Vagal Response During Pulmonary Vein Isolation With Cryoballoon Ablation

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BACKGROUND
The role of the cardiac autonomic nervous system (ANS) in the initiation and maintenance of atrial fibrillation has been well described in the literature in both experimental and clinical settings. Vagal reactions seen during cryoballoon ablation of the pulmonary veins serve as a marker of intrinsic cardiac ANS modification, which can be attributed to ablation of the ganglionic plexi (GP).

OBJECTIVE
In this study, the surrogate markers for vagal response during pulmonary vein isolation with cryoballoon ablation were evaluated.

METHODS
Twenty-two paroxysmal atrial fibrillation (PAF) patients undergoing cryoballoon ablation were evaluated.

Pulmonary vein isolation was performed with one 28-mm second-generation balloon using a 3-minute freeze technique. At least two lesions were performed for each pulmonary vein.

Initial blood pressure (IBP) and nadir blood pressure (NBP) were recorded.

Time to reach -30 degrees (TT-30), time to reach -40 degrees (TT-40), time from start of balloon thaw to zero degrees (TTO), time from start of thaw to the nadir blood pressure (TTNBP), total seconds of freeze, minimal temperature reached, and time to effect from start of freeze to vein isolation by electrogram (TTE) were also recorded. Clustered data for each pulmonary vein were analyzed using the common slope and linear intercept mixed model.

RESULTS
All 22 patients had PAF with mean age of 62.5±8.35 years. Sixty-nine percent were male.

The baseline characteristics were: Body mass index (BMI) 31.7±5.7, CHA2DS2-VASc score 1.8±1.2, white 100%, diabetes mellitus (DM) 6%, hypertension (HTN) 56%, coronary artery disease (CAD) 38%, chronic obstructive pulmonary disease (COPD) 6%, obstructive sleep apnea (OSA) 50%.

The left atrial volume index (LAVI) was 58.57±17.78 ml/m² with 100% normal left ventricular ejection fraction (LVEF). Nineteen patients had four pulmonary veins and three patients had three pulmonary veins.

Univariate analysis of the clustered data demonstrated that the best surrogate marker for vagal response was the TTO; mainly in the inferior veins. The drop of blood pressure correlated well with longer duration of thawing with a one-fold increase in the TTO, the corresponding drop in blood pressure increased three to four-fold (left inferior vein: 3.040, p<0.020; right inferior vein: 4.261, p=0.046). Interestingly, this correlation was not seen during cryoablation of the superior veins.

The second marker was the TTNBP, and it was seen only in the right superior vein. It was a weak predictor with three-fold increase in TTNBP caused one-fold increase in blood pressure drop (0.323, p<0.037).

CONCLUSIONS
Vagal response during cryoballoon ablation was seen mainly during the isolation of the inferior pulmonary veins. The best surrogate marker was longer thawing duration (higher TTO).