Effect of left atrial appendage excision on procedure outcome in patients with persistent atrial fibrillation undergoing surgical ablation

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BACKGROUND Catheter ablation is less successful for treatment of persistent atrial fibrillation (PersAF) than for paroxysmal atrial fibrillation. Some studies suggest that left atrial appendage (LAA) isolation in addition to pulmonary vein isolation (PVI) is required to maximize the benefits for PersAF after ablation.

OBJECTIVE The purpose of this study was to compare the efficacy and safety of 2 surgical ablation approaches for PersAF via video-assisted thoracoscopy: PVI + box lesion and PVI + box lesion + LAA excision.

METHODS We randomly assigned 176 patients with PersAF to video-assisted thoracoscopic surgical ablation with PVI + box lesion (88 patients) or PVI + box lesion + LAA excision (88 patients). The primary endpoint was freedom from any documented atrial arrhythmia lasting >30 seconds after a single ablation procedure without antiarrhythmic drug (AAD).

RESULTS After 18 months of follow-up, 61 of 86 patients (70.9%) assigned to PVI + box lesion were free from recurrent atrial fibrillation compared to 64 of 87 patients (73.6%) assigned to PVI + box lesion + LAA excision after a single ablation procedure without AAD (P = .73). Freedom from any atrial arrhythmia after a single procedure with or without AAD was also nonsignificant (70.9% vs 74.7%, respectively). There were no significant differences between groups with regard to adverse events, including death, transient ischemic attack, stroke, pneumothorax, and hydrothorax.

CONCLUSION Among patients with PersAF, no reduction in the rate of recurrent atrial fibrillation was found when LAA excision was performed in addition to PVI and box lesion during surgical ablation.

KEYWORDS Atrial fibrillation; Ablation; Pulmonary vein; Left atrial appendage

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Introduction

Atrial fibrillation (AF) represents an important public health problem. Catheter ablation is an effective treatment of paroxysmal atrial fibrillation (PAF).[1–3] Most triggers for PAF are located in the pulmonary veins (PVs), and pulmonary vein isolation (PVI) is associated with good results.[4] Catheter ablation for persistent atrial fibrillation (PersAF) is more challenging and is associated with less favorable outcomes.[5,6] To improve outcomes, substrate modification (ablation of linear lesions, complex fractionated electrograms, ganglionated plexuses) is often added to PVI.[7–11] Some studies indicate that surgical ablation has results superior to catheter ablation and suggest this as the method of choice for patients with PersAF.[12,13] Although current guidelines suggest that more extensive ablation is needed to improve results for PersAF, randomized clinical trials have not confirmed this supposition.[14]

Several studies have shown that extra-PV areas may be the source of initiation and maintenance of AF. For example, it was reported that the left atrial appendage (LAA) was responsible for recurrence of atrial arrhythmia in at least 27% of patients who had undergone catheter ablation of PAF/PersAF, and additional isolation of the LAA seemed to be the most effective strategy to achieve freedom from AF.[15] The LAA is also the dominant source of thromboembolism in the setting of AF, and mechanical occlusion or surgical excision is used to reduce the risk of stroke.[16–18]

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We designed a study to test the value of LAA excision in the challenging setting of PersAF based on the premise that the LAA can be a source of both AF triggers and thromboembolism. Using surgical techniques, this study compared 2 approaches to ablation of PersAF: ablation with PVI + box lesions vs PVI + box lesion + LAA excision.

Methods

Patient population and study design

This was a multicenter, randomized, double-blind, parallel-group study (ClinicalTrials.gov Identifier: NCT02562391) that compared 2 strategies of surgical ablation for PersAF by video-assisted thoracoscopy. Patients were recruited from 3 experienced surgical ablation centers.

Patients were eligible if they were 18 years of age or older, had highly symptomatic PersAF (defined as a sustained episode lasting >7 days and up to 1 year) refractory to at least 1 antiarrhythmic agent, and were undergoing ablation for the first time. Exclusion criteria included PAF, sustained AF lasting >1 year, congestive heart failure, left atrial (LA) thrombus, left ventricular ejection fraction <35%, LA diameter ≥60 mm, prior thoracotomy, prior cardiac surgery, and elevated hemidiaphragm. The study protocol was approved by the local ethics committee and was conducted in compliance with the protocol and in accordance with standard institutional operating procedures and the Declaration of Helsinki. All participating patients provided written informed consent.

