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Left Atrial Appendage Ligation and Ablation for Persistent Atrial Fibrillation

The LAALA-AF Registry

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ABSTRACT

OBJECTIVES This study was intended to evaluate the impact of adding the left atrial appendage (LAA) closure system (LARIAT) procedure to conventional atrial fibrillation (AF) ablation in patients with persistent AF.

BACKGROUND Percutaneous endoepicardial LARIAT may result in both mechanical and electrical exclusion of the LAA and aid in improving the outcomes of catheter ablation by eradicating the LAA triggers and altering the substrate.

METHODS We performed a prospective observational study of patients with persistent AF referred for AF ablation. Patients underwent LAA ligation with LARIAT procedure before undergoing AF ablation (LARIAT group). Age- and sex-matched persistent AF patients undergoing AF ablation during the same time frame were included in the control group (ablation-only group).

RESULTS A total of 138 patients were included in the study, with 69 patients in the LARIAT group. The mean age of the population was 67 ± 10 years, with 96 (70%) men. Left atrial (LA) size, $CHADS_2$, CHADSVasc, and HAS-BLED scores were higher in the LARIAT group when compared with the ablation-only group. There were no differences in the type of lesions during AF ablation between the groups. The primary outcome of freedom from AF at 1 year off antiarrhythmic therapy after 1 ablation procedure was higher in the LARIAT group (45 [65%] vs. 27 [39%]; $p = 0.002$). More patients in the ablation-only group underwent repeat ablation because of AF recurrence (11 [16%] vs. 23 [33%]; $p = 0.018$).

CONCLUSIONS In patients with persistent AF, addition of LAA ligation with the LARIAT device to conventional ablation appears to improve the success rate of AF ablation. (J Am Coll Cardiol EP 2015;1:153–60) © 2015 by the American College of Cardiology Foundation.

Atrial fibrillation (AF) is the most common sustained arrhythmia in clinical practice (1,2). Management of AF primarily involves control of symptoms and prevention of stroke. Catheter ablation of AF is the standard of care in the management of drug-refractory symptomatic AF (3). However, the success rates of AF ablation are less than ideal, especially in patients with persistent AF. The left atrial appendage (LAA) has been shown to play a role in the initiation and maintenance of atrial arrhythmias (4,5). Addition of electrical isolation of LAA to conventional AF ablation has shown to improve

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ABBREVIATIONS AND ACRONYMS

AAD = anti-arrhythmic drugs
AF = atrial fibrillation
AT = atrial tachycardia
GP = ganglionated plexi
LA = left atrium/atrial
LAA = left atrial appendage
PV = pulmonary vein
TEE = transesophageal echocardiography/ echocardiogram

outcomes of persistent AF ablation (4). However, electrical isolation of LAA during catheter ablation can be challenging and may potentially result in increased risk of thrombogenesis in the LAA, especially if the mechanical function of the LAA is persistently impaired post-ablation.

The LAA is the most common source of thrombus formation in patients with AF-related thromboembolism (1). Anticoagulation is considered to be the gold standard for preventing thromboembolic complications in AF; however, many patients are intolerant of anticoagulants. Recent studies have shown the feasibility and noninferiority of LAA exclusion in preventing thromboembolic complications (6,7). Device-based endocardial LAA excluders, such as Watchman (Boston Scientific, Natick, Massachusetts) and Amplatzer Cardiac Plug (St. Jude Medical, Minneapolis, Minnesota), can result in mechanical occlusion of the LAA. LAA exclusion with endoepicardial system (LARIAT) and surgical epicardial ligation can result in both mechanical and electrical isolation of the LAA as a result of LAA infarction. Moreover, soon after the LAA occlusion with the LARIAT, there is a significant decrease in voltage (8).

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Because the LAA has an "electrical role" in persistent AF and the LARIAT procedure can result in "electrical exclusion" of LAA, we proposed that addition of LAA exclusion with the LARIAT to conventional AF ablation in patients with persistent AF may improve the success rate of the ablation procedure (9–13).

METHODS

PATIENT POPULATION. We performed a prospective, multicenter, observational study of patients who were referred for ablation of persistent AF. The protocol was approved by all the participating institutions' institutional review boards. After evaluating the following inclusion and exclusion criteria, patients referred for persistent AF ablation (with or without prior ablation) were considered for the LARIAT procedure for LAA exclusion as an adjunct to AF ablation.

Patients for the LARIAT procedure were screened using the following inclusion criteria: 1) age 18 years or older; 2) persistent nonvalvular AF; 3) at least 1 risk factor of embolic stroke ($CHADS_2$ $\geq$1); and 4) a life expectancy of at least 1 year. Patients were excluded from the study if they met any of the following exclusion criteria: 1) history of cardiac surgery; 2) unfavorable chest anatomy (pectus excavatum); 3) recent myocardial infarction (within 3 months); 4) embolic event within the past 30 days; 5) New York Heart Association functional class IV heart failure symptoms; and 6) history of thoracic radiation. Patients who gave informed consent had their computed tomography scan of the heart evaluated for suitability for LARIAT procedure. Exclusion criteria based on LAA anatomy included: 1) a LAA width >40 mm; 2) a superiorly oriented LAA with the LAA apex directed behind the pulmonary trunk; 3) bilobed LAA or multilobed LAA in which lobes were oriented in different planes exceeding 40 mm; and 4) a posteriorly rotated heart.

After excluding patients (n = 18) who were not candidates for LARIAT, a total of 69 patients successfully underwent a protocol-driven LARIAT procedure (LARIAT group) from January 2012 through December 2013. All of these patients then underwent a conventional AF ablation procedure at least 30 days later, primarily involving pulmonary vein antral isolation. We prospectively included an equal number of age- and sex-matched patients with persistent AF undergoing AF ablation during the same time frame as a control group of the study (ablation-only group).

PERCUTANEOUS SUTURE EXCLUSION OF THE LAA USING THE LARIAT DEVICE. LAA exclusion was performed using the standard protocol for LARIAT device implantation as previously described (6). In brief, patients underwent the procedure under general anesthesia. Pericardial access and transseptal puncture for left atrial (LA) access was performed. The standard LARIAT endocardial and epicardial sheaths were used, and under transesophageal echocardiography (TEE) and angiography guidance, the LARIAT device was deployed and LAA occlusion was confirmed. Patients were followed routinely with 1-month and 3-month TEE.

AF ABLATION. AF ablation in both the LARIAT and ablation-only group patients consisted of pulmonary vein isolation using a roving lasso technique using double transseptal puncture. Additional ablation was performed at the discretion of the operator and included linear LA ablation, right atrial flutter line, and complex fractionated atrial electrogram ablation. LAA isolation was attempted only in patients with an identifiable trigger during the procedure. Other non-pulmonary vein triggers were mapped and ablated, if present.

CLINICAL FOLLOW-UP. Patients were followed for a minimum of 1 year. They were seen in the clinic at 2, 6, and 12 months post-procedure. Additional clinic visits occurred when patients developed symptoms. Clinic visits included history and physical