Long-Term Success for the Convergent Atrial Fibrillation Procedure: 4-Year Outcomes

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Background. **The objective of this single-center study was to report long-term efficacy outcomes of the convergent procedure for the treatment of atrial fibrillation.**

Methods. **Outcomes for the convergent procedure were determined by clinical presentation and interrogating implanted loop recorders. Rhythm status and required interventions for atrial fibrillation recurrence (antiarrhythmic drugs, cardioversions, and repeat ablations) were quantified 1 to 4 years after the procedure. Long-term outcomes, atrial fibrillation burden quantified with continuous monitoring, and patient baseline characteristics were analyzed and reported.**

Results. **Seventy-six consecutive patients with paroxysmal (5%), persistent (16%), or longstanding atrial fibrillation (79%) underwent the convergent procedure between January 2009 and July 2013. Clinical presentation in sinus rhythm at isolated timepoints was 88% at 6 months, 85% at 1 year, 85% at 2 years, 84% at 3 years, and 81% at 4 years of follow-up. Total patients requiring repeat catheter ablation was 18% through 4 years. Single procedure 1-year success (freedom from atrial fibrillation/atrial flutter/atrial tachycardia through 1 year and off antiarrhythmic drugs) was 56%; and long-term success (freedom from atrial fibrillation/atrial flutter/atrial tachycardia through at least 36 months and off antiarrhythmic drugs) was 45%.**

Conclusions. **Four-year outcomes for the convergent procedure are promising and demonstrate the ability to maintain sinus rhythm in a predominantly persistent and longstanding atrial fibrillation population. Increasing the extent of posterior ablation should be evaluated for patients with enlarged atria to account for the potential increase in fibrosis distribution and other atrial remodeling markers that produce arrhythmogenic substrates.**

(Ann Thorac Surg 2016;■:■–■)

Managing atrial fibrillation (AF) long-term comprises palliation of symptoms, avoidance of interventions needed to maintain sinus rhythm (SR), and dramatic reduction in atrial fibrillation burden (AFB). Ablative treatments aim to prevent arrhythmia recurrence without continued dependence on interventions. Identification and ablation of substrates can be affected by the degree of atrial remodeling, which is influenced by underlying conditions such as atrial enlargement. Persistent types of AF tend to have an increase in fibrosis, which is distributed more widely than paroxysmal AF [1, 2]. The ideal treatment modality ablates all current triggers and maintenance substrates, while halting or reversing atrial remodeling to prevent new substrates from developing.

Catheter ablation has played an important role in treating patients with lone, paroxysmal AF. Success in this patient population has grown as proactive anatomic approaches have superseded focal ablation of mapped sources. Isolation of the pulmonary veins (PVs) to confine focal triggers is essential for any AF treatment [3]. However, simple PV isolation does not address the progressive remodeling of persistent AF associated with atrial enlargement and underlying heart disease [4].

Chronic atrial stretch has been implicated in structural remodeling, causing conduction abnormalities, especially along the posterior left atrium [5]. This stretch-mediated response produces substrates known to initiate or maintain AF. Therefore, to address the progressive nature of persistent types of AF, it is hypothesized that PV isolation needs to be augmented with posterior left atrial ablation to silence current clinical substrates and proactively ablate known fibrosis regions along the posterior left atrium, where substrates may develop.

The convergent procedure is a multidisciplinary, closed chest treatment solution that ablates the posterior left atrium and isolates the PVs. The complementary epicardial and endocardial ablation approach leverages the endoscopic ability of the cardiac surgeon to create full-thickness lesions along the posterior left atrium with the electrophysiologist's ability to confirm the extent of the posterior left atrial lesions, and complete PV isolation by connecting the epicardial lesions at the pericardial reflections. By combining these two disciplines, a

Accepted for publication April 6, 2016.

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Dr Gersak discloses a financial relationship with nContact, Inc.

Published by Elsevier

0003-4975/$36.00
http://dx.doi.org/10.1016/j.athoracsur.2016.04.018

Abbreviations and Acronyms

AAD = antiarrhythmic drug
AF = atrial fibrillation
AFB = atrial fibrillation burden
AFL = atrial flutter
AT = atrial tachycardia
ILR = implantable loop recorder
PV = pulmonary vein
SR = sinus rhythm

comprehensive pattern of endocardial and epicardial lesions are created without chest incisions, lung deflation, or invasive heart dissections. The purpose of this paper is to report long-term outcomes of the original convergent procedure, which combined PV isolation with a single posterior lesion connecting the right to left PVs, for the treatment of a predominantly persistent and long-standing AF patient population.

