



Universiteit  
Leiden  
The Netherlands

## **New insights on post-myocardial infarction ventricular tachycardia ablation: defining patient-tailored endpoints to improve outcome**

De Riva Silva, M.

### **Citation**

De Riva Silva, M. (2022, June 2). *New insights on post-myocardial infarction ventricular tachycardia ablation: defining patient-tailored endpoints to improve outcome*. Retrieved from <https://hdl.handle.net/1887/3307420>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/3307420>

**Note:** To cite this publication please use the final published version (if applicable).

## **ACKNOWLEDGMENTS**

Many have contributed in different ways to make this thesis possible. I would like to thank especially:

Prof. dr. Katja Zeppenfeld for her big support throughout these years. Her high research and clinical standards motivates me to be better every day. Prof. dr. Martin Schalijs for giving me the opportunity to develop my carrier at the LUMC. Dr. Hadrian Wijnmaalen, for being the best colleague one could wish. Dr. Serge Trines, for the many things I learnt from him and for all the nice non-work related conversations. All the clinical and research fellows who I have worked with both in research and at the EP lab. Especially, Dr. Sebastiaan Piers, with whom I started my first research project and Dr. Micaela Ebert, for the wonderful time in and outside the lab.

My parents, from whom I inherited the respect for the patients, the hard-working spirit and the passion for this beautiful profession.

Ale, Berta, Carlos and Chevi, my family in Leiden.

Jose, Juan and María, because they are the joy of my life.



## LIST OF PUBLICATIONS

- 1. Contemporary patients with congenital heart disease: uniform atrial tachycardia substrates allow for clear ablation endpoints with improved long-term outcome.**

Brouwer C, Hebe J, Lukac P, Nürnberg JH, Cosedis Nielsen J, de Riva Silva M, Blom N, Hazekamp M, Zeppenfeld K.

*Circ Arrhythm Electrophysiol.* 2021 Sep;14(9):e009695. doi: 10.1161/CIRCEP.120.009695

- 2. Accuracy of electroanatomical mapping-guided cardiac radiotherapy for ventricular tachycardia: pitfalls and solutions.**

Abdel-Kafi S, Sramko M, Omara S, de Riva M, Cvek J, Peichl P, Kautzner J, Zeppenfeld K.

*Europace.* 2021;23:1989-1997.

- 3. Predicting early reconnection after cryoballoon ablation with procedural and biophysical parameters.**

Keçe F, de Riva M, Alizdeh Dehnavi R, Wijnmaalen AP, Mertens BJ, Schalij MJ, Zeppenfeld K, Trines SA.

*Heart Rhythm O2.* 2021;2:290-297

- 4. The Prognostic Value of J-wave Pattern for Recurrence of Ventricular Tachycardia after Catheter Ablation in Patients with Myocardial Infarction.**

Naruse Y, De Riva M, Watanabe M, Wijnmaalen AP, Venlet J, Timmer M, Schalij M, Zeppenfeld K.

*Pacing Clin Electrophysiol.* 2021;44:657-666

- 5. Myocardial calcification is associated with endocardial ablation failure of post-myocardial infarction ventricular tachycardia.**

De Riva M, Naruse Y, Ebert M, Watanabe M, Scholte AJ, Wijnmaalen AP, PhD, Trines SA, Schalij MJ, Montero-Cabezas, Zeppenfeld K.

*Europace.* 2021;23:1275-1284

- 6. An accessory pathway with automaticity and bidirectional conductive capacity.**

Bruydonckx L, de Riva M, Blom NA, Bertels RA.

*Europace.* 2021 Jan 4;euaa379.doi:10.1093/europace/euaa379.

**7. Broad complex tachycardia; never judge a book by its cover.**

Regeer MV, Tops LF, de Riva M

*Neth Heart J.* 2020 Oct 2. doi: 10.1007/s12471-020-01495-x

**8. Parameters associated with ventricular arrhythmias in mitral valve prolapse with significant regurgitation.**

van Wijngaarden AL, de Riva M, Hiemstra YL, van der Bijl P, Fortuni F, Bax JJ, Delgado V, Ajmone Marsan N.

