventive strategies to reduce CIED complications [8], reports show significant differences in their implementation [9]. Meticulous antisepsis and preoperative antibiotic prophylaxis are highly effective and recommended by various consensus papers and guidelines [8, 10]. New technologies, including subcutaneous ICDs and leadless pacemakers, also aid in the reduction in CIED infections. However, these apply only to selected patients. The role of antibiotic-eluting envelopes (AEEs) for effective CIED infection prevention has been demonstrated by randomized studies [11].

ESC European Society of Cardiology
European Heart Journal Open (2022) **2**, 1–2
https://doi.org/10.1093/ehjopen/oeac080

Effects of apical right ventricular pacing on right ventricular and left ventricular mechanics in patients with preserved systolic function: 2D speckle tracking assessment

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Received 3 August 2022; revised 8 November 2022; accepted 9 December 2022; online publish-ahead-of-print 12 December 2022

Handling Editor: Alessia Gimelli

Keywords Pacemaker • Ventricular function • Speckle tracking echocardiography

Introduction

Left ventricular (LV) function during right ventricular (RV) stimulation is well studied, while the effects on RV function are not well explored. We used speckle tracking echocardiography (STE) as it provides detailed information on LV and RV contractile performance, hence a more sensitive method to assess RV and LV function.

Methods

Fifty-three consecutive patients underwent echocardiography before implantation. LV and RV function was assessed with 2D echocardiography and STE. At a median follow-up of 8 months, the patients underwent control echocardiography and device interrogation. Patients were divided according to the percentage of cumulative ventricular pacing (CumVP) in Group 1 with <40% in dual chamber trigger/inhibition mode (DDD) mode or <80% in ventricular single chamber inhibition mode (VVI) mode ($n = 20$; 38%) and Group 2 with >40% in DDD or >80% in VVI mode ($n = 33$; 62%), based on the results of the mode selection trial study.[1] Standard echocardiography was performed. LV and RV quantifications were done according to current guidelines.[2]

Results

Patient characteristics and data are listed in *Table 1*. In Group 1, we observed a trend towards worsening all parameters. We registered a deterioration in RV systolic function measured by a significant decline in global right ventricular longitudinal strain (GLSRV) and right ventricular free wall strain (GLSRVFW) without a significant reduction in global longitudinal left ventricular strain (GLSLV). The systolic speed at the lateral tricuspid annulus (S't) and tricuspid annular plane systolic excursion (TAPSE) also decreased significantly without affecting the RV filling pressures measured indirectly by E/e't ratio. LVEF was not affected at all by this point. The systolic shortening speed at medial mitral annulus was significantly attenuated, which was not observed at the lateral mitral annulus. The altered activation leads to increased filling pressures in the LV assessed indirectly by E\e'm ratio. In Group 2, we measured a significant deterioration of RV systolic function assessed by GLSRV, GLSRVFW, S't, and TAPSE, but we also registered a significant worsening in LV function assessed by GLSLV, but almost no dynamics in the LVEF. The same pattern was observed in the systolic speed at the medial and lateral mitral annulus. LV and RV diastolic function worsened in both groups.

Discussion

The results from our study suggest that the altered activation induced subclinical systolic RV dysfunction in all patients and subclinical systolic LV dysfunction only with higher CumVP, based on STE and tissue Doppler imaging parameters. This was caused by the altered activation, leading to intraventricular preload redistribution.[2] LVEF was not affected at this point in all patients. LV filling pressures increased, but RV diastolic function remained normal. Apical stimulation may cause worsening of RV parameters irrespective of CumVP, or the threshold for RV dysfunction is lower than that for LV dysfunction.[3]

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frontiers | Frontiers in Cardiovascular Medicine

TYPE Systematic Review
PUBLISHED 30 November 2022
DOI 10.3389/fcvm.2022.1063147

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OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Cardiac Rhythmology, a section of the journal Frontiers in Cardiovascular Medicine

RECEIVED 06 October 2022
ACCEPTED 01 November 2022
PUBLISHED 30 November 2022

CITATION
Shalganov T, Stoyanov M and Traykov V (2022) Outcomes of early catheter ablation for ventricular tachycardia in adult patients with structural heart disease and implantable cardioverter-defibrillator: An updated systematic review and meta-analysis of randomized trials. *Front. Cardiovasc. Med.* 9:1063147. doi: 10.3389/fcvm.2022.1063147

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Outcomes of early catheter ablation for ventricular tachycardia in adult patients with structural heart disease and implantable cardioverter-defibrillator: An updated systematic review and meta-analysis of randomized trials

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Aims: Catheter ablation (CA) for ventricular tachycardia (VT) can improve outcomes in patients with ischemic cardiomyopathy. Data on patients with non-ischemic cardiomyopathy are scarce. The purpose of this systematic review and meta-analysis is to compare early CA for VT to deferred or no ablation in patients with ischemic or non-ischemic cardiomyopathy.

Methods and results: Studies were selected according to the following PICOS criteria: patients with structural heart disease and an implantable cardioverter-defibrillator (ICD) for VT, regardless of the antiarrhythmic drug treatment; intervention–early CA; comparison–no or deferred CA; outcomes–any appropriate ICD therapy, appropriate ICD shocks, all-cause mortality, VT storm, cardiovascular mortality, cardiovascular hospitalizations, complications, quality of life; published randomized trials with follow-up ≥12 months. Random-effect meta-analysis was performed. Outcomes were assessed using aggregate study-level data and reported as odds ratio (OR) or mean difference with 95% confidence intervals (CIs). Stratification by left ventricular ejection fraction (LVEF) was also done. Eight trials (n = 1,076) met the criteria. Early ablation was associated with reduced incidence of ICD therapy (OR 0.53, 95% CI 0.33–0.83, p = 0.005), shocks (OR 0.52, 95% CI 0.35–0.77, p = 0.001), VT storm (OR 0.58, 95% CI 0.39–0.85, p = 0.006), and cardiovascular hospitalizations (OR 0.67, 95% CI 0.49–0.92, p = 0.01). All-cause and cardiovascular mortality, complications, and quality of life were not different. Stratification by LVEF showed a reduction of ICD therapy only with higher EF (high EF OR 0.40, 95% CI 0.20–0.80, p = 0.01 vs. low EF OR 0.62, 95%

CI 0.34–1.12, p = 0.11), while ICD shocks (high EF OR 0.54, 95% CI 0.25–1.15, p = 0.11 vs. low EF OR 0.50, 95% CI 0.30–0.83, p = 0.008) and hospitalizations (high EF OR 0.95, 95% CI 0.58–1.58, p = 0.85 vs. low EF OR 0.58, 95% CI 0.40–0.82, p = 0.002) were reduced only in patients with lower EF.

Conclusion: Early CA for VT in patients with structural heart disease is associated with reduced incidence of ICD therapy and shocks, VT storm, and hospitalizations. There is no impact on mortality, complications, and quality of life. (The review protocol was registered with INPLASY on June 19, 2022, #202260080).

Systematic review registration: [https://inplasy.com/], identifier [202260080].

KEYWORDS

systematic review, ventricular tachycardia (VT), catheter ablation, all-cause mortality, quality of life

Introduction

Sustained ventricular tachycardia (VT) in patients with structural heart disease is a life-threatening condition posing the risk of syncope and sudden cardiac death, especially with reduced left ventricular ejection fraction (LVEF). Ischemic and non-ischemic cardiomyopathy are the most common conditions associated with VT (1). Most antiarrhythmic drugs are of little value and their use is restricted in patients with LV systolic dysfunction (2). Implantable cardioverter-defibrillators (ICDs) are usually considered first-line treatment in patients with structural heart disease and VT, but this therapy does not prevent VT recurrences and ICD shocks are associated with increased mortality and decreased quality of life (3–7). Several studies and a few meta-analyses in patients with previous myocardial infarction and severe/moderate LV systolic dysfunction have shown that endocardial catheter ablation (CA) can reduce VT recurrences, ICD therapy/shocks, and VT storm (8–11). However, data on patients with non-ischemic cardiomyopathy have shown that ablation more often necessitates an epicardial approach and is less effective, probably due to the more frequent presence of midmyocardial or subepicardial arrhythmogenic substrate (12–15). This additional epicardial approach in patients with diverse etiologies might influence hard clinical outcomes, including all-cause and cardiovascular mortality.

The objective of this systematic review and meta-analysis is to investigate whether early CA with either endocardial or endo-epicardial approach for scar-related monomorphic VT improves outcomes (defined as any appropriate ICD therapy, appropriate ICD shocks, all-cause mortality, VT storm, cardiovascular mortality, cardiovascular hospitalizations, complications, and quality of life) in adult patients with ischemic or non-ischemic cardiomyopathy and ICD regardless of the antiarrhythmic drug treatment, compared to deferred ablation or no ablation.

Methods

This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (16) (**Supplementary File 1**) and is based on a protocol agreed upon by all authors.

Eligibility criteria

The studies included were selected according to the following PICOS criteria: patients ≥18 years old with structural heart disease and an ICD implanted or planned to be implanted for VT, regardless of the antiarrhythmic drug treatment status; interventional arm with CA performed regardless of the access (endocardial or endo-epicardial) and approach (substrate-guided or electrophysiologically guided ablation); comparison arm with no ablation or deferred ablation; ≥3 of the outcomes reported (see Section "Study selection and outcomes"); published randomized studies with follow-up ≥12 months. The length of follow-up was selected with mortality outcomes in mind.

The exclusion criteria were: studies on patients with hypertrophic cardiomyopathy, myocarditis, Chagas disease, congenital heart diseases, surgical ablation, and stereotactic radioablation.

Information sources and search strategy

PubMed, Directory of Open Access Journals (DOAJs), and Cochrane Library databases were searched independently by two of the authors (TS and MS) in June 2022. The search was not restricted by language or time period. A search string

frontiers in Cardiovascular Medicine

REVIEW
published: 28 March 2022
doi: 10.3389/fcvm.2022.855233

Antibiotic-Eluting Envelopes for the Prevention of Cardiac Implantable Electronic Device Infections: Rationale, Efficacy, and Cost-Effectiveness

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Infections related to cardiac implantable electronic devices (CIED) are associated with significant morbidity and mortality. Despite optimal use of antimicrobials and other preventive strategies, the incidence of CIED infections is increasing over time leading to considerable costs to the healthcare systems. Recently, antibiotic-eluting envelopes (AEEs) have been introduced as a promising technology to prevent CIED infections. This review will address the current evidence on stratification of CIED infection risk, present the rationale behind AEE, and summarize the currently available evidence for CIED infection prevention as well as demonstrate the cost-effectiveness of this novel technology.

Keywords: cardiac implantable electronic device, infection, pacemaker, cardiac resynchronization therapy, implantable cardioverter defibrillator, antibiotic eluting envelope, cost-effectiveness

OPEN ACCESS

Edited by:
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University of Szeged, Hungary

Reviewed by:
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Specialty section:
This article was submitted to Cardiac Rhythmology, a section of the journal Frontiers in Cardiovascular Medicine

Received: *14 January 2022*
Accepted: *04 March 2022*
Published: *28 March 2022*

Citation:
Traykov V and Blomström-Lundqvist C (2022) Antibiotic-Eluting Envelopes for the Prevention of Cardiac Implantable Electronic Device Infections: Rationale, Efficacy, and Cost-Effectiveness. Front. Cardiovasc. Med. 9:855233. doi: 10.3389/fcvm.2022.855233

INTRODUCTION

Since the initial experience with electronic pacemakers in the late 1950s and the introduction of implantable cardioverter-defibrillators in the 1980s, cardiac implantable electronic devices (CIEDs) have become routine therapy of numerous arrhythmias and conduction disturbances. The numbers and complexity of CIED implantations continue to rise worldwide (1), especially with the introduction of cardiac resynchronization pacemakers (CRT-P) and defibrillators (CRT-D) (2) which has been accompanied by an increasing rate of complications. Device infection is an important factor for increased morbidity and mortality among CIED recipients (3). The rate of CIED infections has been shown to increase over the years (1, 4). Among the possible causes are increasing complexity of implanted devices, increasing comorbidities, and longer life expectancy with the need for multiple generator replacements and lead revisions.

