Abstract

Pulmonary vein encirclement using an ablation index-guided point-by-point workflow: cardiovascular magnetic resonance assessment of left atrial scar formation

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Background

A point-by-point workflow for pulmonary vein isolation targeting pre-defined Ablation Index values (a composite of contact force, time and power) and minimising inter-lesion distance may optimise the creation of durable and continuous atrial ablation lesions whilst minimising atrial collateral scar formation during atrial fibrillation (AF) ablation.

Purpose

To compare atrial ablation scar formation, procedural parameters, acute outcomes and arrhythmia recurrence in patients undergoing pulmonary vein isolation using a parameter-guided point-by-point workflow to patients undergoing pulmonary vein isolation using a continuous ablation catheter drag workflow.

Methods

Procedural details, acute success rates and arrhythmia recurrence were documented in patients undergoing 1st time pulmonary vein isolation for AF using a parameter-guided point-by-point workflow (n=26) targeting pre-defined Ablation Index and inter-lesion distance values by two operators. Post-ablation Cardiac Magnetic Resonance (CMR) imaging was performed in all patients at a mean time interval of 3.5±0.9 months post-procedure. Total left atrial scar burden, presence and number of gaps in the pulmonary vein encirclement and width of the encirclement were calculated using atrial late gadolinium enhancement CMR. Comparison was made with a cohort of control patients (n=20) undergoing pulmonary vein isolation by the same operators using continuous drag lesions.

Results

Mean total post ablation scar burden was significantly lower in the point-by-point vs. the control group (9.7±11.1% vs. 23.1±14.6%, P=0.001). A non-significant trend towards fewer gaps in the point-by-point group was seen across all segments of the pulmonary vein encirclement with significantly fewer gaps in the right sided pulmonary vein encirclement (1.46±2.0 vs. 3.64±3.8, P=0.034). Overall mean scar width was 25.51±3.1mm in the point-by-point group and 27.1±4.0mm in the control group (P=0.149). Complete pulmonary vein isolation was achieved in all patients. Both procedure and fluoroscopy time were significantly lower in the point-by-point than the control group (147.8±30.3 vs 186.1±45.3 mins, P=0.001 and 3.6±2.5 vs 9.2±10.1 mins, P=0.006). There was no significant difference in arrhythmia recurrence at one year between the groups.

Conclusion

Pulmonary vein isolation using a point-by-point workflow is feasible and results in a lower overall scar burden
and shorter procedure times than a conventional drag lesion approach. Furthermore, similar or better procedural outcomes with a trend towards fewer gaps and no differences in arrhythmia recurrence were observed with a point-by-point workflow.

Red arrows indicate sites of high SI surrounding the pulmonary veins and in the left atrial body in a point-by-point (A) and control patient (B).

Corresponding 3D left atrial scar maps demonstrate lesser degree of scar (red areas) around the pulmonary veins in point-by-point vs. control patient.

Total scar burden (C) and scar width (D) was lower in case vs control groups.