*Heart.* 2021;107:411-418

**9. High prevalence and prognostic impact of pathogenic mutations in patients with dilated cardiomyopathy referred for ventricular tachycardia ablation**

Ebert, M, Wijnmaalen AP, de Riva M, Trines S, Androulakis A, Ghashan CA, van Tintelen JP, PhD, Jongbloed JD, Schalijs MJ, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2020 Sep;6(9):1103-1114.

**10. RV tissue heterogeneity on CT: A novel tool to identify the VT substrate in ARVC.**

Venlet J, Tao Q, de Graaf MA, Ghashan CA, de Riva Silva M, van der Geest RJ, Scholte AJ, Piers SRD, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2020 Sep;6(9):1073-1085

**11. The harm of delayed diagnosis of arrhythmogenic cardiac sarcoidosis: a case series**

Hoogendoorn J, Ninaber MK, Piers SRD, de Riva M, Grauss RW, Bogun FM, Zeppenfeld K.

*Europace.* 2020 Sep 1;22(9):1376-1383

**12. Arrhythmia exacerbation after post-Infarction ventricular tachycardia ablation: prevalence and prognostic significance**

Siontis KC, Kim HM, Vergara P, Peretto G, Do DH, de Riva M, Lam A, Qian P, Yokokawa M, Jongnarangsin K, Latchamsetty R, Jais P, Sacher F, Tedrow U, Shivkumar K, Zeppenfeld K, Della Bella P, Stevenson WG, Morady F, Bogun FM.

*Europace.* 2020 Nov 1;22(11):1680-1687

**13. Integration of electroanatomical mapping with imaging to guide radiotherapy of VT substrates with high accuracy**

Abdel-Kafi S, de Ridder M, de Riva M, van der Geest RJ, Rasch C, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2020 Jul;6(7):874-876

**14. Electroanatomical voltage mapping to distinguish right-sided cardiac sarcoidosis from arrhythmogenic right ventricular cardiomyopathy**

Hoogendoorn J, Sramko M, Venlet J, Siontis KC, Kumar S, Singh R, Nakajima I, Piers SRD, de Riva Silva M, Glashan C, Crawford T, Tedrow UB, Stevenson WG, Bogun F, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2020 Jun;6(6):696-707

**15. New Adjusted Cutoffs for “Normal” Endocardial Voltages in Patients With Post-Infarct LV Remodeling.**

Sramko M, Abdel-Kafi S, van der Geest RJ, de Riva M, Glashan CA, Lamb HJ, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2019;5(10):1115-1126.

**16. Effect of Non-fluoroscopic Catheter Tracking on Radiation Exposure during Pulmonary Vein Isolation: Comparison of Four ablation systems.**

Naruse Y, Kece F, de Riva M, Watanabe M, Wijnmaalen AP, Dehnavi RA, Schalij MJ, Zeppenfeld K, Trines SA.

*J Atr Fibrillation.* 2018;11 (3):2068. doi: 10.4022/jafib.2068.

**17. Entropy as a Novel Measure of Myocardial Tissue Heterogeneity for Prediction of Ventricular Arrhythmias and Mortality in Post-Infarct Patients.**

Androulakis AFA, Zeppenfeld K, Paiman EHM, Piers SRD, Wijnmaalen AP, Siebelink HJ, Sramko M, Lamb HJ, van der Geest RJ, de Riva M, Tao Q.

*JACC Clin Electrophysiol.* 2019 Apr;5(4):480-489.

