



## RACP Foundation Research Awards

### YEAR 2 PROGRESS REPORT

<b>Project / Program Title</b>	Ventricular Tachycardia: From Mechanisms to Therapies	
<b>Name</b>	Dr Robert Anderson	
<b>Award Received</b>	2018 RACP NHMRC Woolcock Scholarship	
<b>Report Date</b>	16 February 2020	
<b>Chief Investigator / Supervisor</b>	Supervisor: Dr Geoffrey Lee; Co-supervisors: Professor Jonathan Kalman, A/Prof Saurabh Kumar	
<b>Administering Institution</b>	The Royal Melbourne Hospital	
<b>Funding Period</b>	Start Date:	1 January 2018
	Finish Date:	31 December 2020

#### PROJECT SUMMARY

Ventricular tachycardia (VT) is a complex and serious rhythm disorder of the heart. This project will explore the mechanisms and treatments of VT: studies will review and summarise the different types and provide insight into the epidemiology in the treatments for this condition. Our research will also perform basic science studies aiming to improve how we diagnose VT and contribute to our understanding of the mechanisms responsible for the high incidence in recurrence following conventional treatments.

#### PROJECT AIMS / OBJECTIVES

1. Provide an overview of the common types of VT and treatment techniques and strategies
2. Understand temporal trends in the use of catheter ablation in Australia
3. Improvements in the diagnosis of idiopathic VT originating from the outflow tracts
4. Understand the mechanisms of scar-related VT using a new novel mapping technique
5. Explore the co-existence of focal and re-entrant VTs in patients with myocardial scar and structural heart disease

#### SIGNIFICANCE AND OUTCOMES

This thesis will explore multiple areas of interest in the field of VT. It is anticipated that studies from this thesis will improve our understanding of VT mechanisms, evaluation and diagnosis of specific VT sub-types leading to better long-term outcomes for patients undergoing treatment with ablation for this condition.

## PUBLICATIONS / PRESENTATIONS

### Publications

1. Anderson RD, Kumar S, Kalman JM, Sanders P, Sacher F, Hocini M, Jais P, Haisaguerre M, Lee G. Catheter Ablation of Ventricular Fibrillation. *Heart, Lung and Circ.* 2019 Jan;28(1):110-122.
2. Anderson RD, Kumar S, Parameswaran R, Wong G, Voskoboinik A, Sugumar H, Watts T, Sparks PB, Morton JB, McLellan A, Kistler PM, Kalman J, Lee G. Differentiating Right- and Left-Sided Outflow Tract Ventricular Arrhythmias - "Classical" ECG Signatures and Prediction Algorithms. *Circulation: Arrhythmia and Electrophysiology. Circ Arrhythmia Electrophysiol.* 2019 Jun; 12(6):e007392. doi: 10.1161/CIRCEP.119.007392.
3. Anderson RD, Ada C, Lee G, Kalman JM, Vohra JK, Kumar S. Incessant Idiopathic Ventricular Fibrillation Trigger Originating From an Unusual Intramyocardial (Non-Purkinje) Site Successfully Treated With Catheter Ablation. *JACC Clin Electrophysiol.* 20'19 Feb;5(2):260-262. doi: 10.1016/j.jacep.2018.10.014.
4. Anderson RD, Lee G, Virk S, Bennett R, Hayward C, Muthiah K, Kalman J, Kumar S. Catheter Ablation of Ventricular Tachycardia in Patients with a Ventricular Assist Device - A Systematic Review of Procedural Characteristics and Outcomes. *JACC: Clin Electrophysiol.* 2019 Jan; 5(1):39-51.
5. Anderson RD, Ariyaratna N, Lee G, Virk S, Trivic I, Campbell T, Chow CK, Kalman J, Kumar S. Catheter Ablation versus Medical Therapy for Treatment of Ventricular Tachycardia associated with Structural Heart Disease: Systematic Review and Meta-analysis of Randomised Controlled Trials and Comparison with Observational Studies. *Heart Rhythm.* 2019 May 28. pii: S1547-5271(19)30536-3. doi: 10.1016/j.hrthm.2019.05.026.
6. Anderson RD, Lee G, Prabhu M, Patrick CJ, Trivic I, Campbell T, Chow CK, Kalman JM, Kumar S. Ten Year Trends in the Use of Catheter Ablation for the Treatment of Ventricular Tachycardia Versus Other Interventional Cardiovascular Procedures in Australia. *Journal of Cardiovascular Electrophysiology.* 2019 Nov;30(11 ):2353-2361. doi: 10.1111/jce.14143.
7. Anderson RD, Lee G, Trivic I, Campbell T, Pham T, Nalliah C, Kizana E, Thomas SP, Trivedi SJ, Watts T, Kalman J, Kumar. Focal Ventricular Tachycardias (VT) in Structural Heart Disease: Prevalence, Characteristics and Clinical Outcomes after Catheter Ablation. *JACC: Clinical Electrophysiology.* 2020 Jan;6(1):56-69. doi: 10.1016/j.jacep.2019.09.013.

