Simultaneous Pace During Ablation Approach to Achieve Scar Non-Excitability as a Substrate-Based Catheter Ablation Endpoint of Ventricular Tachycardia

Robert Anderson
Geoffrey Lee
Timothy Campbell
Ivana Trivic
Timmy Pham
Chrishan Nalliah
Eddy Kizana
Stuart Thomas
Siddharth Trivedi
Troy Watts
Jonathan Kalman
Saurabh Kumar

Introduction: Background A simultaneous pace-ablate strategy to achieve electrical non-excitatibility has not previously been evaluated in the VT ablation cohort. In this study, we outline an additional ablation endpoint for targeting scar-related VT substrate. Objectives To summarise the procedural characteristics and outcomes of patients with structural heart disease (SHD) undertaking a substrate-based catheter ablation of ventricular tachycardia (VT) until high-output pacing loss-of-capture with simultaneous ablation.

Methods: Substrate-based catheter ablation was performed where loss of pacing capture was used as the ablation lesion endpoint using bipolar pacing at a fixed output of 600ms with 10mA and a 9ms pulse width.

Result: Twenty-three VTs were inducible in 7 patients with a total of 868 ablation lesions applied using simultaneous bipolar pacing with the acute ablation endpoint of tissue loss-of-capture. The mean age was 72±3 years (all men, mean LV ejection fraction of 29%±7%; ischaemic cardiomyopathy, 6; recurrent ICD shocks and electrical VT storm, 5) with a median endocardial bipolar scar of 64.8cm² (IQR25-75 52.1-136.3cm²), equating to 47% (IQR25-75 42-56%) of the total ventricular surface. The median ablation area was 22.2cm² (IQR25-75 16.3-68.1cm²) which converted to a median percentage of bipolar scar ablated to be 41% (IQR25-75 27-66%). Overall, the median ablation lesions per patient was 101 lesions (IQR25-75 80-173) and the total ablation time was 51 minutes (IQR25-75 41-72 minutes) with average duration per lesion of 30.3 seconds (IQR25-75 23.7-38.3 seconds). Median total energy was 115,798 joules (IQR25-75 92,081 – 158,163 joules) and average power was 33.2 Watts (IQR25-75 32.2-36.3 Watts). Median impedance drop was 9.7ohms per lesion (IQR25-75 9.1-9.9ohms) and CF was 11.9g (IQR25-75 10.2-12.7g). There was no VF episodes during any pacing and simultaneous ablation session. The median procedure time was 270 minutes (IQR25-75 218-370 minutes). Acute procedural success was seen in 6 patients (86%) and partial success in the remaining patient. After a median follow-up of 246 days, there was no VT recurrence or repeat ablation procedures in any patient. One patient died within 30 days following re-admission with multi-organ dysfunction without recurrent ventricular arrhythmias. In addition, 4 patients (57%) had a reduction in AAD therapy.
Conclusion: Achieving scar non-excitability as an additional endpoint to complete scar homogenisation during catheter ablation of scar-VT is an effective technique to suppress recurrent VT and reduce AAD therapy in a high-risk group of patients with recurrent ICD shocks, severe cardiomyopathy and extensive scar substrate. In conjunction with high-density mapping and guidance with real-time ICE feedback, it appears safe and does not increase procedural or ablation time.