Periesophageal vagal plexus injury is a favorable outcome predictor after catheter ablation of atrial fibrillation

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BACKGROUND Collateral damage to periesophageal vagal plexus associated with symptomatic gastric hypomotility and associated symptoms are not uncommon after catheter ablation of atrial fibrillation (AF). The injury may indicate transmural ablation lesions.

OBJECTIVE The purpose of this study was to evaluate the periesophageal vagal plexus injury (PNI) and long-term outcome after catheter ablation of AF.

METHODS A total of 441 consecutive patients with AF (mean age 54.71 ± 10.52 years; 134 women) who underwent catheter ablation (paroxysmal AF, n = 312; persistent AF, n = 129) were retrospectively enrolled from 2011 to 2013; group 1 was defined as patients with PNI and associated symptoms (n = 88), and group 2 was defined as patients without PNI or associated symptoms (n = 353). Baseline characteristics and electrophysiological properties were collected to analyze the relationship between PNI and clinical outcome. The association of AF recurrence after catheter ablation and PNI symptoms was also investigated.

RESULTS During a mean follow-up period of 37.3 ± 0.94 months, group 1 had longer AF-freedom days in sinus rhythm after AF ablation and had less recurrence after the blanking period compared with group 2 (mean recurrence days, 1254.22 ± 45.26 days vs 1065.21 ± 33.35 days; $P < .01$). Multivariate analysis also revealed that PNI was an independently protective predictor of AF recurrence (hazard ratio 0.527; 95% confidence interval 0.289–0.959; $P = .036$). There was no difference in baseline characteristics, CHA_2DS_2-VASc score, or echocardiography follow-up duration.

CONCLUSION PNI and associated symptoms are not uncommon after catheter ablation of AF. A better long-term outcome is thereby independently predicted, suggesting transmural ablation lesions during pulmonary vein isolation.

KEYWORDS Periesophageal vagal plexus injury; Atrial fibrillation; Catheter ablation; Recurrences

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Introduction

The symptoms of gastrointestinal (GI) paresis, such as bloating or dyspepsia, have been reported in some patients after catheter ablation of atrial fibrillation (AF).[1,2] In previous reports before 2012, the incidence of GI symptoms is about 1% and the duration of symptoms can last from a few hours to 2 days after AF ablation.[1,3] However, in recent studies from 2014 to 2015, the incidence of periesophageal vagal plexus injury (PNI) and associated symptoms increased to 10%–20%,[4,5] which might be related to more patients undergoing AF ablation and more aggressive strategies. The associated symptoms could vary from nonspecific symptoms to serious complications such as gastric ulcer or atrioesophageal fistula.[1,2] PNI is the possible main cause for these symptoms.[2,6,7] This could result in gastric hypomotility and delayed gastric emptying time after AF ablation.

Several examinations such as endoscopy or upper GI series are currently used for the diagnosis of PNI.[2] PNI might implicate transmural injury in the elimination of pulmonary vein potential (PVP) for AF ablation,[8] which means more complete elimination and less reconnection rate of PVP. However, the relationship between PNI and clinical outcome has been less discussed and lacks investigation. In this study, we aimed to investigate the relationship of PNI and clinical outcome of AF ablation.

Methods

Patient selection

A total of 441 consecutive patients with symptomatic and drug refractory AF referred to Taipei Veterans General Hospital for the electrophysiology study (EPS) and radiofrequency catheter ablation (RFCA), including paroxysmal AF (PAF) and non-PAF, were enrolled from 2011 to 2013 retrospectively. All the clinical data were obtained after the

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approval of the Taipei Veterans General Hospital Institutional Review Board. Baseline characteristics were assessed in detail. Patients younger than 18 years in combination with those who had other supraventricular arrhythmia and documented structural heart disease were excluded.

EPS and catheter ablation of AF

Each enrolled patient underwent an EPS, and catheter ablation was in the fasting, nonsedative state after informed consent was obtained. All antiarrhythmic medications except amiodarone were held for at least 5 half-lives before the study. Before the EPS and RFCA, transesophageal echocardiography and enhanced computed tomography were performed to exclude any left atrial (LA) thrombi and evaluate cardiac anatomy. The surface electrocardiogram and bipolar intracardiac electrogram were stored on a digital recording system (LabSystem PRO; Bard Electrophysiology, Lowell, MN). A 7-F, 10-pole catheter (St. Jude Medical, Inc., St Paul, MN) was inserted from the right jugular vein to the coronary sinus for pacing and recording.