**18. Incidence and Clinical Significance of Cerebral Embolism During Atrial Fibrillation Ablation With Duty-Cycled Phased-Radiofrequency Versus Cooled-Radiofrequency: A Randomized Controlled Trial.**

Keçe F, Bruggemans EF, de Riva M, Alizadeh Dehnavi R, Wijnmaalen AP, Meulman TJ, Brugman JA, Rooijmans AM, van Buchem MA, Middelkoop HA, Eikenboom J, Schalij MJ, Zeppenfeld K, Trines SA. *JACC Clin Electrophysiol.* 2019 Mar;5(3):318-326.

**19. Optimizing ablation duration using dormant conduction to reveal incomplete isolation with the second generation cryoballoon: A randomized controlled trial.**

Keçe F, de Riva M, Naruse Y, Alizadeh Dehnavi R, Wijnmaalen AP, Schalij MJ, Zeppenfeld K, Trines SA. *J Cardiovasc Electrophysiol.* 2019 Jun;30(6):902-909.

**20. Impact of left atrial box surface ratio on the recurrence after ablation for persistent atrial fibrillation.**

Keçe F, Scholte AJ, de Riva M, Naruse Y, Watanabe M, Alizadeh Dehnavi R, Schalij MJ, Zeppenfeld K, Trines SA.

*Pacing Clin Electrophysiol.* 2019 Feb;42(2):208-215.

**21. Noninvasive identification of ventricular tachycardia-related anatomical isthmuses in repaired Tetralogy of Fallot: what is the role of the 12-lead ventricular tachycardia electrocardiogram?.**

Brouwer C, Kapel GFL, Jongbloed MRM, Schalij MJ, de Riva Silva M, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2018;4:1308-1318.

**22. Slow conducting electroanatomic isthmuses: an important link between QRS duration and ventricular tachycardia in Tetralogy of Fallot.**

Kapel GFL, Brouwer C, Jalal Z, Sacher F, Venlet J, Schalij MJ, Thambo JB, Jongbloed MRM, Blom NA, de Riva M, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2018;4:781-793.

**23. Targeting the hidden substrate unmasked by right ventricular extrastimulation improves ventricular tachycardia ablation outcome after myocardial infarction.**

De Riva M, Naruse Y, Ebert M, Androulakis AFA, Tao Q, Watanabe M, Wijnmaalen AP, Venlet J, Brouwer C, Trines SA, Schalij MJ, Zeppenfeld K.

*JACC Clin Electrophysiol.* 2018;4:316-327.

**24. Whole human heart histology to validate electroanatomical voltage mapping in patients with nonischaemic cardiomyopathy and ventricular tachycardia.**

Glashan CA, Androulakis AFA, Tao Q, Gashan RN, Wisse LJ, Ebert M, de Ruitter MC, van Meer BJ, Brouwer C, Dekkers OM, Pijnappels DA, de Bakker JMT, de Riva M, Piers SRD, Zeppenfeld K.

*Eur Heart J.* 2018;39:2867-2875.

**25. Fast nonclinical ventricular tachycardia inducible after ablation in patients with structural heart disease: definition and clinical implications.**

De Riva M, Watanabe M, Piers SRD, Dekkers OM, Ebert M, Venlet J, Trines SA, Schalij MJ, Pijnappels DA, Zeppenfeld K.

*Heart Rhythm.* 2018;15:668-676.

**26. Unipolar endocardial voltage mapping in the right ventricle: optimal cutoff value correcting for computed tomography-derived epicardial fat thickness and their clinical value for substrate delineation.**

Venlet J, Piers SRD, Kapel GFL, de Riva M, Pauli PFG, van der Geest RJ, Zeppenfeld K. *Circ Arrhythm Electrophysiol.* 2017;10. Pii:e005175

**27. Isolated subepicardial right ventricular outflow tract scar in athletes with ventricular tachycardia.**

Venlet J, Piers SR, Jongbloed JD, Androulakis AF, Naruse Y, den Uijl DW, Kapel GF, de Riva M, van Tintelen JP, Barge-Schaapveld DQ, Schalij M, Zeppenfeld K. *J Am Coll Cardiol.* 2017;69(5):497-507.