Although various preventive strategies have been proposed to reduce these serious and costly CIED complications (5) there is a significant discrepancy in the implementation of the different preventive strategies worldwide (6). The rules of antisepsis and preoperative antibiotic prophylaxis have been shown to be highly effective and are recommended by consensus papers and guidelines (5, 7). The introduction of subcutaneous ICDs and leadless pacemakers may also contribute to a reduction of CIED infections but are applicable only in a selected patient population. The implantation of antibiotic-eluting envelopes (AEE) currently presents a promising strategy to prevent CIED infections in patients at risk for device infections including those not suitable for the currently available leadless or subcutaneous technology. As such, AEE use has been recommended by recent guidelines and consensus statements (5, 7).

Check for updates

Received: 7 March 2021 | Revised: 11 June 2021 | Accepted: 16 June 2021

DOI: 10.1002/clc.23681

CLINICAL INVESTIGATIONS

CLINICAL CARDIOLOGY WILEY

Differences in activated clotting time and total unfractionated heparin dose during pulmonary vein isolation in patients on different anticoagulation therapy

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Abstract

Background: Periprocedural pulmonary vein isolation (PVI) anticoagulation requires balancing between bleeding and thromboembolic risk. Intraprocedural anticoagulation is monitored by activated clotting time (ACT) with target value >300 s, and there are no guidelines specifying an initial unfractionated heparin (UFH) dose.

Methods: We aimed to assess differences in ACT values and UFH dosage during PVI in patients on different oral anticoagulants. We conducted an international, multi-center, registry-based study. Consecutive patients with atrial fibrillation (AF) undergoing PVI, on uninterrupted anticoagulation therapy, were analyzed. Before transseptal puncture, UFH bolus of 100 IU/kg was administered regardless of the anticoagulation drug.

Results: Total of 873 patients were included (median age 61 years, IQR 53–66; female 30%). There were 248, 248, 189, 188 patients on warfarin, dabigatran, rivaroxaban, and apixaban, respectively. Mean initial ACT was 257 ± 50 s, mean overall ACT 295 ± 45 s and total UFH dose 158 ± 60 IU/kg. Patients who were receiving warfarin and dabigatran compared to patients receiving rivaroxaban and apixaban had: (i) significantly higher initial ACT values (262 ± 57 and 270 ± 48 vs. 248 ± 42 and 241 ± 44 s, $p < .001$), (ii) significantly higher ACT throughout PVI (309 ± 46 and 306 ± 44 vs. 282 ± 37 and 272 ± 42 s, $p < .001$), and (iii) needed lower UFH dose during PVI (140 ± 39 and 157 ± 71 vs. 171 ± 52 and 172 ± 70 IU/kg).

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

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KEYWORDS
apixaban, atrial fibrillation, dabigatran, pulmonary vein isolation, rivaroxaban, warfarin

1 | INTRODUCTION

Pulmonary vein isolation (PVI) is a well-established therapeutic option for patients with atrial fibrillation (AF).[1,2] Although currently performed on a routine basis, PVI is associated with a nonnegligible complication rates.[3,4] Periprocedural PVI anticoagulation strategy always represents a balance between the risk of bleeding (vascular access site complications and pericardial effusion/tamponade) and the risk of thromboembolic incidents, in particular cerebrovascular events which incidence could reach up to 1%.[1–6] Effective intraprocedural anticoagulation is essential to minimize the risk of thromboembolism during the PVI and is monitored throughout the procedure by activated clotting time (ACT).[1,7–9] It has been observed that thrombi could form on the transseptal sheath and/or the catheter even before the transseptal puncture.[7] Early unfractionated heparin (UFH) administration significantly reduces the risk for thrombus formation.[7,8] However, the use of high UFH loading doses may come with a higher bleeding risk, suggesting that there exists a potential for overshooting with the initial UFH bolus.[1,4,10,11] The EHRA/HRS consensus statement recognizes the need of higher initial doses of UFH in patients on DOACs than on vitamin K antagonist (VKA), as well as the requirement for more frequent ACT measurements.[1] Similarly, it has been recognized by the EHRA Practical guide on the use of DOACs, that larger doses of UFH might be required to achieve target ACT values in patients on DOACs than on VKA.[12] In addition, recent studies showed great variability in UFH loading dosage and periprocedural anticoagulation strategies.[1,4,8–12] Thus, the aim of the current study is to assess differences in ACT values and total UFH dosage during PVI in patients on different oral anticoagulation therapies. We aimed to evaluate the differences in the initial and overall ACT during the procedure as well as doses of the initial UFH bolus required to achieve ACT >300 s in patients receiving different oral anticoagulation therapy.

2 | METHODS

We performed an international, multi-center, registry-based cohort analysis. Total of nine electrophysiology centers from four countries (Table 1) were actively participating in the prospective Southeast-Central European PVI (SECE-PVI) registry. Consecutive patients with paroxysmal, persistent and long-standing persistent AF enrolled in the SECE-PVI registry, in the period between April 2016 and July 2019, were analyzed. Patients with moderate and severely decreased renal function (creatinine clearance rate < 50 ml/min), those with anticoagulation therapy started just before or after PVI and in whom the ACT measurements were not done or not recorded properly were excluded from the study. Additionally, patients with left atrial appendage thrombus have not undergone PVI, and thus could not be included in the registry or the study itself. Baseline demographic characteristics, medical history with chronic medication usage and all procedural data were collected. Baseline laboratory data included hemoglobin, platelet count, international normalized ratio (INR) and serum creatinine.

All included patients gave written informed consent for participating in the SECE-PVI registry. The hospital's Ethics Committee gave its approval for the study, which was conducted in accordance with the current version of Declaration of Helsinki.

2.1 | PVI procedure

Transthoracic and transoesophageal echocardiogram to rule out left atrial (LA) thrombus, to determine LA diameter in the parasternal long axis (PLAX) plane, and left ventricular ejection fraction (LVEF) were performed before every PVI procedure. PVI procedure was performedeither using: (i) focal irrigated-tip radiofrequency (RF) catheter (RF-group) in combination with a 3D electroanatomical mapping systems (either CARTO3, Biosense Webster, or NavX, Abbott) as described in detail previously[13,14]; (ii) using the 2nd-generation cryoballoon (Arctic Front Advance 28 mm Medtronic Inc.,) ablation (CB-group) as described in detail previously.[13,14]

2.2 | Anticoagulation therapy and ACT measurement

In each group, last dose of warfarin or DOAC was given in the evening before the procedure. When PVI was performed in the afternoon, morning dose of warfarin or DOAC was administered in the morning

TABLE 1 Electrophysiology centers participating in the study with number of patients per center

Centre	*N* of patients
University Hospital Sestre Milosrdnice (Zagreb, Croatia)	388
General Hospital Zadar (Zadar, Croatia)	19
University Hospital Zagreb (Zagreb, Croatia)	91
University Hospital Rijeka (Rijeka, Croatia)	104
Clinic for Cardiovascular Medicine Magdalena (KrapinskeToplice, Croatia)	54
University Medical Center Ljubljana, Cardiology (Ljubljana, Slovenia)	6
University Medical Center Ljubljana, Cardiac Surgery (Ljubljana, Slovenia)	51
Tokuda Hospital Sofia (Sofia, Bulgaria)	63
University Hospital Graz (Graz, Austria)	97

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ДРУЖЕСТВО НА КАРДИОЛОЗИТЕ В БЪЛГАРИЯ
Българска кардиология
том XXXI, 2025, № 1

АВТОРСКИ СТАТИИ
ORIGINAL ARTICLES

doi: 10.3897/bgcardio.31.e146281

РЕЗУЛТАТИ ОТ НАЦИОНАЛНО ДОПИТВАНЕ „ВРЕМЕ Е ЗА LP(A)“ОТНОСНО ПОЗНАНИЕТО, НАГЛАСИТЕ И ПРАКТИКИТЕ НА БЪЛГАРСКИТЕ КАРДИОЛОЗИ КЪМ ИЗСЛЕДВАНЕТО НА ЛИПОПРОТЕИН(А)

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RESULTS OF A NATIONAL SURVEY ‘IT’S TIME FOR LP(A)’ REGARDING THE AWARENESS, ATTITUDES AND PRACTICES OF BULGARIAN CARDIOLOGISTS FOR TESTING LIPOPROTEIN(A)

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Резюме. Цел на проучването: „Време е за Lp(a)“ е проучване на Дружеството на кардиолозите в България (ДКБ) за оценка на нивото на познаване и използване на липопротеин(а) – Lp(a), и предизвикателствата, които ограничават извършването на такава липидна оценка. Методи и резултати: В периода юли-август 2024 г. ДКБ проведе онлайн национално допитване с въпроси в три области: професионална информация; информация за обстоятелства, при които кардиолозите обмислят изследване на Lp(a), и въпроси относно причините за ограничено препоръчване на теста. От 585 кардиолози, включили се в проучването, 189 са отговорили на всички въпроси, а 396 са отговорили частично. Делът на клиницистите, които декларират рутинно измерване на Lp(a) с цел стратификация на риска и при фамилна обремененост, е само 18%, като 50% от кардиолозите никога не измерват Lp(a). Най-честите причини да не поръчват изследване на Lp(a) според 55% от кардиолозите са отсъствието на теста в рутинната оценка на липидите и фактът, че изследването не се покрива от НЗОК (54%). От анкетираните 94% споделят, че биха използвали Lp(a), ако тестът е реимбурсиран. 48% от кардиолозите имат нужда от ясни клинични указания относно Lp(a). Според 64% наличието на терапии, насочени към този липопротеин, би довело до по-голяма употреба на теста за Lp(a). Заключение: Резултати показват необходимостта от допълнителни усилия от научните дружества за въвеждане на ясни и подробни клинични насоки, включване в липидни панели и реимбурсиране на изследването, както и образователни инициативи за справяне с ограниченото използване и признаване на Lp(a) за рисков фактор.

