POWER, LESION SIZE INDEX AND OESOPHAGEAL TEMPERATURE ALERTS DURING ATRIAL FIBRILLATION ABLATION (PILOT-AF): A RANDOMIZED STUDY

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Background: Oesophageal heating is a colateral effect of RadioFrequency (RF) catheter ablation for atrial fibrillation (AF) on the left atrial (LA) posterior wall. It is attributed to conductive heat transfer from the ablation site, a time-dependent process. Lower powers are routinely used to prevent this damage, requiring a longer duration of RF applications to reach the target lesion size index (LSI), a recently introduced parameter to predict the RF lesion size and depth. We investigated whether the risk of oesophageal heating is reduced by use of higher powers for shorter times compared with lower powers for longer times.

Methods: Consecutive patients undergoing AF ablation with a ThermoCool ablation catheter (Abbott) were prospectively enrolled in the study and randomized to one of four combinations of RF power and target LSI for ablation on the LA posterior wall (Group 20W/4 = 20W and target LSI 4; Group 20W/5 = 20W and target LSI 5; Group 40W/4 = 40W and target LSI 4; Group 40W/5 = 40W and target LSI 5). Temperature settings were such in all patients for ablation on the rest of the LA (RF power 40W, target LSI 5) on LA anterior wall, target LSI 5.5 on LA roof and floor. A minimum contact force of 25g was recommended for all RF lesions. A multi-sensor oesophageal temperature monitoring system (S-CAT®) (CIBA scientific) was used for continuous local temperature recording. The primary endpoint of the study was the number of oesophageal temperature alerts (OTAs, defined as luminal temperature rise > 39°C per patient. The occurrence of first pass Pulmonary Vein Isolation (PVI), acute Pulmonary Vein Reconnection (PVR) and total RF time for PVI were assessed as secondary endpoints.

Results: A total of 80 patients (mean age 59 ± 15 years), undergoing catheter ablation for a history of symptomatic and drug-resistant AF (paroxysmal in 31; persistent in 49), were enrolled and randomized to one of the 4 groups. The baseline characteristics were similar among the groups. Similar number of experienced OTAs in each group (96% vs 99% vs 96% vs 97%, p = 0.87). A significantly higher number of OTAs per patient was observed in Group 20W/4 (median [IQD] ETAs per patient 4 [2-6] vs 7 [9-42] vs 42 [4-42] vs 92 [69-123], p = 0.012). Oesophageal peak temperature were similar among groups (39.5 [39.5-40.1] vs 39.7 [39.4-40.6] vs 39.8 [39.4-40.3] vs 39.4 [39.0-40.4], p = 0.417). Fast pass PVI was less frequently achieved in Group 20W/4 (73.8% vs 47.8% vs 73.8% vs 73.8% of the pulmonary veins, p = 0.001) with longer RF duration required (31.3 ± 25.3 ± 26 vs 38 ± 52.7 vs 27 ± 16.8 [13.4-57.6] vs 30 ± 16.4 [13.4-75.6] vs min, p = 0.044). Acute PVR also occurred more frequently in Group 20W/5 (6.5% vs 23.8% vs 12.5% vs 6.3% vs min, p = 0.008). At the multivariate analysis RF power, RF duration for each lesion and BMI were found to be predictors of the number of ETAs (power: β = 0.201, p = 0.011; duration: β = 0.205, p = 0.002; BMI: β = 0.242, p = 0.035).

Conclusions: While guided by LSI, high power, short duration lesions do cause more OTAs or higher unsealed peak temperatures than lower power, long duration lesions. High power lesions are associated with comparable or higher acute success but shorter total RF times. When using a target LSI of 4, low power results in longer duration lesion than cause more oesophageal temperature alerts and certain ablation so the that target LSI is often not reached. Long-term follow-up will reveal the effect of low and high power on freedom of AF.

Figure 1. Figure LV activation maps during VT (A), SR (B) and RV pacing (C). White arrows depict direction of activation wavefront propagation and white dots depict lines of conduction slowing/block.

