



RACP Foundation Research Awards

FINAL REPORT

Project / Program Title	Three Dimensional Wavemapping of Human Persistent Atrial Fibrillation	
Name	Dr Manaswi Bhupesh Pathik	
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Administering Institution	The Royal Melbourne Hospital	
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PROJECT SUMMARY

Atrial fibrillation (AF) is the most common cardiac arrhythmia. In patients with the more advanced form of persistent AF, the mechanisms involved remain poorly elucidated. Recent work using a two-dimensional mapping technique with a special basket catheter has observed the presence of rotational circuits known as rotors which are thought to be driving AF in a majority of patients with the advanced form of AF. This study using the same basket catheter sought to understand the mechanisms of persistent AF using novel three-dimensional technology. This study analysed 14 patients undergoing catheter ablation for AF and found that there was significant limitations of the basket catheter in covering the entire left atrium and providing adequate electrical signals for analysis. Within the limitations of the basket catheter, we found that single wavefronts to be the predominant subtype of activation pattern. In the one minute segment of data analysed, we did not observe rotors using activation mapping. We also analysed the data using a technique called two dimensional phase mapping similar to the abovementioned study and observed rotors. However, when we analysed the same segment of data using novel three-dimensional technology, we did not observe rotors. During prolonged five minute recordings, transient rotors were observed during 3D mapping and appeared to occur in locations where the basket catheter was positioned in proximity to the left atrium. Although we observed transient rotors, more sophisticated catheters which provide better coverage of the left atrium need to be developed in order to allow a more complete understanding of the activation patterns in persistent AF.

PROJECT AIMS / OBJECTIVES

Recent work using the 64 electrode Constellation basket catheter and two dimensional phase mapping has suggested the presence of rotors in most patients with persistent AF. However, such a mapping technique is based on the assumptions that the electrodes are arranged uniformly in regular grid of 8X8, that all the electrodes are in contact and that the catheter provides global coverage of the left atrium. We therefore sort to investigate the spatial characteristics of the 64 electrode Constellation basket catheter. In addition, the abovementioned

work has rendered the left atrium as a 20 structure. We therefore sought to determine whether 20 phase maps based on these assumptions provide an accurate representation compared with 30 phase maps. Furthermore, various investigators using different mapping techniques have observed different dominant activation patterns in AF. The aim of our study was to determine the dominant activation patterns using 30 activation with 64 electrode basket catheter in patients with persistent AF during prolonged six minute recordings.

SIGNIFICANCE AND OUTCOMES

This study found the 64 electrode Constellation basket catheter did not provide global left atrial mapping and there was marked variability in the distance between splines and electrodes were not arranged uniformly. Rotors seen with 20 phase mapping were not observed in corresponding time segments and anatomical location with 30 phase mapping. Transient rotors were observed during prolonged 30 phase mapping for five minutes. Within the limitations of the basket catheter mapping, single wavefronts appeared to be predominant subtype of 30 propagation pattern. Therefore, a more complete understanding of the activation patterns of persistent AF will depend on the development of more sophisticated basket catheters which provide better coverage of the left atrium.

PUBLICATIONS / PRESENTATIONS

This study has been presented at multiple Australian and International scientific meetings. This study was presented as an oral presentation at the 2015 Cardiac Society of Australia and New Zealand Annual Scientific Meeting in Melbourne and the 2016 Heart Rhythm Society Scientific Session in San Francisco, USA and the 2016 Asia Pacific Heart Rhythm Society Scientific Session in Seoul, South Korea.