Ключови думи: липопротеин(а), сърдечносъдов риск; клинична оценка; фамилна обремененост

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Abstract. Aim: “It’s Time for Lp(a)” is a survey of Bulgarian Society of Cardiology (BSC) assessing the awareness and use of lipoprotein(a) – Lp(a), and the challenges that limit this lipid assessment. Methods and results: In the period of July-August 2024, the BSC conducted an on-line national survey with questions in three areas: professional information; information on the clinical circumstances in which cardiologists are considering Lp(a) testing and questions about reasons for limited test recommendation. Of the 585 cardiologists who took part in the survey, 189 answered all of the questions, and 396 answered partially. Only 18% of clinicians declare that they routinely measure Lp(a) primarily for cardiovascular risk stratification and in cases of family history. Additionally, 50% of cardiologists never measure Lp(a) at all. The most

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ДРУЖЕСТВО НА КАРДИОЛОЗИТЕ В БЪЛГАРИЯ
Българска кардиология
том XXIX, 2023, № 4

doi: 10.3897/bgcardio.29.e116391

СЪРДЕЧНИ ИМПЛАНТИРУЕМИ ЕЛЕКТРОННИ УСТРОЙСТВА В БЪЛГАРИЯ: ДАННИ ОТ ЕЛЕКТРОННИЯ РЕГИСТЪР BG-PACE ЗА 2022 ГОДИНА

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CARDIAC IMPLANTABLE ELECTRONIC DEVICES IN BULGARIA: RESULTS FROM THE ELECTRONIC REGISTRY BG-PACE FOR 2022

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Резюме. Настоящото проучване представя анализ на дейността по електрокардиостимулация в България през 2022 г. въз основа на данни от Национален регистър на имплантираните пациенти. **Материал и методи:** Данните, въведени в регистъра BG-Pace за 2022 г. са изследвани ретроспективно. Анализирани са демографските данни на пациентите, типът процедура, типът устройство, режимът на стимулация, етиологията, симптомите и ЕКГ образът преди имплантацията. Анализирани са броят имплантации при различните типове устройства и обемът дейност на центрове и оператори. **Резултати:** За изследвания период са имплантирани 4770 устройства от 45 оператори в 30 центъра. Възрастта на пациентите при имплантацията е била 76 (IQR 69-82, 14-98) години, като преобладават пациентите от мъжки пол – 2843 (59,6%). Най-голям брой имплантации са осъществени във възрастовата група 70-79 години. Основен дял заемат антибрадикардните стимулатори – 578,8/милион. От тях системи за физиологична стимулация са били 111 (2,3%). Броят на имплантираните кардиовертер-дефибрилатори е по-висок спрямо предходни периоди и достига 31,9/милион. Имплантациите на системи за ресинхронизираща терапия с функция на дефибрилатор също бележат ръст до 15,9/милион. Значителен ръст се наблюдава и при имплантируемите лууп-рекордери, които достигат до 8,8/милион. Броят имплантации за център е бил 115,5 (IQR 53-261,3, 3-546), а за оператор – 76,5 (IQR 36,8-154,8, 3-364) устройства. Преобладават имплантациите на двукухинни устройства, чийто дял е 83,1% при AV блок I и II степен, 72,5% при пълен AV блок, 82,6% при нарушения на вътрекамерната проводимост и 66,8% при синдром на болния синусов възел. Режимите, позволяващи предсърден сензинг, демонстрират превъзходство – 62,4% при всички проводни нарушения. Налице е значимо ($P < 0,001$) нарастване на дела на VVI режима с увеличаване на възрастта. **Заключение:** Националният регистър BG-Pace включва системно въведени клинични, демографски и процедурни данни на имплантираните пациенти. Демонстрира се повишаване на броя имплантации в сравнение с предходни периоди, като същият остава нисък спрямо средното европейско ниво.

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Ключови думи: електрокардиостимулатор, имплантируем кардиовертер-дефибрилатор, система за ресинхронизираща терапия, обем имплантации, режим на стимулация, регистър

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Abstract. The current study analyses the activity in cardiac pacing in Bulgaria in 2022 based on data derived from a national registry of patients with cardiac implantable electronic devices (CIEDs). **Material and methods:** Data from the national registry BG-Pace for 2022 was studied retrospectively. Demographic data, procedure and device type, pacing mode, etiology, symptoms, preimplantation ECG, number of implantations, and centre and operator volumes were analyzed. **Results:** Four thousand seven hundred seventy devices were implanted by 45 operators at 30 centers. Median age was 76 (IQR 69-82, 14-98) years, and male patients were 2843 (59,6%). The most significant number of implantations were carried out in the age group 70-79 years. The most commonly implanted CIEDs were antibradycardia devices – 578.8/million. Of them, conduction system pacing was used in 111 (2.3%). Implanted cardioverter-defibrillators demonstrated a growth compared to previous periods and reached 31.9/million. Cardiac resynchronization defibrillators implantations also showed a growth to 15.9/million. A considerable increase was found with implantable loop-recorders, which reached 8.8/million. Number of implantations per center was 115.5 (IQR 53-261.,3, 3-546), and 76,5 (IQR 36,8-154,8, 3-364) devices per operator. Dual chamber devices were most commonly implanted with a share of 83.1% in AVB I and II degrees, 72.5% in complete AVB, 82.6% in intraventricular conduction disturbances, and in 66.8% in patients with sick sinus syndrome. Pacing modes allowing for atrial sensing were most frequently used – 62.4% of all implantations for conduction disturbances. There was a significant increase in the use of VVI mode with increasing age ($P < 0.001$). **Conclusion:** The national registry BG-Pace includes systematic clinical, demographical, and procedural data for CIED implantations in Bulgaria. There is a growth in the implantation rates compared to previous periods, but they remain lower than the average number for Europe.

Key words: pacemaker, implantable cardioverter-defibrillator, resynchronization therapy, volume of implantations, pacing mode, registry

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Въведение

Имплантируемите антибрадикардни електрокардиостимулатори са устройства, които се имплантират рутинно в страната. С подобряването на реимбурсацията достъпни станаха и имплантируемите кардиовертер-дефибрилатори (ICD) и системите за ресинхронизираща терапия (CRT), които се имплантират рутинно в специализираните центрове в страната. Европейското кардиологично дружество (ESC) редовно публикува данни относно броя и типа имплантирани електронни устройства в отделните страни членки [1, 2]. Някои национални дружества също са публикували обзор на дейността си, базиран на данни от локални или национални регистри и бази данни [3]. В предходна публикация ние докладвахме данните от наличния в страната национален регистър на имплантираните за периода 2019-2021 г. [4]

Целта на настоящото проучване е да се представи информация относно обема на дейността в областта на електрокардиостимулацията в рамките на 2022 г.

Материал и методи

Данните за настоящото проучване са получени от действащия в страната Национален регистър на им-

Introduction

Antibradycardia pacemakers are devices that are routinely implanted nationwide. With the improvement in reimbursement, implantable cardioverter-defibrillators (ICDs) and cardiac resynchronization therapy systems (CRT) have also become more accessible. They are routinely implanted in the specialized centers in the country. European Society of Cardiology (ESC) routinely publishes data on the number and type of implanted devices in the member states [1, 2]. Some national societies also published reports on their activity, based on data from local and national registries and data bases [3]. In a previous report we have published results from the national registry for the period 2019-2021 [4].

The current study aims to report data regarding the activity in cardiac pacing in 2022 based on a national registry.

Material and methods

Data for the current study has been derived from the national registry of CIED patients which is active in

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Българска кардиология
том XXVII, 2021, № 3

АВТОРСКИ СТАТИИ
ORIGINAL ARTICLES

doi: 10.3897/bgcardio.27.e71177

СЪРДЕЧНИ ИМПЛАНТИРУЕМИ ЕЛЕКТРОННИ УСТРОЙСТВА В БЪЛГАРИЯ: ДАННИ ОТ ЕЛЕКТРОННИЯ РЕГИСТЪР BG-PACE ЗА ПЕРИОДА 2019-2021

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CARDIAC IMPLANTABLE ELECTRONIC DEVICES IN BULGARIA: RESULTS FROM THE ELECTRONIC REGISTRY BG-PACE FOR THE PERIOD 2019-2021

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Резюме. Настоящата разработка представя анализ на дейността по електрокардиостимулация в България през 2019, 2020 и 2021 година на базата на данни от национален регистър на имплантираните пациенти. **Материали и методи.** Данните, въведени в регистъра BG-Pace за периода м .08-2019 – м. 06.2021 са изследвани ретроспективно. Анализирани са демографски данни на пациентите, типа процедура, типа устройство, режима на стимулация, етиологията, симптомите и ЕКГ образа преди имплантацията. Направен е и анализ на броя имплантации при различните типове устройства и обема дейност на центрове и оператори. **Резултати.** За изследвания период са имплантирани 6949 устройства от 47 оператори в 28 центъра. Възрастта на пациентите при имплантацията е била 75 (IQR 68-81, 21-103) години за мъжете и 77 (IQR 71-82, 17-98) години за жените, P < 0,05. Най-голям брой имплантации са осъществени във възрастовата група 70-79 години. Основен дял заемат антибрадикардните стимулатори, от които за периода м.08.2019-м.08.2020 г. са имплантирани общо 486,7/милион, а за периода м. 08.2020-м. 06.2021 г. този брой е 353,9/милион. Броят на имплантираните кардиовертер-дефибрилатори нараства за периода 08.2020-06.2021 г. спрямо предходния период – от 14,1 на 20,1/милион, а броят имплантирани устройства от всички типове спада по време на двете епидемични вълни от КОВИД-19. Средният брой имплантации за център за целия период е 232,3 ± 204 (2-705), а за оператор – 148±139,1 (2-660) устройства. Преобладават имплантациите на двукухинни устройства, чийто дял е 65,8% при AV блок I и II степен, 63,5% при пълен AV блок, 59,8% при нарушения на вътрекамерната проводимост и 60,9% при синдрома на болния синусов възел. Режимите, позволяващи предсърден сензинг демонстрират превъзходство – над 55% при всички проводни нарушения. Налице е значимо (P < 0,001) нарастване на дяла на VVI режима с нарастване на възрастта. **Заключение.** Националният регистър BG-Pace включва системно въведени клинични, демографски и процедурни данни на имплантираните пациенти. Демонстрира се нисък брой имплантации в сравнение със средното европейско ниво като се забелязва значим спад по време на двете вълни на пандемията от КОВИД-19.

Ключови думи: електрокардиостимулатор, имплантируем кардиовертер-дефибрилатор, система за ресинхронизираща терапия, обем имплантации, режим на стимулация, регистър

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Abstract. The current study analyses the activity in cardiac pacing in Bulgaria in 2019, 2020 and 2021 based on data derived from a national registry of patients with cardiac electronic implantable devices (CIEDs). **Materials and methods.** Data from the national registry BG-Pace in the period 08.2019-06.2021 was retrospectively studied. Demographic data, procedure and device type, pacing mode, etiology, symptoms, preimplantation ECG, number of implantations and centre and operator volumes were analysed. **Results.** Six thousand nine hundred forty-nine devices were implanted by 47 operators in 28 centres for the study period. Median age was 75 (IQR 68-81, 21-103) years in males and 77 (IQR 71-82, 17-98) years in females, P<0.05. The largest number of devices were implanted in the age group 70-79 years. The most commonly implanted CIEDs were antibradycardia devices with a total of 486.7/million implantations for the period 08.2019-08.2020 and 353.9/million for the period 08.2020-06.2021. Implanted cardioverter-defibrillators demonstrated a growth from 14.1/million to 20.1/million in the period 08.2020 – 06.2021. The number of all implantations dropped significantly during the two epidemic waves of COVID-19. The mean number of implantations per centre and per operator for the whole period was 232.3±204 (2-705) and 148±139.1 (2-660), respectively. Dual chamber device implantations were more prevalent, representing 65.8% of implantations in AV block I and II degree, 63.5% in complete AV block, 59.8% in intraventricular conduction disturbances and 60.9% in sick sinus syndrome. Pacing modes with atrial sensing represented more than 55% of the implantations for all indications. Increasing age was associated with significantly more common use of VVI pacing mode (P < 0.001). **Conclusion.** The national registry BG-Pace includes systematic clinical, demographical and procedural data for CIED implantations in Bulgaria. Results demonstrate lower number of implantations compared to the average European volume. There was a significant drop in the implantation rate during the two waves of COVID-19.