DERIVATION OF A PREDICTION MODEL FOR THE OPTIMIZATION OF PATIENT SELECTION FOR CATHETER ABlation OF ATRIAL FIBRILLATION: THE AF-FREEDOM SCORE

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Background: Catheter ablation is the most effective treatment option for sustaining sinus rhythm and potentially reduce or eliminate the overall burden of atrial fibrillation (AF). Success rates as high as 80% have been described for patients with paroxysmal AF, but for other forms of this arrhythmia, or for patients with specific comorbidities success rates are known to be well below 50%. This therapy is associated with costs and non-negligible procedural complications. Development of a risk predictive model to identify patients with higher chances of procedural success could be of interest to improve the risk-benefit and cost-effectiveness of this treatment approach.

Methods: We assessed for predictors of procedural success, defined as freedom from atrial arrhythmia relapse following an initial 3 month blanking period among 1,250 patients undergoing a first procedure of catheter ablation of AF in a high-volume center. The obtained predictors were combined into a prediction model and assigned points to their respective effect size. Discriminative capacity was assessed through receiver operating characteristic (ROC) and Kaplan-Meier survival curves.

Results: On multivariate Cox regression the following independent predictors were identified: persistent AF (HR = 1.42; 95% CI 1.02-1.98), longstanding persistent AF (HR = 1.53; 95% CI 1.03-2.21), AF at the start of the procedure (HR = 1.45; 95% CI 1.06-1.92), severe enlargement of the left atrium (HR = 1.32; 95% CI 1.06-1.64), AF duration < 3 years since diagnosis (HR = 1.31; 95% CI 1.03-1.68), obesity (BMI>30 kg/m²); HR = 1.42; 95% CI 1.07-1.84), obstructive sleep apnoea (HR = 1.32; 95% CI 1.03-1.68) and structural heart disease (HR = 2.03; 95% CI 1.23-3.34). Whenever present in a particular patient, those predictors were assigned 1 point each, allowing the calculation of the respective AF-FREEDOM score. During a mean-follow-up of 12 months (9.6-12.6) AF relapse gradually increased in parallel with the number of points (log rank P = 0.001). AF-FREEDOM displayed a moderately good discrimination of the endpoint of arrhythmia relapse (c-statistic = 0.72, 95% CI 0.64-0.75; P = 0.001).

Conclusions: We derived a simple and easy to obtain prediction model, which can potentially be used in patients being considered for AF ablation with a good discrimination capacity. External validation and assessment of potential improvement of health resource allocation and expenditure warrants further investigation.

Figure 1. Note: Structural: HCM, Prophylactic valves, ASD/VDSD, moderate to severe valvular disease, LVEF < 50%, previous heart valve surgery

EFFECT OF ACTIVATION WAVEFRONT ON ELECTROGRAM CHARACTERISTICS DURING VENTRICULAR TACHYCARDIA ABLATION


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Introduction: Catheter ablation of ventricular tachycardia (VT) is still being challenged due to non-inducibility or haemodynamic compromise. Ablation procedures often depend on substrate-based techniques e.g. elimination of local abnormal ventricular activities (LAVA), representing regions of low conduction velocity (CV) in the scar border zone (SBZ). LAVA hidden within farfield signal may be unmasked by pacing manoeuvres, but effects of activation wavefront on CV and LAVA characteristics in relation to scar anatomy and VT isthmus characteristics have not been assessed.

Methods: Patients with ischemic cardiomyopathy under treatment using the ultra-high density RhythmScan basket (Boston Scientific). Maps were generated for all usable VIS, in SR, and with 600ms pacing duration, in VT. CV was measured at the center of the coronary sinus. Activation endpoints were VT isthmus ablation, LAVA elimination and VT non-inducibility.

Results: 19 LV endocardial activation and voltage maps (12406 from the RV apex and an LV branch of the coronary sinus. Ablation endpoints were VT isthmus ablation, LA VAs elimination and VT non-inducibility. CV during VT was faster at the centre of the isthmus (230.6 ± 114.7mms⁻¹) than at the entrance (77.0 ± 72.0 mms⁻¹, p = 0.026). LA VAs hidden within farfield signal may be unmasked by pacing manoeuvres, but effects of activation wavefront on CV and LAVA characteristics in relation to scar anatomy and VT isthmus characteristics have not been assessed.

Conclusions: While guided by LSI, high power, short duration lesions do cause more OTAs or higher unsealed peak temperatures than lower power, long duration lesions. High power lesions are associated with comparable or higher acute success but shorter total RF times. When using a target LSI of 4, low power results in longer duration lesion that cause more oesophageal temperature alerts and certain ablation so that the target LSI is often not reached. Long-term follow-up will reveal the effect of low and high power on freedom from AF.