**28. Prognostic impact of the timing of recurrence of infarct-related ventricular tachycardia after catheter ablation.**

Siontis KC, Kim HM, Stevenson WG, Fujii A, Bella PD, Vergara P, Shivkumar K, Tung R, Do DH, Daoud EG, Okabe T, Zeppenfeld K, Riva Silva M, Hindricks G, Arya A, Weber A, Kuck KH, Metzner A, Mathew S, Riedi J, Yokokawa M, Jongnarangsin K, Latchamsetty R, Morady F, Bogun FM. *Circ Arrhythm Electrophysiol.* 2016;9(12). pii:e004432.

**29. QRS prolongation after premature stimulation is associated with polymorphic ventricular tachycardia in nonischemic cardiomyopathy: results from the Leiden nonischemic cardiomyopathy study.**

Piers SR, Askar SF, Venlet J, Androulakis AF, Kapel GF, de Riva Silva M, Jongbloed JJ, van Tintelen JP, Schalij MJ, Pijnappels DA, Zeppenfeld K. *Heart Rhythm.* 2016;13(4):860-869.

**30. Fatigue as presenting symptom and a high burden of premature ventricular contractions are independently associated with increased ventricular wall stress in patients with normal left ventricular function.**

Van Huls van Taxis CF, Piers SR, de Riva Silva M, Dekkers OM, Pijnappels DA, Schalij MJ, Wijngaalen AP, Zeppenfeld K. *Circ Arrhythm Electrophysiol.* 2015;8(6):1452-1459.

**31. Twelve-lead ECG of ventricular tachycardia in structural heart disease.**

De Riva M, Watanabe M, Zeppenfeld K. *Circ Arrhythm Electrophysiol.* 2015;8(4):951-962.



**32. Re-assessing non-inducibility as ablation endpoint of post-infarction ventricular tachycardia: the impact of left ventricular function.**

De Riva M, Piers SR, Kapel GF, Watanabe M, Venlet J, Triens SA, Schalij MJ, Zeppenfeld K.

*Circ Arrhythm Electrophysiol* 2015;8(4):853-862.

**33. Incidence and predictors of dormant conduction after cryoballoon ablation incorporating a 30-min waiting period.**

Compier MG, De Riva M, Dyrda K, Zeppenfeld K, Schalij MJ, Trines SA.

*Europace*. 2015;17(9):1383-1390.

**34. Predictive value of programmed electrical stimulation after catheter ablation of post-infarction ventricular tachycardia.**

Yokokawa M, Kim HM, Baser K, Stevenson W, Nagashima K, Della Bella P, Vergara P, Hindricks G, Arya A, Zeppenfeld K, de Riva Silva M, Daoud EG, Kumar S, Kuck KH, Tilz R, Mathew S, Ghanbari H, Latchamsetty R, Morady F, Bogun FM.

*J Am Coll Cardiol*. 2015;65(18):1954-1959.

**35. An easy-to-use, operator-independent, clinical model to predict the left vs. right ventricular outflow tract origin of ventricular arrhythmias.**

Penela D, De Riva M, Hercku C, Catto V, Pala S, Fernández-Armenta J, Acosta J, Cipolletta L, Andreu D, Borrás R, Ríos J, Mont L, Brugada J, Carbuccichio C, Zeppenfeld K, Berruezo A.

*Europace*. 2015;17(7):1122-1128.

**36. Value of intraoperative electrical parameters obtained during implantation of cardiac resynchronization therapy devices for the prediction of reverse remodeling.**

De Riva-Silva M, López-Gil M, Salgado-Aranda R, Fontenla-Cerezuela A, Salguero-Bodes R, Arribas-Ynsaurriaga F.

*Rev Esp Cardiol*. 2014;67(10):855-857.

**37. CMR-based identification of critical isthmus sites of ischemic and nonischemic ventricular tachycardia.**

Piers SR, Tao Q, de Riva Silva M, Siebelink HM, Schalij MJ, van der Geest RJ, Zeppenfeld K.