### Abstracts (posters/oral presentations)

8. Anderson RD, Kumar S, Parameswaran R, Wong G, Voskoboinik A, Sugumar H, Watts T, Sparks PB, Morton JB, McLellan A, Kistler PM, Kalman J, Lee G. Differentiating Right- and Left-Sided Outflow Tract Ventricular Arrhythmias - "Classical" ECG Signatures and Prediction Algorithms. 2019 August. Volume 28, Supplement 4, Pages S210. CSANZ Annual Scientific Meeting 2019, Adelaide. Poster Presentation.
9. Anderson RD, Ariyaratna N, Lee G, Virk S, Trivic I, Campbell T, Chow CK, Kalman JM, Kumar S. Catheter Ablation versus Medical Therapy of Ventricular Tachycardia associated with Structural Heart Disease: Systematic Review and Meta-analysis of Randomised Controlled Trials and Comparison with Observational Studies. European Heart Rhythm Association (EHRA), 2019, Lisbon, Portugal. Poster Presentation.
10. Anderson RD, Lee G, Prabhu M, Patrick CJ, Trivic I, Campbell T, Chow CK, Kalman JM, Kumar S. Ten Year Trends in the Use of Catheter Ablation for the Treatment of Ventricular

Tachycardia Versus Other Interventional Cardiovascular Procedures in Australia. European Heart Rhythm Association (EHRA), 2019, Lisbon, Portugal. Poster Presentation.

11. Anderson RD Lee G, Watts T, Trivic I, Kalamn J, Kumar S. Clinical Significance of Focal Ventricular Tachycardias (VT) Remote or Adjacent to Scar in Patients with Structural Heart Disease: Procedural Characteristics and Clinical Outcomes. Heart, Lung and Circulation. 2019 August. Volume 28, Supplement 4, Pages S205-S206. CSANZ Annual scientific Meeting 2019, Adelaide. Poster Presentation.
12. Anderson RD Lee G, Watts T, Trivic I, Kalamn J, Kumar S. Clinical Significance of Focal Ventricular Tachycardias (VT) Remote or Adjacent to Scar in Patients with Structural Heart Disease: Procedural Characteristics and Clinical Outcomes. 1ih Asia Pacific Heart Rhythm Society (APHRS) Scientific Sessions 2019, Bangkok, Thailand. Oral Presentation.
  - a. Winner: Young Investigators Award (VT), APHRS, 2019
13. Anderson RD, Lee G, Trivic I, Campbell T, Nalliah C, Thomas SP, Watts T, Pham T, Kalman JM, Kumar S. Clinical Significance of Focal Ventricular Tachycardias (VT) Remote or Adjacent to Scar in Patients with Structural Heart Disease: Procedural Characteristics and Clinical outcomes. Melbourne Health Early Career Research Symposium. Royal Melbourne Hospital, 2019. Oral Presentation.
14. Anderson RD, Lee G, Campbell T, Trivic I, Bennett RG, Pham T, Nalliah C, Kizana E, Thomas SP, Trivedi SJ, Watts T, Kalman J, Kumar S. Simultaneous Pace During Ablation Approach to Achieve Scar Nonexcitability as a Substrate-Based Catheter Ablation Endpoint of Ventricular Tachycardia. 12th Asia Pacific Heart Rhythm Society (APHRS) Scientific Sessions 2019, Bangkok, Thailand. Poster Presentation.

#### ACKNOWLEDGEMENTS

1. Prabhu M, Wong G, Anderson R, Kalman J. A narrow QRS tachycardia What is the mechanism(s). Pacing Clin Electrophysiol. 2018 Jun 4. doi: 10.1111/pace.13406.
2. Prabhu M, Anderson RD, Sparks P. Supraventricular tachycardia with abrupt onset and termination - what is the mechanism? J Cardiovasc Electrophysiol. 2018 Nov;29(11 ): 1584-1587. doi: 10.1111/jce.13672.
3. Moore BM, Anderson RD, Nisbet AM, Kalla M, Du Plessis K, d'Udekem Y, Bullock A, Cordina RL, Celermajer OS, Kalman J, McGuire MA. Ablation of Atrial Arrhythmias after the atriopulmonary Fontan Procedure; Mechanisms of, arrhythmia and Outcomes. JACCEP. In Press September 2018.
4. Anderson RD, Kumar S, Kalman JM, Sanders P, Sacher F, Hocini M, Jais P, Haisaguerre M, Lee G. Catheter Ablation of Ventricular Fibrillation. Heart, Lung and Circ. 2019 Jan;28(1):110-122.
5. Anderson RD, Lee G, Virk S, Bennett R, Hayward C, Muthiah K, Kalman J, Kumar S. Catheter Ablation of Ventricular Tachycardia in Patients with a Ventricular Assist Device - A Systematic Review of Procedural Characteristics and Outcomes. JACC: Clin Electrophysiol. 2019 Jan; 5(1):39-51.
6. Anderson RD, Ada C, Lee G, Kalman JM, Vohra JK, Kumar S. Incessant Idiopathic Ventricular Fibrillation Trigger Originating From an Unusual Intramyocardial (Non-Purkinje) Site Successfully Treat With Catheter Ablation. JACC Clin Electrophysiol. 2019 Feb;5(2):260-262. doi: 10.1016/j.jacep.2018.10.014.

