**REVIEW**

**For awarding the Educational and Scientific Degree "Doctor"**

Field of Higher Education: 7. Health and Sport;

Professional Field: 7.1. Medicine

Scientific Specialty: Cardiology

**PhD Candidate:** Dr. Krasimir Rosenov Dzhinsov

**Dissertation Title:** "Significance of Radiofrequency Lesion Tagging and Their Characteristics in Pulmonary Vein Isolation in Patients with Atrial Fibrillation"

**Scientific Supervisor:** Prof. Vasil Borislavov Traykov, MD, PhD

**Reviewer:** Prof. Mariya Petkova Tokmakova, MD, PhD

Head of Department, Clinic of Cardiology, University Hospital "St. George" EAD

Head of the First Department of Internal Medicine, Faculty of Medicine, Medical University of Plovdiv

## 1. General overview of the procedure and the PhD candidate

The set of materials and documents submitted by Dr. Krasimir Rosenov Dzhinsov in electronic format complies with the requirements of the Bulgarian Act on the Development of the Academic Staff in the Republic of Bulgaria and its Implementing Regulations, the Higher Education Act, as well as the Regulations of "Acibadem City Clinic UMBAL Tokuda" EAD governing the conditions and procedure for awarding the Educational and Scientific Degree "Doctor". By decision of the Scientific Council of "Acibadem City Clinic UMBAL Tokuda" EAD (meeting held on 26.11.2025, Minutes No. 61), I was elected, and by Order No. 15-01-448 No. 2/22.12.2025 issued by the Executive Director and the Procurator of the hospital, I was approved as a member of the Scientific Jury for this procedure.

## 2. Brief biographical data of the PhD candidate

Dr. Krasimir Dzhinsov was born on 08.12.1987. He graduated in Medicine from the Medical University of Plovdiv in 2012 with full honors and was awarded the "Golden Hippocrates" prize. He completed his specialization in Cardiology at University Hospital

"St. George" EAD, Plovdiv, and obtained board certification in Cardiology in 2017, as well as certification in cardiac pacing and electrophysiology (basic and expert level) in 2019. Since 2020, he has served as Head of the "Invasive Electrophysiology and Cardiac Pacing" Unit at University Hospital "St. George" EAD – Plovdiv, and since 2024 he has been Executive Director of the National Cardiology Hospital EAD. Since 2021, he has been a part-time assistant at the Simulation Center of the Medical University of Plovdiv. Since 2023, he has served as Chairman of the Professional Association of Cardiac Pacing and Electrophysiology in Bulgaria. On 07.11.2024, he was enrolled as an external PhD candidate (independent training) at the Clinic of Cardiology of "Acibadem City Clinic UMBAL Tokuda" EAD in the doctoral programme "Cardiology", under the supervision of Prof. Vasil Traykov.

**3. Relevance of the topic and appropriateness of the aims and objectives**

The topic of the dissertation is relevant, clinically significant and of high practical applicability, as atrial fibrillation is the most common sustained arrhythmia and is associated with an increased risk of ischemic stroke, progression of heart failure, increased hospitalizations, and a substantial impairment of quality of life. Catheter ablation, and in particular radiofrequency pulmonary vein isolation, is an established rhythm-control strategy in appropriately selected patients; however, recurrences after the procedure remain a major problem. One of the main mechanisms of arrhythmia recurrence is reconnection through gaps in the ablation lines, which highlights the need for objective assessment and standardization of procedural technique, as well as analysis of factors determining lesion durability. In this context, the stated aims are clearly defined and fully appropriate, as they integrate two key aspects: assessment of the effect of the lesion-tagging method on procedural success, long-term freedom from recurrence and quality of life, and analysis of objectively measurable biophysical characteristics of radiofrequency applications and their association with long-term outcome and changes in quality of life. The formulated objectives are logically consistent and adequately cover the stated aims. They include: analysis of clinical and procedural characteristics of a cohort of patients with atrial fibrillation treated by catheter ablation, including demographic and clinical variables, procedural success rate and complication rate; comparison of selected clinical and procedural characteristics and procedural success rate according to the lesion-tagging

method (manual versus automatic); determination of the significance of gaps in ablation lines identified by the two tagging methods for the acute outcome (including acute reconnection) and the long-term outcome after both first and repeat ablation; characterization of ablation lesions based on radiofrequency application data from the electroanatomical mapping system and assessment of their influence on procedural success; and evaluation of the impact of catheter ablation, tagging method and objective lesion characteristics on patients' quality of life.

In summary, the aims and objectives are scientifically grounded, well aligned with real-world clinical challenges in atrial fibrillation ablation, and provide a basis for practically applicable results aimed at procedural optimization and improvement of long-term clinical outcomes.

**4. Structure of the dissertation**

The dissertation is presented in a volume of 196 pages and is divided into 13 main chapters. The sections are well balanced and logically structured. The dissertation contains 44 figures and 28 tables, which are informative and clearly illustrate the results of the study. The reference list includes 336 sources, of which 7 are by Bulgarian authors. The structure of the dissertation meets the generally accepted academic criteria for a dissertation submitted for awarding the Educational and Scientific Degree "Doctor".