*JACC Cardiovasc Imaging*. 2014;7(8):774-784.

**38. Delayed positive response to a flecainide test in a patient with suspected Brugada syndrome: a worrisome finding.**

De Riva-Silva M, Montero-Cabezas JM, Fontenla-Cerezuela A, Salguero-Bodes R, López-Gil M, Arribas-Ynsaurriaga F.

*Rev Esp Cardiol.* 2014;67(8):674-675.

**39. Endocardial or epicardial ventricular tachycardia in nonischemic cardiomyopathy?. The role of 12-lead ECG criteria in clinical practice.**

Piers SR, Silva M de R, Kapel GF, Trines SA, Schaliij MJ, Zeppenfeld K.

*Heart Rhythm.* 2014;11(6):1031-1039.

**40. Usefulness of exercise test in cardiac resynchronization therapy follow-up.**

De Riva-Silva M, López Gil M, Fontenla-Cerezuela A, Salgado-Aranda R, Salguero-Bodes R, Arribas-Ynsaurriaga F.

*Rev Esp Cardiol.* 2013;66(11):912-913.

**41. 1:1 atrial flutter after vernakalant administration for atrial fibrillation cardioversion.**

De Riva-Silva M, Montero-Cabezas JM, Salgado-Aranda R, López-Gil M, Fontenla-Cerezuela A, Arribas-Ynsaurriaga F.

*Rev Esp Cardiol.* 2012;65(11):1062-1064.

**42. An uncommon complication of an aortic root aneurysm.**

Montero Cabezas JM, de Riva Silva M, Martín Asenjo R, Hernández Hernández F.

*Clin Res Cardiol.* 2013;102(1):81-83.

**43. Single and inappropriate shock delivered out of tachycardia: device dysfunction?.**

Fontenla A, Carrero D, Salguero R, López-Gil M, De Riva M, Arribas F.

*Pacing Clin Electrophysiol.* 2012;35(7):884-886.



## CURRICULUM VITAE

Marta de Riva Silva was born on November 25 1980 in Segovia (Spain). After graduating *cum laude* in secondary school in Segovia, she started her studies of Medicine at Universidad Autonoma de Madrid where she graduated in 2004. In 2005, she successfully passed the M.I.R exam classifying as number 46 out of more than 10.000 applicants. In 2005, she joined the cardiology training program at the Doce de Octubre University Hospital (Complutense University of Madrid) where she became a cardiologist in May 2010. Between May 2010 and June 2012, she followed the clinical electrophysiology fellowship program at the Doce de Octubre University Hospital. In 2011, she successfully underwent the EHRA (European Heart Rhythm Association) exams of cardiac pacing and clinical electrophysiology. In 2012, she won the EHRA grant for a one-year training fellowship in advanced cardiac electrophysiology which she underwent at the LUMC under the supervision of prof. dr. Katja Zeppenfeld. After completing this year of fellowship, she obtained a position as a staff member of the cardiology department at the LUMC, where she still works. Since her arrival at the LUMC in July 2012, Marta has been active in research in the field of invasive cardiac electrophysiology with national and international collaborations. The main interest of her research has been the invasive treatment of ventricular arrhythmias in the setting of ischemic cardiomyopathy, which is the focus of this thesis. The results of her research have been presented in different international conferences. In addition, she has participated in research projects on catheter ablation of atrial fibrillation, catheter ablation of idiopathic ventricular arrhythmias and ventricular arrhythmias related to structural heart disease other than ischemic cardiomyopathy and catheter ablation of atrial and ventricular arrhythmias in adults with repaired congenital heart disease. In the last years, Marta has also been highly involved in post-graduate education in invasive electrophysiology. Between 2017 and 2020 she was one of the members of the EHRA education committee being the co-director of the EHRA course on advanced clinical electrophysiology with focus on ventricular tachycardia ablation in its editions of 2018, 2019 and 2020.