Key words: pacemaker, implantable cardioverter-defibrillator cardiac resynchronization therapy, implantation volume, pacing mode, registry

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Въведение

Имплантируемите антибрадикардни електрокардиостимулатори се прилагат в страната повече от 5 десетилетия. Еволюцията на технологиите през годините създаде възможност за увеличаване на сложността на софтуера и хардуера на тези устройства. Изключително голям напредък беше направен и в областта на имплантируемите кардиовертер-дефибрилатори (ICD) и системите за ресинхронизираща терапия. Голяма част от тези устройства са налични в нашата страна, а някои от тях се имплантират напълно рутинно. Европейската Асоциация по Аритмии (EHRA) и Европейското Кардиологично Дружество (ESC) редовно публикуват данни относно броя и типа имплантирани електронни устройства в отделните страни членки [1, 2]. Някои национални дружества също са публикували обзор на дейността си, базиран на данни от локални или национални регистри и бази данни [3, 4]. Въпреки дългогодишния опит с имплантируемите електронни устройства в нашата страна до момента не са публикувани систематизирани данни, които да дадат широк поглед върху електрокардиостимулацията в България.

Цел на настоящото проучване е да представи информация относно обема на дейността в електрокардиостимулацията в България за периода от 2019 до 2021 година.

Introduction

Cardiac implantable electronic devices (CIED) have been utilised in the country for more than 5 decades. The evolution of technology over the years allowed for increased hardware and software complexity in those devices. There was a huge step forward in the field of implantable cardioverter-defibrillators (ICDs) and cardiac resynchronisation systems. Most of these devices are available in our country and some of them are implanted on a routine basis. The European Heart Rhythm Association (EHRA) and the European Society of Cardiology (ESC) publish data regarding the number and the type of implanted CIEDs in the member states on a regular basis [1, 2]. Some national societies have also published data on the volume and type of implanted CIEDs [3, 4]. Despite significant experience with CIEDs in our country no systematic data providing an overview of pacing in the country has been published so far.

The current study aims to provide detailed data on cardiac pacing in Bulgaria in the period 2019-2021.

ДРУЖЕСТВО НА КАРДИОЛОЗИТЕ В БЪЛГАРИЯ
Българска кардиология
том XXVII, 2021, № 3
КЛИНИЧНИ СЛУЧАИ
CASE REPORTS
doi: 10.3897/bgcardio.27.e71009

КАТЕТЪРНА АБЛАЦИЯ НА МАКРОРИЕНТРИ ПРЕДСЪРДНИ ТАХИКАРДИИ С ТРАНСКОНДУИТЕН ДОСТЪП ПРИ ПАЦИЕНТ С ТОТАЛНА КАВОПУЛМОНАЛНА АНАСТОМОЗА С ЕКСТРАКАРДИАЛЕН КОНДУИТ

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CATHETER ABLATION OF MACROREENTRANT ATRIAL TACHYCARDIAS FOLLOWING TRANSCONDUIT PUNCTURE ACCESS IN A PATIENT AFTER TOTAL CAVOPULMONARY CONNECTION WITH AN EXTRACARDIAC CONDUIT

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Резюме. Представяме случай на 23-годишен мъж с комплексна вродена сърдечна малформация с еднокамерна физиология, наложила многократни оперативни интервенции, включително и извършване на тотална кавопулмонална анастомоза. Пациентът се представя с често (почти ежедневно) рецидивираща предсърдна тахикардия с висока камерна честота и лоша субективна и хемодинамична поносимост. Поради неуспех от лечението с антиаритмични медикаменти пациентът беше насочен за извършване на катетърна аблация. За достъп до предсърдието беше използвана пункция на кондуита със стандартен комплект за транссептална пункция. Преминаването на транссепталния интродюсер в предсърдието беше неуспешно поради значителна резистентност от стената на кондуита и предсърдната стена. Затова се наложи балонна дилатация на пункционното отверстие с режещ балон, което даде възможност за безпрепятствено въвеждане на управляем транссептален интродюсер в предсърдието. Индуцираха се няколко предсърдни тахиаритмии, две от които позволиха изграждане на активационна карта. Диагностицираха се макрориентри тахикардия, вероятно зависима от кавоануларния истмус, и макрориентри тахикардия със сложен кръг тип осморка, ангажираща десните белодробни вени и деснопредсърдното ухо. След създаване на линейни лезии през критичните истмуси на двата кръга се постигна неиндуцируемост. Пациентът е проследен за период от 9 месеца, през които не са регистрирани ритъмни нарушения.

Ключови думи: тотална кавопулмонална анастомоза; екстракардиален кондуит; предсърдна тахикардия; катетърна аблация.

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Abstract. We present the case of a 23-year-old male diagnosed with a complex congenital heart disease (with single ventricle physiology) which necessitated many surgical interventions including total cavopulmonary connection. The patient presents with recurrent (almost daily) highly symptomatic atrial tachycardia with rapid ventricular rate and poor haemodynamic tolerance. Due to failure of antiarrhythmic drug therapy the patient was referred for catheter ablation. Atrial access was provided following transconduit puncture with a standard transseptal set. Crossing to the atrium with the transseptal introducer was not successful due to resistance from the conduit and the atrial wall. Therefore, balloon dilation of the puncture using a cutting balloon was carried out which resulted in easy crossing to the atrium with a steerable transseptal introducer. Several atrial tachyarrhythmias were induced two of which allowed mapping demonstrating a macroreentrant tachycardia dependent on the cavoannular isthmus as well as a complex figure-of-eight circuit involving right pulmonary veins and the right atrial appendage. Linear lesions transecting the critical isthmuses of the two circuits were delivered which rendered the patient noninducible. During a 9-month follow-up period the patient remained arrhythmia free.

Key words: total cavopulmonary connection; extracardiac conduit; atrial tachycardia, catheter ablation

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ДРУЖЕСТВО НА КАРДИОЛОЗИТЕ В БЪЛГАРИЯ
Българска кардиология
том XXIX, 2023, № 4

doi: 10.3897/bgcardio.29.e108927

КАТЕТЪРНА АБЛАЦИЯ НА НАДКАМЕРНИ ТАХИКАРДИИ И ПРЕДСЪРДНО ТРЕПТЕНЕ БЕЗ ИЛИ С МИНИМАЛНО ИЗПОЛЗВАНЕ НА ФЛУОРОСКОПИЯ: НАЧАЛЕН ОПИТ НА ЕДИНИЧЕН БЪЛГАРСКИ ЦЕНТЪР

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CATHETER ABLATION OF SUPRAVENTRICULAR TACHYCARDIA AND ATRIAL FLUTTER WITH NO OR MINIMAL USE OF FLUOROSCOPY: THE INITIAL EXPERIENCE OF A SINGLE BULGARIAN CENTER

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Резюме.

Въведение: Катетърната аблация (КА) е утвърден метод за лечение на повечето аритмии. Триизмерните (3D) електроанатомични системи за картографиране позволяват КА на надкамерни тахикардии (НКТ) и предсърдно трептене (ПТ) без или с минимално използване на флуороскопия (ZF/NZF). Настоящото проучване цели да докладва нашия начален опит с ZF/NZF КА при пациенти с НКТ и ПТ. **Материал и методи:** Проведохме едноцентрово проспективно проучване, включващо последователни пациенти, насочени за КА при НКТ или ПТ. При всички беше проведена ZF/NZF КА с използването на 3D система за картографиране. Използване на флуороскопия бе разрешено през цялата процедурата. Анализирани бяха процедурните характеристики, отдалечените резултати и ефекта на кривата на обучение. **Резултати:** В периода 07.2020- 08.2021 г изследвахме 63-ма пациенти (възраст 53,5 ± 14,1 години, 57% мъже) с НКТ или ПТ. Според типа аритмия AV нодална риентри тахикардия беше диагностицирана при 36 (57,1%) случаи, ПТ при 25 (39,7%), лява допълнителна проводна връзка при 1 (1,6%), и фокална деснопредсърдна тахикардия при 1 случай (1,6%). При трима пациенти (4,8%) се установиха два аритмогенни субстрата. При 49 от 63-ма пациенти (77,8%) осъществихме ZF КА, а при 14 (22,2%) – NZF КА с флуороскопско време 220 ± 169 s и произведение доза-площ 7556 ± 5886 mGy*cm^2. Медианата на процедурното време беше 88 (IQR 25-75 персентил 71,5-116) min, като за картографиране са използвани 22 (IQR 25-75 персентил 16-31) min. Непосредствен процедурен успех беше постигнат при всички пациенти. Перипроцедурни усложнения не бяха наблюдавани. При проследяване от 12 ± 3 месеца не бяха установени рецидиви на ритъмните нарушения. Отчете се ефектът на кривата на обучение, с редукция на процедурното време (p = 0,025) и значима разлика (p = 0,019) в използването на флуороскопия през различните времеви периоди на проучването. **Заключение:** ZF/NZF КА е свързана с висока ефективност и безопасност при НКТ и ПТ. Катетърна аблация без използване на флуороскопия е приложима при повечето пациенти. Това е лесно осъществим подход с отчетлива крива на обучение.

Ключови думи: катетърна аблация, надкамерна тахикардия, процедура без използване на флуороскопия, експозиция на йонизиращи лъчения

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Abstract.

Introduction: Catheter ablation (CA) is an established therapy for most arrhythmias. Non-fluoroscopic three-dimensional (3D) electroanatomic mapping systems allow ablation of supraventricular tachycardia (SVT) and atrial flutter (AFL) with zero or near-zero fluoroscopy (ZF/NZF). The current study aims to report our initial experience with ZF/NZF in SVT or AFL CA. **Material and methods:** We conducted a single-center prospective registry enrolling consecutive patients referred for CA of SVT or AFL. ZF/NZF CA was attempted in all patients using a commercially available 3D mapping

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system. Fluoroscopy use was allowed at any point of the procedure. Procedural characteristics and long-term outcome were analyzed. The learning curve effect was also studied. **Results:** Sixty-three patients (age 53.5 ± 14.1, 57% males) with SVT or AFL were enrolled. According to arrhythmia type typical AVNRT was diagnosed in 36 (57.1%) cases, right atrial flutter in 25 (39.7%) cases, left-sided accessory pathway in 1 (1.6%) and focal right atrial tachycardia in 1 (1.6%) case. Three patients (4.8%) had two arrhythmia substrates. The procedure was performed with ZF in 49/63 cases (77.8%), while NZF was necessary in 14 (22.2%) patients with a fluoroscopy time of 220 ± 169 sec and a dose-area product of 7556 ± 5886 mGy*cm^2. Median procedural time was 88 (IQR 25-75 percentile 71.5-116) min with 22 (IQR 25-75 percentile 16-31) min of mapping time. Acute procedural success was accomplished in all patients with no periprocedural complications. Over a follow-up of 12 ± 3 months, all patients remained arrhythmia-free. There was a learning curve effect with a significant reduction of procedural time (P = 0.025) and a significant difference (P = 0.019) in the rate of fluoroscopy use among different periods of the study duration. **Conclusion:** ZF/NZF CA of SVT and AFL is associated with high efficacy and safety. Entirely fluoroless CA can be performed in the vast majority of patients. It is a feasible approach associated with a detectable learning curve effect.