**5. Knowledge of the problem**

The literature review is comprehensive and demonstrates very good knowledge of the problem and current trends in catheter ablation for atrial fibrillation. The factors associated with failure and recurrence are discussed, including the role of gaps and reconnection, as well as approaches to improve catheter stability and lesion reliability. A major strength is the focus on patient-oriented outcomes, with quality of life addressed as a key component of the overall evaluation of the intervention.

**6. Research methodology and evaluation of the dissertation**

The study includes 131 patients with atrial fibrillation treated between August 2017 and January 2022 who underwent radiofrequency pulmonary vein isolation in three centers. Clearly defined inclusion and exclusion criteria are presented. The endpoints for success are defined as follows: procedural (acute) success – complete electrical isolation of all pulmonary veins at the end of the procedure; clinical success – absence of recurrence after

the third month until the end of follow-up. The statistical methodology includes tests for normality, parametric and non-parametric tests, Kaplan–Meier analysis, and logistic regression models for predictors of recurrence. The results are presented consistently and cover procedural, electrophysiological and patient-oriented outcomes. The study is multicenter and observational, which makes it close to real-world practice; however, some variability between centers and an influence of increasing experience during the implementation of automatic tagging are possible. The follow-up method for detecting recurrences and the settings used to define gaps should be clearly specified, as they may affect interpretation of results. Follow-up is sufficiently long – mean 39.7 ± 13.3 months (median 38 months), with low attrition (3.1%), supporting the reliability of the analysis. After the blanking period, 43.3% of patients experienced recurrence, and some underwent repeat PVI, allowing assessment of reconnection. Kaplan–Meier analysis shows recurrence-free survival of 77.1% at 1 year and 64.9% at 2 years (median 47 months). The comparison between manual and automatic tagging shows no statistically significant difference in recurrence rates (up to 3 months: 25% vs 22.2%; at end of follow-up: 52.1% vs 38%), although a trend towards lower recurrence with automatic tagging is observed. Automatic tagging demonstrates advantages in procedural efficiency, with significantly shorter radiofrequency time (2801 s vs 3311.5 s) and a more favorable distribution below the median for radiofrequency and procedural time. Particularly important is the mechanistic analysis of acute reconnection: at the site of acute reconnection, manual tagging identifies a gap in only 3.85%, whereas automatic tagging identifies a gap in 56.60% ($p<0.001$), and agreement between methods is low ($\kappa=0.049$), indicating that the methods are not interchangeable for gap localization. Objective biophysical parameters of applications (especially impedance drop and duration) are associated with long-term success, and automatic tagging is linked to a higher mean impedance drop. Quality-of-life analysis (EQ-5D-5L) shows that changes in quality of life depend on clinical profile (LVEF, mitral regurgitation, BMI) and early recurrences, strengthening the practical value of the results.

**7. Contributions and significance**

The PhD candidate formulates clear scientific-theoretical and scientific-applied contributions that can be considered real and of practical significance for contemporary

electrophysiology. The main contributions include: a systematic comparison between manual and automatic lesion tagging in atrial fibrillation ablation; evaluation of automatic tagging as a tool for more precise detection of gaps in the ablation line and potential sites of acute reconnection; analysis of objectively measurable biophysical characteristics of applications and their relationship with long-term clinical outcome; confirmation of improved quality of life after catheter ablation and identification of factors influencing its change; and the proposal of criteria for gap assessment applicable in routine clinical practice.

**8. Publications**

The publications related to the dissertation topic are thematically consistent and reflect a logical development of the PhD candidate's scientific work – from initial experience and methodological assessment of automatic tagging of radiofrequency applications, through its use as a tool for identifying gaps in the ablation line, to a patient-oriented analysis of the effect of catheter ablation on quality of life and the factors determining its change. The publication activity meets the requirements for awarding the Educational and Scientific Degree "Doctor" and reflects scientific progress on the dissertation topic.

**9. Personal contribution of the PhD candidate**

The personal contribution of the PhD candidate is substantial and includes participation in clinical work and electrophysiology procedures, data collection, interpretation of results, and preparation of publications. His professional experience and qualifications in invasive electrophysiology have been essential for the selection of the topic, study design, and implementation of the research.

**10. Abstract**

The abstract corresponds to the dissertation and reflects the key aspects of the study. The most illustrative figures and tables from the dissertation are included. Lists of publications and the main scientific contributions of the PhD candidate are also presented.

**CONCLUSION**

The dissertation of Dr. Krasimir Rosenov Dzhinsov contains scientific-theoretical and applied results that represent an original contribution to science and meet all requirements of the Bulgarian Act on the Development of the Academic Staff in the Republic of Bulgaria, its Implementing Regulations, and the relevant Regulations and specific

requirements of "Acibadem City Clinic UMBAL Tokuda" EAD for awarding the Educational and Scientific Degree "Doctor". The PhD candidate Dr. Dzhinsov possesses in-depth theoretical knowledge and professional skills in the scientific specialty of Cardiology and demonstrates qualities and abilities for independent scientific research. In view of the above, I give my positive assessment of the conducted research, presented in the dissertation, abstract, achieved results and contributions, and I propose that the esteemed Scientific Jury award the Educational and Scientific Degree "Doctor" to Dr. Krasimir Dzhinsov in the doctoral programme in Cardiology.

17 JAN 2026
Plovdiv

Prof. Mariya Tokmakova, MD, PhD