7. Anderson RD, Prabhu M, Kalman JM, Vohra JK, Morton JB, Stevenson I. Intra-Hisian Wenckebach Phenomenon During His Bundle Pacing. *JACC Clin Electrophysiol*. 2019 Apr;5(4):530-531. doi: 10.1016/j.jacep.2018.12.012.
8. Romero J, Shivkumar K, DiBiase L, Avendano R, Anderson RD, Natale, Kumar S. Mastering the Art of Epicardial Access in Cardiac Electrophysiology. *Heart Rhythm*. 2019 Apr 20. pii: S1547-5271(19)30367-4. doi: 10.1016/j.hrthm.2019.04.038.
9. Wong G, Nalliah, C, Lee G, Voskoboinik A, Prabhu S, Parameswaran R, Sugumar H, Anderson RD, McLellan A, Ling LH, Morton J, Sanders P, Kistler P, Kalman J. Dynamic Atrial Substrate During High-Density Mapping of Paroxysmal and Persistent AF: Implications for Substrate Ablation. *JACC: Clin Electrophysiol*. In Press 2019 April
10. Lubis A, Prabhu M, Anderson RD, Kalman JM. A narrow QRS tachycardia with changed atrial activation after previous ablations: what is the mechanism? *Pacing Clin Electrophysiol*. 2019 Jun;42(6):730-732. doi: 10.1111/pace.13664.
11. Anderson RD, Kumar S, Parameswaran R, Wong G, Voskoboinik A, Sugumar H, Watts T, Sparks PB, Morton JB, McLellan A, Kistler PM, Kalman J, Lee G. Differentiating Right- and Left-Sided Outflow Tract Ventricular Arrhythmias - "Classical" ECG Signatures and Prediction Algorithms. *Circulation: Arrhythmia and Electrophysiology*. *Circ Arrhythm Electrophysiol*. 2019 Jun; 12(6):e007392. doi: 10.1161/CIRCEP.119.007392.
12. Al-Kaisey AM, Chandra N, Ha F, Vsanthakumar S, Anderson RD, AlKaisey Y, Ord M, Shaw M, Srivastava F>M, O'Donnell D, Lim H, Matalanis G. The A. Permanent pacing and conduction recovery in patients undergoing cardiac surgery for active infective endocarditis in an Australian Tertiary Centre. *J Cardiovasc Electrophysiol*. 2019 May 2. doi: 10.1111/jce.13963.
13. Anderson RD, Ariyaratna N, Lee G, Virk S, Trivic I, Campbell T, Chow CK, Kalman J, Kumar S. Catheter Ablation versus Medical Therapy for Treatment of Ventricular Tachycardia associated with Structural Heart Disease: Systematic Review and Meta-analysis of Randomised Controlled Trials and Comparison with Observational Studies. *Heart Rhythm*. 2019 May 28. pii: S1547-5271(19)30536-3. doi: 10.1016/j.hrthm.2019.05.026.
14. Anderson RD, Lee G, Prabhu M, Patrick CJ, Trivic I, Campbell T, Chow CK, Kalman JM, Kumar S. Ten Year Trends in the Use of Catheter Ablation for the Treatment of Ventricular Tachycardia Versus Other Interventional Cardiovascular Procedures in Australia. *Journal of Cardiovascular Electrophysiology*. *J Cardiovasc Electrophysiol*. 2019 Sep 9. doi: 10.1111/jce.14143.
15. Anderson RD, Lee G, Trivic I, Campbell T, Pham T, Nalliah C, Kizana E, Thomas SP, Trivedi SJ, Watts T, Kalman J, Kumar. Focal Ventricular Tachycardias (VT) in Structural Heart Disease: Prevalence, Characteristics and Clinical Outcomes after Catheter Ablation. *JACC: Clinical Electrophysiology*. Accepted, September 2019.
16. Sugumar H, Nanayakkara S, Chieng D, Wong GR, Parameswaran R, Anderson RD, Al-Kaisey A, Nalliah CJ, Azzopardi S, Prabhu S, Voskoboinik A, Lee G, McLellan AJ, Ling LH, Morton JB, Kalman JM, Kistler PM. Arrhythmia recurrence is more common in females undergoing multiple catheter ablation procedures for persistent atrial fibrillation: Time to close the gender gap. *Heart Rhythm*. 2019 Dec 19. pii: S1547-5271(19)31121-X. doi: 10.1016/j.hrthm.2019.12.013.
17. Tan S, Xie L, Anderson RD, Hammond A, Fong AY, Lim S, Allen AM, Harrap SB. Does glyceryl trinitrate cause central sympatholytic effects? Insights from a case of baroreflex failure. *Internal Medicine Journal*. November, 2019.