Key words: catheter ablation, supraventricular tachycardia, zero-fluoroscopy procedure, radiation exposure

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Въведение

Понастоящем радиофреквентната катетърна аблация (КА) е основната терапия за повечето симптоматични и рецидивиращи сърдечни аритмии особено за надкамерните тахикардии (НКТ) като атриовентрикуларната нодална риентри тахикардия (AVNRT), атриовентрикуларната риентри тахикардия (AVRT) и типичното предсърдно трептене (CTIdAFL) [1]. Катетърната аблация с използване на флуороскопия е приемана за златен стандарт в продължение на много години [2]. Конвенционалната флуороскопия неизбежно е свързана с излагане на йонизираща радиация и има някои ограничения като представяне на триизмерни (3D) структури в двуразмерни флуороскопски равнини. Успехът на тези процедури е над 90% [1]. Използването на йонизираща радиация е свързано с потенциални рискове за пациентите и медицинския персонал поради наличните детерминистични и стохастични ефекти [3]. Те имат кумулативен ефект и са от сериозно значение особено в младата популация пациенти, което определя и важността на намаляването на радиационната експозиция по време на електрофизиологичните процедури [4]. По тези причини Американският колеж по кардиология препоръчва принципа “ALARA“ (възможно най-ниската разумно постижима доза) във всички интервенционални лаборатории [5].

Нефлуроскопските 3D електроанатомични системи за картографиране бяха въведени с цел улесняване процедурите за КА. Процедурите без или с минимално използване на флуороскопия вече доказаха съпоставими резултати с конвенционалните такива по отношение на продължителност, непосредствен процедурен успех и честота на услож-

Introduction

Radiofrequency catheter ablation (CA) is currently a mainstream therapy for most symptomatic and recurrent cardiac arrhythmias, especially supraventricular tachycardia (SVT) such as atrioventricular nodal reentrant tachycardia (AVNRT), atrioventricular reentrant tachycardia (AVRT) and typical atrial flutter (CTIdAFL) [1]. Fluoroscopy-guided catheter ablation technique has been considered the gold standard for many years [2]. Conventional fluoroscopy is inevitably associated with ionizing radiation exposure and carries some inherent limitations, such as the representation of three-dimensional (3D) structures in a biplane fluoroscopic view. The success rate for this procedure is greater than 90% [1]. The use of ionizing radiation is associated with risks for patients and staff due to the deterministic and stochastic effects of radiation exposure [3]. These effects are cumulative and give rise to great concerns, especially in the younger population highlighting the importance of reducing radiation exposure during cardiac electrophysiology procedures [4]. Thus, the American College of Cardiology recommends the adoption of the “ALARA” (as low as reasonably achievable) principle in all interventional laboratories [5].

Non-fluoroscopic 3D electroanatomic mapping systems have been introduced to facilitate catheter ablation procedures. Procedures with zero or minimal X-ray exposure have already been proved to be comparable to the conventional approach in terms of procedural time, acute success, and rate

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БЪЛГАРСКА КАРДИОЛОГИЯ
ТОМ XXIX, 2023, № 4

doi: 10.3897/bgcardio.29.e115081

ОЦЕНКА НА ЕФЕКТА НА КАТЕТЪРНАТА АБЛАЦИЯ ВЪРХУ КАЧЕСТВОТО НА ЖИВОТ И ПРЕДИКТОРИ ЗА ПРОМЯНАТА МУ ПРИ ПАЦИЕНТИ С ПРЕДСЪРДНО МЪЖДЕНЕ

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ASSESSMENT OF THE EFFECT OF CATHETER ABLATION ON QUALITY OF LIFE AND PREDICTORS OF IMPROVEMENT IN PATIENTS WITH ATRIAL FIBRILLATION

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Резюме.

Въведение: През последните десетилетия терапевтичните опции за контрол на честотата и ритъма при пациенти с предсърдно мъждене (ПМ) са насочени към подобряване на качеството им на живот (QoL). По отношение на контрола на ритъма катетърната аблация се превърна в утвърдена възможност за лечение. Тя е инвазивна и сравнително скъпа процедура, която обикновено се извършва с цел повлияване на симптомите, затова получаването на информация за степента, до която QoL е повлияно от интервенцията, е от голямо значение. **Целта** на настоящото изследване е да се оцени ефектът от изолацията на белодробните вени върху QoL на пациенти с ПМ и да се открият факторите с най-голямо влияние върху промяната в този показател. **Материал и методи**: Проучването е многоцентрово проспективно кохортно проучване, включващо пациенти с предсърдно мъждене, преминали радиофреквентна изолация на белодробните вени. За оценка на качеството на живот преди процедурата и на края на проследяването са използвани стандартизирани въпросници и скали. **Резултати**: Включени са 131 пациенти на средна възраст 59 ± 9.27 години, от които 75.6% (n = 99) мъже, проследени за средно 39.7 ± 13.3 месеца. Отчита се сигнификантно подобрение ($p < 0.001$) във всички домейни на качеството на живот на края на проследяването спрямо преди процедурата. Регресионен анализ на мултифакторен модел отличи като независими предиктори за определяне на големината на промяната в QoL преди и след аблация фракцията на изтласкване на лявата камера ($p = 0.047$), наличието на митрална инсуфициенция ($p < 0.0001$), индекса на телесната маса ($p = 0.002$) и рецидивите през първите 3 месеца след PVI ($p = 0.009$). **Заключение**: Катетърната аблация при ПМ води до подобрение в QoL при пациенти с ПМ. Важни предиктори за промяна в QoL след РФА са фракцията на изтласкване на ЛК, наличието на митрална инсуфициенция, индекса на телесната маса и наличието на рецидив по време на първите 3 месеца след PVI. Те трябва да се имат предвид при избора на терапевтична стратегия и при определяне на индивидуализирания подход при всеки болен с ПМ.

Ключови думи: предсърдно мъждене, качество на живот, QoL, PVI, катетърна аблация

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Abstract.

Introduction: Over the last decades the rate and rhythm control options available for patients with atrial fibrillation (AF) have been aimed at improving arrhythmia symptoms and quality of life (QoL). In terms of rhythm control catheter ablation has become a valid treatment option. Since it is an invasive and relatively costly procedure generally performed with the aim of symptom control, obtaining information on the degree to which QoL is affected by the intervention is of great importance. **The aim** of the present study was to assess the effect of pulmonary vein isolation (PVI) on the QoL of patients with AF and to determine the factors of greatest influence on the change in QoL. **Material and methods:** This was a multicenter prospective cohort study involving patients with atrial fibrillation who underwent radiofrequency PVI. Standardized questionnaires and scores were used to assess QoL before the procedure and at the end of the follow-up period. **Results:** The study included 131 patients at mean age of 59 ± 9.27 years, 75.6% (n=99) were men. The patients were followed for a mean of 39.7 ± 13.3 months. At the end of the follow-up period, we observed a significant improvement ($p < 0.001$) in all domains of quality of life compared to baseline. Through multivariate regression analysis, left ventricular ejection fraction ($p = 0.047$), mitral regurgitation ($p < 0.0001$), body mass index ($p = 0.002$) and recurrences within the first 3 months following PVI ($p = 0.009$) were found to be independent predictors of the change in QoL before and after ablation. Conclusion: Catheter ablation of atrial fibrillation results in improvement of QoL in patients with AF. Left ventricular ejection fraction, functional mitral regurgitation, body mass index and recurrences within the first 3 months following PVI are important predictors of change in QoL after radiofrequency ablation. They are to be considered when choosing therapeutic strategy and defining the individual approach to each AF patient.

Key words: atrial fibrillation, quality of life, PVI, catheter ablation

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Въведение

През последните десетилетия предсърдното мъждене (ПМ), в резултат на свързаната с него заболеваемост и смъртност, се превърна в социално значимо заболяване, особено в развитите страни. Като се имат предвид застаряването на населението и високият процент пациенти със затлъстяване и артериална хипертония, се очаква неговото разпространение да нарасне допълнително през следващите години [1]. С изключение на антикоагулацията, липсва терапевтична възможност, намаляваща заболяемостта и смъртността при пациенти с ПМ. Наличните опции за контрол на честотата и ритъма са насочени към подобряване на симптомите на аритмията и качеството на живот (QoL) на пациентите [2]. Следователно точната оценка на QoL е от решаващо значение при подбора на пациенти, които биха имали най-голяма полза от която и да е терапевтична интервенция.

По отношение на контрола на ритъма катетърната аблация се превърна в утвърдена възможност за лечение, намаляваща рецидивите на аритмията и честотата и продължителността на епизодите на ПМ при симптомни пациенти. Наличните данни показват, че изолацията на белодробните вени (PVI) може да намали броя на хоспитализациите, да подобри когнитивните способности, функционалния статус и физическия капацитет на пациентите [3]. Това може да промени възприятието им за заболяването и тяхното качество на живот независимо от успеха на процедурата и типа на предсърдното мъждене [3]. Въпреки че ефектът от катетърната аблация върху пациенти с ПМ е широко проучен, повечето клинични изпитвания се концентрират основно върху резултата от PVI и наличието на рецидив [4]. Успеваемостта на аблацията и

Introduction

Over the last decades atrial fibrillation (AF) along with associated morbidity and mortality has become a disease of social significance especially in developed countries. Given the aging population and the incidence of risk factors its prevalence is expected to increase further in the following years [1]. Only a few measures have been shown to significantly reduce morbidity and mortality in AF patients. The treatment options available for rate and rhythm control are aimed at improving arrhythmia symptoms and quality of life [2]. Therefore, accurate assessment of the latter is crucial for the selection of individuals who would have the greatest benefit from any intervention.

In terms of rhythm control catheter ablation has become a valid treatment option, reducing arrythmia recurrence and AF burden in symptomatic patients. Available data suggest that pulmonary vein isolation (PVI) may decrease healthcare utilization and improve cognition, functional status, and exercise tolerance. [3] It might change patients' perception of the disease and their quality of life regardless of procedural success and atrial fibrillation sub-type [3]. Although the effect of catheter ablation on AF patients has been extensively studied, most clinical trials assess procedural outcomes and arrythmia recurrence. [4] Procedural outcome and QoL improvement determine the cost-effectiveness of the PVI and its benefit in terms of healthcare utilization

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Българска кардиология
том XXIX, 2023, № 4

doi: 10.3897/bgcardio.29.e116198

HIS BUNDLE PACING IN A PATIENT WITH ATRIOVENTRICULAR CONDUCTION ABNORMALITIES, PERSISTENT ATRIAL FLUTTER AT HIGH THROMBOEMBOLIC AND BLEEDING RISK AFTER HYBRID CORONARY REVASCULARIZATION AND LEFT ATRIAL APPENDAGE CLOSURE – CASE REPORT

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СТИМУЛАЦИЯ НА СНОПА НА ХИС ПРИ ПАЦИЕНТ С НАРУШЕНО АТРИОВЕНТРИКУЛАРНО ПРОВЕЖДАНЕ, ПЕРСИСТИРАЩО ПРЕДСЪРДНО ТРЕПТЕНЕ С ВИСОК ТРОМБОЕМБОЛИЧЕН И ХЕМОРАГИЧЕН РИСК СЛЕД ХИБРИДНА КОРОНАРНА РЕВАСКУЛАРИЗАЦИЯ И ЗАТВАРЯНЕ НА ЛЕВОПРЕДСЪРДНОТО УХО.