Local anesthesia was used during the procedure, and no general anesthesia was performed. No analgesic agent was used before or after RFCA, and all patients well tolerated the whole procedure. Fluid hydration with at least 2000–3000 cm^3 was given intravenously during the procedure. In our practice, patients did not move too much to cause inaccuracy of the 3-dimensional mapping system. The details have been described in our previous publications.[9,10] Because the esophageal temperature probe is not available in Taiwan, we did not use esophageal temperature monitoring during the procedure. Pulmonary vein (PV) isolation was performed, guided by the EnSite NavX system (St. Jude Medical Inc.) using an irrigated-tip catheter (CoolPath, St. Jude Medical, Inc.). Radiofrequency energy was delivered continuously while repositioning the catheter tip every 40 seconds (temperature 35–40°C; power 25–30 W). Supplementary ablation procedures were applied to obtain an entrance block. Successful circumferential PV isolation was demonstrated by the absence of any PV electroactivity or dissociated PV activity. If non-PAF persisted after PV isolations, an additional complex fractionated electrographically guided substrate ablation procedure was performed after PV isolation. Complex fractionated electrographic ablation was confined to the continuous complex fractionated electrograms persisting >5 seconds in the LA and proximal coronary sinus.[11,12] After sinus rhythm was restored from AF by procedural AF termination or electric cardioversion, mapping and ablation were applied only to spontaneously initiating focal atrial tachycardias and non-PV ectopy that initiated AF. If any non-PV ectopy initiating AF from the superior vena cava was identified, the superior vena cava isolation was performed using circular catheter recordings from the superior vena cava–atrial junction.

Clinical follow-up after ablation

After RFCA, patients received antiarrhythmic medications at least for 8 weeks to prevent early recurrence. Patients discontinued all antiarrhythmic medications after the 3-month blanking period if no AF recurrence. Regular follow-up was arranged (2 weeks after catheter ablation and then every 1–3 months) at our clinic after discharge. The *recurrence of AF* was defined as an episode of atrial arrhythmias lasting more than 30 seconds and confirmed by electrocardiograms 3 months after ablation (blanking period). The long-term efficacy of AF freedom was assessed clinically on the basis of the clinical symptoms, resting surface 12-lead electrocardiogram, 24-hour Holter recording, and/or cardiac event recordings.

Diagnostic definition and management of PNI

After AF ablation, we transferred patients to the coronary care unit and record their condition in medical and nursing records. Patients were diagnosed as having PNI if they exhibited the following symptoms and findings,[4,13,14] including acute onset of delayed gastric emptying symptoms, such as nausea, vomiting, postprandial fullness, bloating, or epigastric pain. If patients underwent GI fluoroscopy and/or endoscopy and revealed positive finding such as gastric hypomotility, gastric ulcer, or gastroesophageal reflux disease, we also defined these patients as having PNI. Gastroenterologists qualitatively evaluated the gastric motility. Prokinetic agents, antacids, H2 blockers, or proton-pump inhibitors were not routinely given to all patients after PV isolation but only to patients with GI symptoms. Most patients relieved symptoms in 2 weeks, and most symptoms were self-limited. In our study, patients with PNI after RCFA were defined as group 1 and other patients were defined as group 2.

Statistical analysis

Data are expressed as mean ± SD for normally distributed continuous variables and as proportions for categorical variables. Continuous variables were analyzed using a 2-tailed t test. Discrete variables were compared using the χ^2 test. The Kaplan-Meier cumulative recurrence curves were plotted for incidence of events and recurrent events. The association between selected parameters and AF recurrence was studied by univariate Cox regression analysis. The variables selected for testing by multivariate Cox regression analysis were those with $P < .05$ in the univariate models. All statistical significances were set at $P < .05$, and all statistical analyses were carried out using SPSS 17.0 (SPSS, Inc., Chicago, IL).

Results

Baseline characteristics of patients

A total of 441 consecutive patients with AF (mean age 54.71 ± 10.52 years; 134 women) were recruited in this study. The mean follow-up duration was 37.3 ± 0.94 months. There were 312 patients with PAF; others were without PAF. In all study patients, 88 patients had PNI and were classified as group 1, of which 75 patients had PAF and 13 patients had no PAF. The incidence of PNI was 23.8%, 15.6%, and 17.3% in 2011, 2012, and 2013, respectively. There was no significant difference in the incidence of PNI among each

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