Patients and Methods

This study reports long-term outcomes from a single center in compliance with the Helsinki Declaration. Local Medical Ethics Committee approval was obtained. Seventy-six consecutive AF patients underwent the convergent procedure between January 2009 and July 2013. Acute and midterm outcomes for the first 50 patients were reported previously [6].

Convergent Procedure

Epicardial and endocardial ablation define the essential components of the convergent procedure. Figure 1 shows the original lesion pattern for the convergent procedure. In 60 cases, the entire convergent procedure was performed on the same day as a single-setting procedure in an operating room that was equipped with fluoroscopy and electrophysiology mapping equipment. As described previously, the epicardial and endocardial components for 16 patients were staged on 2 different days, requiring separate hospitalizations [6]. In 5 of these staged cases, the endocardial component was not performed owing to patient preference. In 1 of the nonstaged cases, difficulty in obtaining transseptal access precluded endocardial ablation, which has not been performed to date. As the purpose of this article was to evaluate long-term outcomes for the combined procedure, results for these 6 patients were imputed only for the efficacy evaluation and reported as a separate cohort.

Subthoracic Total Endoscopic Epicardial Ablation

All the procedures (surgical and electrophysiological part) were performed in the surgical operating room. Endoscopic access to the posterior left atrium was achieved by creating a pericardial window through the central tendon of the diaphragm and pericardium just above the liver margin and at least 1 cm from the falciform ligament using endoscopic instruments inserted through

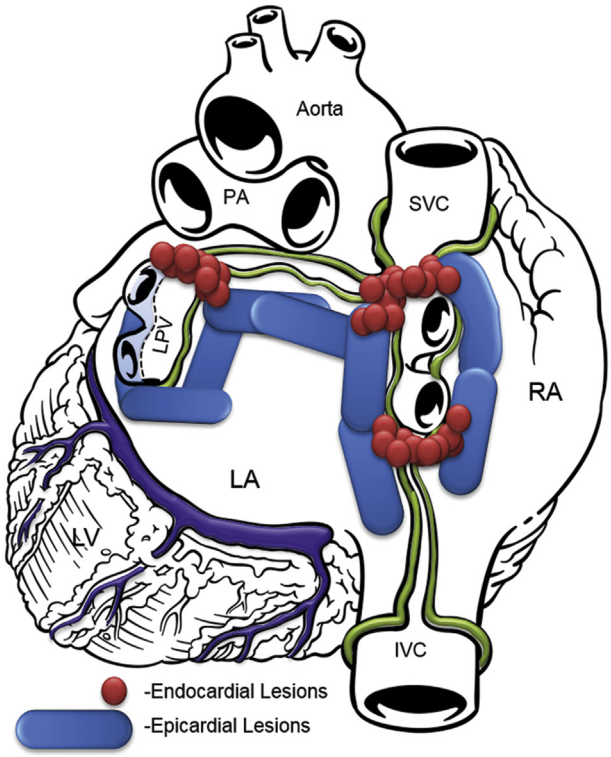

Fig 1. Original convergent procedure lesion pattern. Pulmonary vein isolation, achieved with both epicardial lesions (blue) and endocardial lesions (red), is combined with a single posterior line connecting the left pulmonary vein (LPV) and right pulmonary vein. (IVC = inferior vena cava; LA = left atrium; LV = left ventricle; PA = pulmonary artery; RA = right atrium; SVC = superior vena cava.)

abdominal trocars. Abdominal insufflation allowed visualization of the central tendon of the diaphragm while creating a pericardial window using a monopolar L-hook electrocoagulation probe.

The Subtle cannula (Atricure, Inc/nContact, Morrisville, NC) was inserted abdominally through the pericardial window into the oblique sinus, providing direct visualization of the posterior left atrium through the use of a separate 5 mm or 7 mm, 0-degree endoscope. The Numeris or Epi-Sense epicardial ablation device (Atricure Inc./nContact) was inserted through the Subtle cannula, beside the endoscope, and positioned along the posterior left atrium. Radiofrequency energy at a preset power (30 W) and time (90 seconds) was used to create epicardial lesions, as shown in Figure 1. Endoscopic visualization of the lesions was used to ensure they interconnect. After lesion creation, abdominal incisions were closed; a pericardial drain was not utilized. Atrial appendage was not occluded or removed in any of the patients, and left atrial isthmus lesion was not considered important during the initial procedure.

The vacuum-contact, fluid-perfused epicardial ablation devices have been proven, in preclinical studies, to create continuous and full-thickness lesions capable of interrupting erratic electrical signals [7]. The Numeris and Epi-Sense systems have Conformité Européenne Mark