Patients were randomly assigned in a 1:1 ratio to 1 of the following 2 strategies: PVI + box lesion or PVI +box lesion + LAA excision. Randomization was performed using the coded envelope system. The study was double-blind, and patients as well as clinical outcome assessors were unaware of the ablation strategy. The surgeons were unavoidably aware of treatment allocation but were not involved in the follow-up with regard to arrhythmia management or detection.

The hypothesis of this study was that LAA excision combined with PVI + box lesion set of the posterior LA enhances the procedural success rate in PersAF patients undergoing surgical ablation. The primary endpoint was any episode of atrial arrhythmia (AF, atrial flutter, atrial tachycardia) >30 seconds documented by any form of monitoring, regardless of symptoms. For the primary outcome, no episode of AF occurring within the initial 3-month blanking period after ablation was counted, in accordance with guidelines.[4] A redo ablation procedure at any time was also considered to constitute a recurrence for the purpose of outcome analyses. Patients who completed <3 months of follow-up and thus did not complete the blanking period were excluded from endpoint analysis.

Secondary outcomes included adverse events (death, transient ischemic attack, stroke, pneumothorax, hematothorax, hydrothorax, pneumonia, conversion to median sternotomy), rates of any documented atrial arrhythmia (including AF, flutter, or tachycardia) after 1 ablation procedure with or without antiarrhythmic drug (AAD) as well as after 2 ablation procedures, and AF burden during follow-up.

Ablation procedure

All patients were treated with video-assisted thoracoscopy under general anesthesia, according to a previously described technique.[13] In brief, PVI was performed from the epicardial surface with a bipolar radiofrequency (RF) ablation clamp (AtriCure, West Chester, OH). At least 2 overlapping applications around each of the ipsilateral veins were made. In case of sinus rhythm, PV exit block was confirmed by pacing from a unipolar electrode (MLP, AtriCure) connected to an analyzer (2290 Analyzer, Medtronic, Minneapolis, MN) at a rate of 120 bpm, with an output of 18 mV and frequency of 200 Hz. PV entrance block was confirmed by the absence of PV potentials. During AF, PV entrance block was only verified. In addition to PVI, the bilateral epicardial ganglia were found by high-frequency stimulation and ablated, as confirmed by the absence of a vagal response after ablation. Finally, additional lines were made to create a posterior LA box lesion. Sensing and pacing maneuvers verified isolation of the posterior box (Figure 1). In patients randomized to the PVI + box lesion + LAA excision, the LAA was completely amputated at the base with linear stapler guided by video-assisted tool excepting any residual LAA cavity, which was confirmed by intraoperative transesophageal echocardiography (TEE).

Patient follow-up

Before ablation, patients received treatment with class I or III AADs and therapeutic oral anticoagulants for at least 4 weeks. Oral anticoagulation therapy was switched to low-molecular-weight heparin 3–5 days before the procedure. The use of AADs (amiodarone, sotalol, propafenone) was

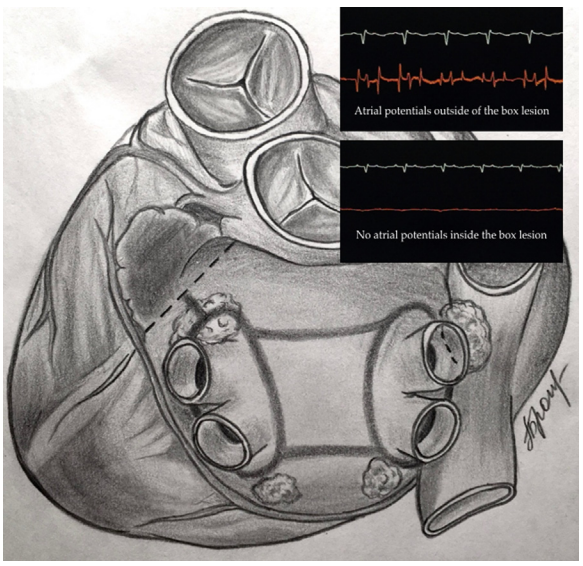

Figure 1 Scheme of the surgical ablation procedure. Tracings from the unipolar electrode show atrial potentials outside of the box lesion and no potentials inside the box lesion.

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