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Abstract. We present a case of a 78-year-old patient with persistent atrial flutter, history of atrial fibrillation and atrioventricular conduction disturbances, including first-degree atrioventricular block (AVB) and paroxysmal complete AVB. Echocardiography revealed mildly reduced left ventricular ejection fraction (LVEF, 44%). The patient had high thromboembolic risk, had previous ischemic stroke, suffered from chronic coronary artery disease treated with hybrid coronary revascularization (minimally invasive direct coronary artery bypass grafting and subsequent percutaneous coronary intervention) as well as left atrial appendage closure. Because of high bleeding risk, double antiplatelet therapy (acetylsalicylic acid and clopidogrel) combined with low dose of low-molecular-weight heparin after cardiac surgery were introduced. Due to persistent atrial flutter, complete AVB, lack of intraventricular conduction abnormalities, mildly reduced LVEF and expected high right ventricle pacing burden, the patient was referred for dual-chamber pacemaker implantation using conduction system pacing (CSP), preferentially His bundle pacing (HBP). The procedure was performed with good outcome and CSP was utilized via HBP. After reassessment of thromboembolic and bleeding risk, the patient was discharged home on reduced dose of dabigatran. Short-term follow-up showed stable HBP parameters along with no additional symptoms. Despite good short-term outcomes and no complications in studied patient, large randomized controlled trials are needed to verify long-term safety and efficacy of HBP to optimize clinical care of patients with atrioventricular conduction abnormalities using a personalized approach.

Key words conduction system pacing; heart failure; His bundle pacing; pacemaker; thromboembolic risk; bleeding risk

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Резюме. Представяме случай на 78-годишен пациент с персистиращо предсърдно трептене, анамнеза за предсърдно мъждене и нарушено атриовентрикуларно провеждане, вкл. артиовентрикуларн блок (AVB) първа степен и пароксизмален пълен AVB. Ехокаредиографията обективизира леко намалена левокамерна фракция на изтласкване (LVEF) от 44%. Пациентът беше с висок тромбоемболичен риск поради преживян мозъчен инсулт и хроничен коронарен синдром, лекуван с хибридна коронарна реваскуларизация (минимално инвазивен аорто-коронарен байпас и последваща перкутанна коронарна интервенция) и беше третиран със затваряне на левопредсърдното ухо. Поради висок хеморагичен риск, след кардио-

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Резюме. хирургичната интервенция беше стартирана двойна антиагрегантна терапия (ацетилсалицилова киселина и клопидогрел) в комбинация с ниска доза нискомолекулярен хепарин. Пациентът беще насочен за имплантация на двукухиненелектрокардиостимулатор със стимулация на проводната система (CSP) с предпочитания към стимулация на снопа на Хис (HBP) поради персистиращ епизод на предсърдно трептене, пълен AVB, липсата на нарушения във вътрекамерната проводимост и очаквания висок дял на деснокамерна стимулация при леко намалена LVEF. Постигна се успешна имплантация като CSP се осъществи чрез HBP. След преоценка на тромбоемболичния и хеморагичния риск пациентът беше дехоспитализиран на терапия с ниска доза дабигатран. Краткосрочното проследяване демонстрира стабилни параметри на стимулация и липса на симптоматика. Въпреки добрия резултат и липсата на усложнения при описания случай, са необходими големи рандомизирани проучвания, които да потвърдят дългосрочната безопасност и ефикасност на HBP и ролята на метода за оптимизацията на грижата за пациентите с нарушения в атриовентрикулното провеждане чрез използване на персонализиран подход.

Ключови думи: стимулация на проводната система, сърдечна недостатъчност, стимулация на снопа на Хис, електрокардиостимулатор, тромбоемболичен риск, хеморагичен риск

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Introduction

Conduction system pacing (CSP), including His bundle pacing (HBP) and left bundle branch area pacing (LBBAP) has emerged as an alternative approach to traditional right ventricular pacing (RVP) [1]. These methods aim to predominantly capture conduction system, compared to dominant myocardial pacing with traditional RVP. There is growing evidence that CSP provides more physiological cardiac pacing, preserving ventricular synchrony (or reducing ventricular dyssynchrony) as well as preventing decrease in left ventricular ejection fraction (LVEF) and development of pacing induced cardiomyopathy (PICM), which may be observed in about 12% of patients with atrioventricular block (AVB) after a mean period of about 4 years [1, 2]. Considering the above, current European Society of Cardiology (ESC) guidelines state that HBP may be considered, among others, as a viable method in patients with AVB, expected high RVP percentage and preserved or mildly reduced LVEF [3].

Case presentation

We present a case of the 78-year-old patient with persistent atrial flutter, a history of atrial fibrillation, atrioventricular conduction disturbances, including first degree and paroxysmal complete AVB as well as heart failure with mildly reduced LVEF (HFmrEF) who was admitted to the hospital for cardiac implantable electronic device placement.

Previous electrocardiogram (ECG) recordings revealed first-degree AVB and paroxysmal complete AVB (Figure 1) with concomitant pauses over 2 seconds.

Evaluation of the medical history revealed multiple comorbidities. The patient had a history of ischemic stroke (signs of Wallenberg's syndrome), chronic coronary syndrome with multivessel disease, which was treated using hybrid coronary revascularization, due to high surgical risk when performing standard coronary artery bypass grafting. The patient underwent minimally invasive direct coronary artery bypass grafting through left minithoracotomy with left internal mammal artery to left anterior descending coronary artery (MIDCAB, LIMA-LAD) with concomitant left atrial appendage (LAA) closure using epicardial clip (AtriClip) and percutaneous coronary angioplasty (PCI) of right coronary artery with the use of drug eluting stent implantation 3 weeks after MIDCAB. Additionally, the patient presented with several additional conditions: hypertension, type 2 diabetes mellitus, obesity, cholelithiasis, cysts of the left kidney, incidentaloma of left adrenal gland and discopathy. The patient had been hospitalized due to severe anemia with red blood cells transfusion, then additional endoscopic examination had revealed sigmoid diverticuli and esophageal varices. However, no signs of active bleeding had been observed during previous hospitalization.

On admission, during medical interview, the patient reported reduced exercise tolerance, vertigo and presyncope that had been present for two months.

The 12-lead ECG revealed atrial flutter with unknown onset, no intraventricular conduction disturbances with QRS duration of about 90 ms (Figure 2, Panel A). Atrial flutter persisted throughout the whole hospital stay. Transthoracic echocardiography (TTE) revealed: mildly reduced LVEF (44%), hypokinesis of inferior-lateral wall, inferior wall, apex and anterior part of intraventricular septum, increased left atrium area (23 cm^2) and right atrium area (20 cm^2), mild regurgitation of mitral valve and restrictive left ventricular filling pattern. Following discussion with the patient and shared decision making rhythm control strategy was undertaken. After careful evaluation of patients' overall health status including expected high RVP percentage, the patient was qualified for permanent dual-chamber pacemaker implantation with CSP, preferentially HBP. After obtaining patients informed consent, pacemaker implantation procedure was performed.

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Българска кардиология
том XXIX, 2023, № 4

doi: 10.3897/bgcardio.29.e116261

СТИМУЛАЦИЯ НА ПРОВОДНАТА СИСТЕМА ПОД КОНТРОЛА НА ИНТРАКАРДИАЛНА ЕХОКАРДИОГРАФИЯ – КЛИНИЧЕН СЛУЧАЙ

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CONDUCTION SYSTEM PACING USING INTRACARDIAC ECHOCARDIOGRAPHY GUIDANCE – A CASE REPORT

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Резюме. Стимулацията на проводната система (CSP) е техника за кардиостимулация, включваща имплантиране на електроди за постоянна кардиостимулация на различни места по протежение на сърдечната проводна система, включващи снопа на His (HBP) и областта на лявото бедро (LBBAP). Интракардиалната ехокардиография (ICE) може да улесни имплантирането на постоянния електрод за стимулация в областта на лявото бедро (LBB) на междукамерния септум. Докладваме случай на 83-годишен пациент с десен бедрен блок (RBBB), ляв преден фасцикуларен блок (ЛПФБ) и световъртеж по време на епизоди на 2:1 атриовентрикуларен (AV) блок, при който се осъществи CSP под контрола на ICE в нашия център. Освен стандартния флуроскопски контрол и мониторирането на интракардиалните сигнали, в този случай използвахме и ICE за визуализация на проникването на електрода в междукамерната преградата по време на имплантацията. Локализацията на електрода на деснокамерния аспект на междукамерния септум, и дълбочината на проникване на електрода в септума и достигането му до областта на лявото бедро бяха лесно визуализирани с ICE. Постигна се селективен LBBAP, демонстриран чрез приетите критерии от ЕКГ и интракардиалните електрограми. Използва се автоматичен strain rate със speckle tracking, за да се демонстрира запазена левокамерна (LV) синхронност след процедурата. При имплантирането на LBBAP може да се използва ICE за наблюдение на проникването на електрода в септума, което потенциално подобрява безопасността и ефикасността на този подход за стимулация.

Ключови думи: интракардиална ехокардиография; стимулация на зоната на лявото бедро; електрод, управляван със стилет

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Abstract. Conduction system pacing (CSP) is a pacing technique involving the implantation of permanent pacing leads at different sites along the cardiac conduction system and includes His bundle pacing (HBP) and left bundle branch area pacing (LBBAP). Intracardiac echocardiography (ICE) might facilitate the implantation of the permanent pacing lead in the left bundle branch (LBB) area of the interventricular septum. We report a case of an 83-year-old patient presenting with right bundle branch block (RBBB), left anterior fascicular block (LAFB), and dizzy spells during episodes of 2:1 atrioventricular (AV) block who underwent CSP with ICE guidance at our center. Apart from standard fluoroscopic guidance and monitoring of intracardiac signals, ICE was also used to monitor lead advancement in the septum during the implantation. The

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landing zone and penetration depth of the pacing lead through the RV septum, mid-septum, and LBB area septum were easily visualized with ICE. Selective LBBAP demonstrated by the accepted ECG and electrogram criteria was achieved. Automated strain rate protocol with speckle tracking was used to demonstrate preserved left ventricular (LV) synchrony following the implantation. The use of ICE to guide LBBAP implantation can be used to monitor lead penetration in the septum, potentially improving the safety and efficacy of this promising pacing modality.

Key words: Intracardiac echocardiography; Left bundle branch area pacing; stylet-driven lead

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Въведение

Стимулацията на проводната система (CSP) е техника, която включва имплантиране на проводник за постоянна кардиостимулация по протежение на различни места на сърдечната проводна система, включваща стимулация на снопа Хис, неговите основни клонове или техните допълнителни разклонения, в това число дисталните влакна на Пуркиние. Поради възможността за постигане на по-стабилни електрически параметри наскоро в клиничната практика беше въведена и популяризирана стимулацията на зоната на лявото бедро (LBBAP). Mafi-Rad и сътр. демонстрират осъществимостта на левокамерната септална стимулация (LVSP) чрез транссептален подход в първото проучване при хора [1]. Huang и сътр. модифицират тази техника и демонстрират, че директната стимулация в областта на проксималния сегмент на лявото бедро (LBB) може да бъде постигната и осъществена по транссептален път [2]. Конвенционални електроди, управлявани със стилет, както и такива без лумен могат да бъдат използвани за CSP, като електродите, управлявани със стилет, предлагат по-висока честота на успешна имплантация на LBBAP при по-кратки процедурни времена [3]. Независимо от типа електрод, който се използва за CSP, често са необходими многократни опити за проникване през септума за фиксиране на електрода в близост до или директно върху LBB [4]. Интракардиалната ехокардиография (ICE) може да е полезна за по-добро позициониране на електрода [5, 6]. Едно от най-ценните предимства на ICE е способността да се оцени близостта на фиксиращия механизъм на върха на електрода до ендокарда на лявата камера (LV) или за ранно откриване на септална микроперфорация.

Описание на клиничния случай

Докладваме случай на 83-годишен пациент с 2:1 AV блок, десен бедрен блок (RBBB) и ляв преден фасцикуларен блок (ЛПФБ) (фиг. 1), представящ се със задух, световъртеж и причерняване пред очите, без синкоп. Оплакванията датират от две седмици

Introduction

Conduction system pacing (CSP) is a technique of pacing that involves the implantation of permanent pacing leads along different sites of the cardiac conduction system by pacing at the level of His bundle or its major branches or their further ramifications including distal Purkinje fibers. Recently left bundle branch area pacing (LBBAP) was introduced and accepted widely as it provides more stable pacing parameters. Mafi-Rad et al. demonstrated the feasibility of permanent left ventricular septal pacing (LVSP) via the ventricular transseptal approach in a first-in-human study [1]. Huang et al. modified this technique and demonstrated that direct pacing of the proximal part of the left bundle branch can be acquired and accomplished using the transseptal route [2]. Conventional stylet-driven and lumenless leads could be used as CSP lead and stylet-driven leads offer higher LBBAP lead implantation success rates while shortening implant duration [3]. Regardless of the type of permanent lead that is used for CSP, multiple screw-in attempts under fluoroscopy are often needed to place the pacing lead tip near or at the left bundle branch (LBB) [4]. Because of that, intracardiac echography (ICE) guidance could be helpful for better lead placement [5, 6]. One of the most valuable advantages of ICE is the ability to assess the proximity of lead helix to the LV endocardium and detect septal perforation early.

Case description

We report the case of an 83-year-old male patient with 2:1 AV block, right bundle branch block (RBBB), and left anterior fascicular block (LAFB) (Figure 1) presenting with shortness of breath and dizziness without syncope dating back two weeks prior to hospi-

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Българска кардиология
том XXIX, 2023, № 2

doi: 10.3897/bgcardio.29.e104528

ИНТЕРВЕНЦИОНАЛНАТА ЕЛЕКТРОФИЗИОЛОГИЯ В БЪЛГАРИЯ ПРЕЗ 2022 ГОДИНА: ДАННИ ОТ ЕЛЕКТРОННИЯ РЕГИСТЪР BG-EPHY

Ч. Шалганов[1], М. Стоянов[1], В. Трайков[2], от името на участниците в регистъра BG-EPHY[3]

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INTERVENTIONAL ELECTROPHYSIOLOGY IN BULGARIA IN 2022: DATA FROM THE ELECTRONIC REGISTRY BG-EPHY

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Резюме. Представени са данни от националния електронен регистър BG-EPHY за електрофизиологичните катетърни аблации през 2022 година. **Материал и методи:** Ретроспективно е проучена пълна едногодишна извадка от регистъра BG-EPHY. Представени са разпределението на пациентите по пол и възраст, броят процедури, честотата на използване на електроанатомичен мепинг (EAM), иригирана аблация и криоаблация, честотата на електрофизиологичните диагнози, на непосредствен успех, както и на интрапроцедурни усложнения. **Резултати:** През 2022 г. в седем електрофизиологични центъра са извършени 1369 аблации при 872 мъже (63.7%) и 497 жени (нарастване с 57% спрямо предходната година), вкл. 15 пациенти на възраст < 18 год. (1.1%). EAM е използван в 746 аблации (54.5%), иригиран катетър – в 814 (59.5%), криобалонен катетър – в 130 (9.5%), интракардиална ехография – в 33 (2.4%). Най-често е правена изолация на белодробни вени (40.2%), следвана от аблация на AV нодална риентри тахикардия (18.6%) и типично предсърдно трептене (16.6%). Непосредственият успех е над 98%, а интрапроцедурните усложнения – под 2%. **Заключение:** Националният регистър по електрофизиология включва системно и непрекъснато основни данни за аблациите на сърдечни аритмии, извършвани в страната. В условията на затихваща пандемия от COVID-19 и с включването на нови центрове в регистъра през 2022 г. се отчита увеличение в броя на извършените аблации спрямо предходната година. Структурата на дейността се запазва спрямо предходната година. Непосредственият процедурен успех е много висок, а интрапроцедурните усложнения – много редки.

Ключови думи: инвазивна електрофизиология; катетърна аблация; електроанатомичен мепинг

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Abstract. This study presents data from the national electronic registry BG-EPHY on electrophysiologic (EP) cardiac ablations in 2022. **Material and methods:** This is a retrospective study of a full one-year sample of the BG-EPHY registry. Sex and age distribution of the patients, number of ablations, use of electroanatomic mapping (EAM), irrigated and cryoablations, distribution of different types of arrhythmias, acute procedural success and complications are presented. **Results:** In 2022 seven EP centers performed 1369 ablations in 872 men (63.7%) and 497 women (57% increase compared to previous year), incl. 15 ablations in pediatric patients (1.1%). EAM was used in 746 procedures (54.5%), irrigated-tip catheter – in 814 (59.5%), cryoballoon catheter – in 130 (9.5%), and intracardiac echocardiography – in 33 (2.4%). The most frequently performed ablation was pulmonary vein isolation (40.2%), followed by ablation for AV nodal reentrant tachycardia (18.6%) and typical atrial flutter (16.6%). The acute success was over 98%, while intraprocedural complications were less than 2%. **Conclusion:** The national registry of electrophysiology collects systematically and continuously basic data on all ablations of cardiac arrhythmias performed in the country. In 2022, during a subsiding COVID-19 pandemic and with the inclusion of new centers the number of ablations increased compared to 2021. Distribution of EP procedure types was similar to previous years. Acute success was very high, while intraprocedural complications were rare.

Key words: invasive electrophysiology; catheter ablation; electroanatomic mapping

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* https://10.3897/bgcardio.29.e104528.suppl1

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Българска кардиология
том XXVIII, 2022, № 2

АВТОРСКИ СТАТИИ
ORIGINAL ARTICLES

doi: 10.3897/bgcardio.28.e82407

ИНТЕРВЕНЦИОНАЛНАТА ЕЛЕКТРОФИЗИОЛОГИЯ В БЪЛГАРИЯ ПРЕЗ 2021 ГОДИНА: ДАННИ ОТ ЕЛЕКТРОННИЯ РЕГИСТЪР BG-EPHY

Ч. Шалганов[1], М. Стоянов[1], В. Трайков[2], от името на участниците в регистъра BG-EPHY[3]

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INTERVENTIONAL ELECTROPHYSIOLOGY IN BULGARIA IN 2021: DATA FROM THE ELECTRONIC REGISTRY BG-EPHY

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Резюме. Обзорът представя данни от Националния електронен регистър BG-EPHY за електрофизиологичните катетърни аблации през 2021 г. **Материал и методи:** Ретроспективно е проучена пълна едногодишна извадка от регистъра BG-EPHY. Представени са разпределение на пациентите по пол и възраст, брой процедури, честота на използване на електроанатомичен мепинг (EAM), иригирана аблация и криоаблация, честота на електрофизиологичните диагнози, честота на непосредствен успех, интрапроцедурни усложнения. **Резултати:** През 2021 г. в 5 електрофизиологични центъра са извършени 872 аблации при 546 мъже (62.6%) и 326 жени (нарастване с 4.4% спрямо предходната година), вкл. 6 пациенти на възраст < 18 год. (0.7%). EAM е използван при 60.9% от аблациите, иригиран катетър – в 55.2%, криобалонен катетър – в 6%, интракардиална ехография – при 4.2%. Най-често е правена изолация на белодробни вени, следвана от аблация на AV нодална риентри тахикардия и типично предсърдно трептене. Непосредственият успех е над 98%, а интрапроцедурните усложнения – под 2%. **Заключение.** Националният регистър по електрофизиология включва системно и непрекъснато основни данни за аблациите на сърдечни аритмии, извършвани в страната. В условията на продължаваща пандемия от COVID-19 през 2021 г. се отчита леко увеличение в броя на извършените аблации спрямо предходната година. Структурата на дейността се запазва спрямо предходната година. Непосредственият процедурен успех е много висок, а интрапроцедурните усложнения редки.

Ключови думи: инвазивна електрофизиология; катетърна аблация; електроанатомичен мепинг

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Abstract. This study presents data from the national electronic registry BG-EPHY on electrophysiologic (EP) cardiac ablations in 2021. **Material and methods:** This is a retrospective study of a full one-year sample of the BG-EPHY registry. Sex and age distribution of the patients, number of ablations, electroanatomic mapping (EAM), irrigated and cryoablations, distribution of different types of arrhythmias, acute procedural success and complications are presented. **Results:** In 2021 five EP centers performed 872 ablations in 546 men (62.6%) and 326 women (4.4% increase compared to previous year), incl. 6 ablations in pediatric patients (0.7%). EAM was used in 60.9% of the procedures, irrigation catheter was used in 55.2%, cryoballoon catheter – in 6%, and intracardiac echocardiography – in 4.2%. The most common ablation was pulmonary vein isolation, followed by ablation for AV nodal reentrant tachycardia and typical atrial flutter. The acute success was over 98%, while intraprocedural complications were less than 2%. **Conclusion:** The national registry of electrophysiology collects systematically and continuously basic data on all ablations of cardiac arrhythmias performed in the country. In 2021, during a continuing COVID-19 pandemic the number of ablations increased slightly compared to the previous year. Distribution of EP procedure types was similar to previous years. Acute success was very high, while intraprocedural complications were rare.

Keywords: invasive electrophysiology; catheter ablation; electroanatomic mapping

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Българска кардиология
том XXVII, 2021, № 3

doi: 10.3897/bgcardio.27.e66077

ОБЗОР НА ИНТЕРВЕНЦИОНАЛНАТА ЕЛЕКТРОФИЗИОЛОГИЯ В БЪЛГАРИЯ ПРЕЗ 2019 И 2020 ГОДИНА: ДАННИ ОТ ЕЛЕКТРОННИЯ РЕГИСТЪР ЗА АБЛАЦИИ BG-EPHY

Ч. Шалганов[1], М. Стоянов[1], В. Трайков[2], от името на участниците в регистъра BG-EPHY[3]

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REVIEW OF INTERVENTIONAL ELECTROPHYSIOLOGY IN BULGARIA IN 2019 AND 2020: DATA FROM THE ELECTRONIC ABLATION REGISTRY BG-EPHY

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Резюме. Настоящата статия представя данни от националния електронен регистър BG-EPHY за електрофизиологичните катетърни аблации през 2019 и 2020 г. **Материал и методи.** Извършено е ретроспективно проучване на пълна двугодишна извадка от регистъра BG-EPHY. Представени са разпределение на пациентите по пол и възраст, брой процедури, честота на използване на електроанатомичен мепинг (EAM) и на иригирана аблация, честота на електрофизиологичните диагнози, брой и относителен дял на успешните процедури, интрапроцедурни усложнения. **Резултати:** През 2019 г. в 4 електрофизиологични центъра са извършени 1033 аблации при 652-ма мъже (63.1%) и 381 жени, вкл. 12 пациенти на възраст < 18 год. (1.2%). EAM е използван при 46.7% от аблациите, иригиран катетър – в 52.2%, а криокатетър – в 0.5%. Най-често е правена изолация на белодробни вени, следвана от аблация на AV нодална риентри тахикардия и типично предсърдно трептене. През 2020 г. в 5 електрофизиологични центъра са извършени 835 аблации при 508 мъже (60.8%) и 327 жени, вкл. 8 пациенти на възраст < 18 год. (1%). EAM е прилаган в 50.9%, иригиран катетър – в 54.5%, криокатетър – в 3.8%. Най-честата аблация отново е изолацията на белодробни вени, но аблацията при типично предсърдно трептене изпреварва AV нодалната риентри тахикардия. През 2020 г. отчетливо намаляват и аблациите на допълнителни проводни връзки с 37%. И през двете години непосредственият успех е над 98%, а усложненията – под 2%. **Заключение.** Националният регистър по електрофизиология включва системно и непрекъснато основни данни за сърдечните аблации, извършвани в страната. Структурата на дейността е много сходна с тази в други европейски страни. Непосредственият процедурен успех е много висок, а интрапроцедурните усложнения – много редки. През 2020 година се отчита спад в броя на извършените аблации с 19% спрямо предходната година в резултат на пандемията от COVID-19.

Ключови думи: инвазивна електрофизиология; катетърна аблация; електроанатомичен мепинг.

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Abstract. This study presents data from the national electronic registry BG-EPHY on electrophysiologic (EP) cardiac ablations in 2019 and 2020. **Material and methods.** This is a retrospective study of a full two-year sample of the BG-EPHY registry. Sex and age distribution of the patients, number of ablations, electroanatomic mapping (EAM), irrigated ablations, distribution of different types of arrhythmia, intraprocedural success and complications are presented. **Results.** In 2019 four EP laboratories performed 1033 ablations in 652 men (63.1%) and 381 women, incl. 12 pediatric ablations (1.2%). EAM was used in 46.7% of the procedures, irrigation catheter was used in 52.2%, and cryocatheter – in 0.5%. The most common procedure was pulmonary vein isolation, followed by ablation for AV nodal reentrant tachycardia and typical atrial flutter. In 2020 five EP laboratories performed 835 ablations in 508 men (60.8%) and 327 women, incl. 8 pediatric ablations (1%). EAM was used in 50.9% of the ablations, irrigation catheter – in 54.5%, and cryocatheter – in 3.8%. The most common procedure was again pulmonary vein isolation. Ablation of typical atrial flutter was the second most frequently

performed procedure, ahead of AV nodal reentrant tachycardia. In 2020 the number of ablations of accessory pathways also distinctly dropped by 37%. In both years the acute success was over 98%, and the complications were less than 2%. **Conclusion.** The national registry of electrophysiology collects systematically and continuously basic data on all cardiac ablations performed in the country. The structure of the EP service is remarkably similar to other European countries. Acute success is very high, while intraprocedural complications are rare. In 2020 the number of the ablations dropped by 19% as a consequence of the COVID-19 pandemic.

Key words: invasive electrophysiology; catheter ablation; electroanatomic mapping

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Въведение

Инвазивна електрофизиология в България се практикува от над 30 години. След кратък период на катетърни аблации с прав ток, през 1993 г. в Националната кардиологична болница (тогава Национален център по сърдечно-съдови заболявания) е извършена първата радиофреквентна катетърна аблация. От 1994 г. методът започва да се прилага рутинно за лечение на различни тахиаритмии, първоначално само в Националната кардиологична болница [1, 2]. Едва през 2012 г. в Аджибадем Сити Клиник Токуда (тогава Токуда болница) е създадена втората електрофизиологична лаборатория в страната. Впоследствие са основани и други електрофизиологични лаборатории, вкл. извън столицата. Въпреки над 25-годишната история на методиката в България, досега са съобщавани само едноцентрови резултати [3-9], но национални данни за обема, вида и резултатите от електрофизиологичните интервенции липсват. Обратно, в редица европейски страни съществува дългогодишна практика да се публикуват периодични цялостни обзори на дейността или тематични извадки, базирани на национални регистри [10-14].

Целта на настоящия преглед е да се представят обемът и видът на извършените електрофизиологични интервенции в национален мащаб през 2019 и 2020 г.

Материал и методи

През ноември 2014 г. в страната е пуснат в действие електронен регистър за инвазивна електрофизиология BG-EPHY. Регистърът е създаден по проект на Съсловното сдружение по кардиостимулация и електрофизиология в България (ССКЕБ), поддържа се от Сдружението и е изцяло негова собственост. След няколкомесечен пробен период, от 1 март 2015 г. въвеждането на данни за всяка катетърна аблация на сърдечна аритмия, извършена в страната, става задължително за отчитане на дейността пред НЗОК. По решение на ССКЕБ в регистъра задължително се въвеждат и всички ди-

Introduction

Invasive electrophysiology has been practiced in Bulgaria for over 30 years now. Following a short period of direct current catheter ablations, the first radiofrequency catheter ablation was performed in the National Heart Hospital (then National center for cardiovascular diseases) in 1993. Since 1994 this modality has become routine for treatment of different types of tachyarrhythmia, initially only at the National Heart Hospital [1, 2]. Only in 2012 in Acibadem City Clinic Tokuda (then Tokuda Hospital) the second electrophysiology (EP) laboratory in the country was founded. Afterwards other EP centers appeared, including outside the capital. Although the method has over 25 years of history in Bulgaria, only single center results have been reported so far [3-9]. However, data on the number, type and results of EP interventions on a national scale are lacking. Conversely, in a number of European countries there is a long-standing practice of publishing periodic comprehensive reviews of activities or thematic samples based on national registries [10-14].

The purpose of this review is to present the number and type of EP interventions performed nationwide in 2019 and 2020.

Material and methods

An electronic registry for invasive electrophysiology BG-EPHY was initiated in Bulgaria in November 2014. It has been designed by the Association for cardiac pacing and electrophysiology in Bulgaria (ACEB), it is maintained by the Association and is owned entirely by it. Following a test period of a few months, data entry for each catheter ablation of cardiac arrhythmia performed in the country became mandatory for reporting the activity to the National

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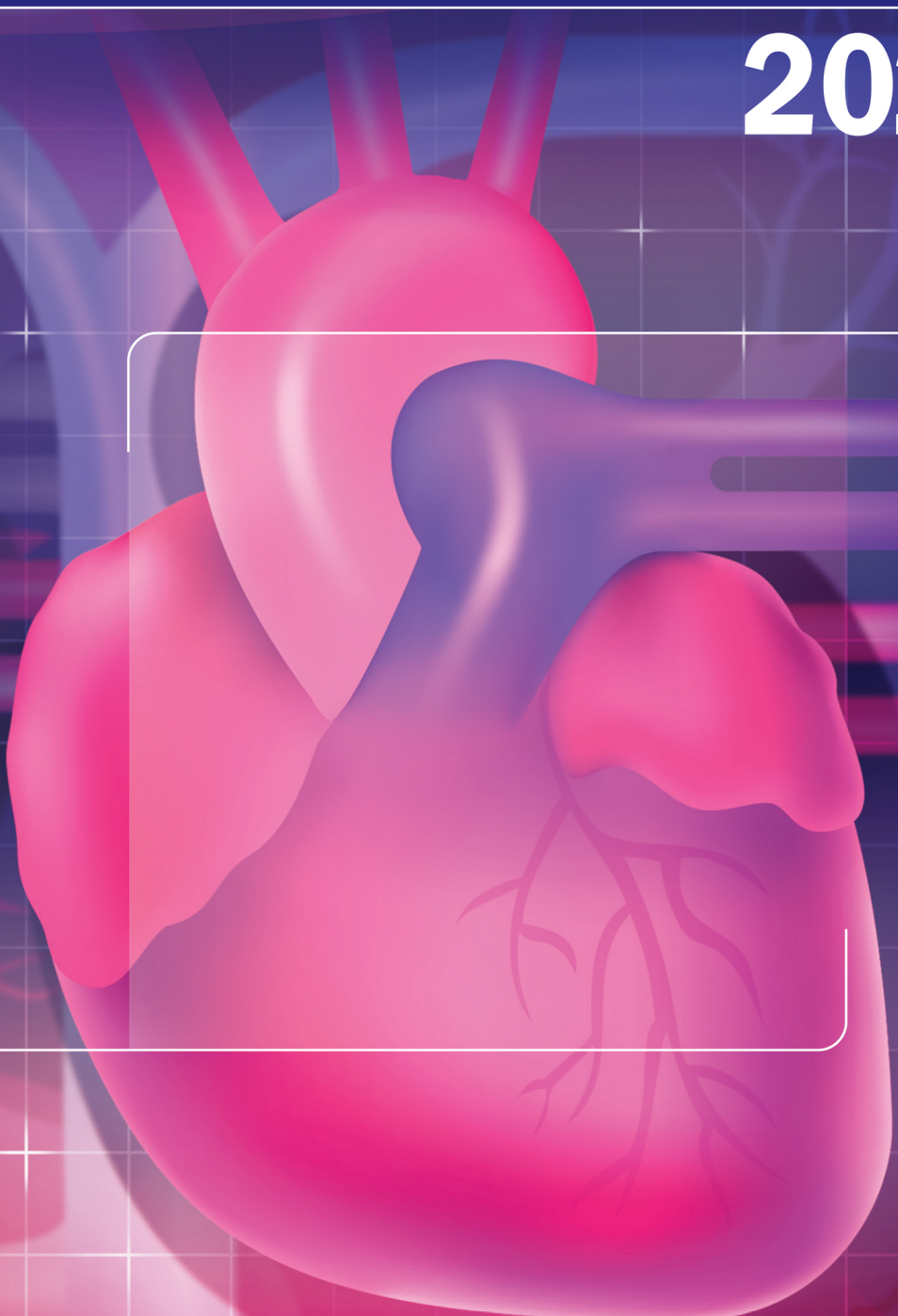
под редакцията на ПРОФ. Д-Р МЛАДЕН ГРИГОРОВ, Д.М.Н.

2024



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КАРДИОЛОГИЯ 2024

под ред. на проф. д-р Младен Григоров, д.м.н.

Централна медицинска библиотека, МУ – София

КАРДИОЛОГИЯ 2024

под ред. на проф. д-р Младен Григоров, д.м.н.

Трето преработено и допълнено издание

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Стилова редакция и корекция: *Св. Цветанова, И. Митева, В. Цъклева*

Страниране: *Д. Александрова*

ISBN 978-619-7491-79-1

Печат: Таурус Адвертайзинг

СЪДЪРЖАНИЕ

Резюме:

В главата, посветена на електрофизиологичното изследване и катетърна аблация в настоящата колективна монография са разгледани основните принципи на регистрация на интракардиални сигнали. Представени са основните техники за извършване на електрофизиологично изследване и находки при изследване на антеградното и ретроградното провеждане. Описани са принципите на катетърната аблация и най-често използваните източници на енергия. В детайл са разгледани електрофизиологичните находки и подходите за аблация при пациенти с надкамерни тахикардии, камерни тахиаритмии и предсърдно мъждене като са посочени индикациите за извършване на процедурата, резултатите от аблацията и потенциалните усложнения при отделните типове аритмогенни субстрати.

Комплексен подход в терапията в старческа възраст и при дълголетници

ГЕРИАТРИЧНИ АСПЕКТИ НА СЪВРЕМЕННАТА ДИАГНОСТИКА И ТЕРАПИЯ

2020/2021

Под редакцията на
проф. Борислав Георгиев
проф. Мария Орбецова

Проводната система в старческа възраст. Особености при имплантацията на електронни устройства

Васил Трайков

Аджибадем Сити Клиник УМБАЛ Токуда

В световен мащаб се установява отчетлива тенденция към застаряване на населението. С напредването на възрастта настъпват анатомични и патологични промени в миокарда и проводната система, които предразполагат към изява на редица аритмии и проводни нарушения. Поради това в следващите години се очаква делът на пациентите в старческа възраст с индикации за поставяне на имплантируеми сърдечни електронни устройства да нарасне значително.

Настоящият обзор цели да разгледа основните патологични механизми, обуславящи по-честата изява на ритъмни и проводни нарушения в старческа възраст. Разглеждат се и епидемиологията на проводните нарушения при възрастните пациенти, както и особеностите при имплантацията на сърдечни електронни устройства по отношение на възможностите за възникване на усложнения и относно избора на режим на стимулация.