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A Totally Thoracoscopic Ablation for Persistent Atrial Fibrillation

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We report the case of a 72-year-old female with persistent atrial fibrillation who underwent a totally thoracoscopic ablation. A successful normal sinus conversion was achieved.

Key words: 1. Atrial fibrillation
2. Thoracoscopy
3. Ablation

CASE REPORT

A 72-year-old female visited the emergency room because of a suddenly developed headache. The brain imaging studies revealed acute cerebral infarction. Further, the electrocardiography showed atrial fibrillation (AF). The echocardiography revealed that the mean left atrial dimension was 32.7 mm in the parasternal long axis view and 38.6 mm in the apical four-chamber view. The left ventricular ejection fraction was 86%. Transthoracic echocardiography revealed no intracardiac thrombus and normal valvular function. Amiodarone and coumadine were begun and maintained for the following five months. Just before the operation, the electrocardiogram still showed AF and the patient complained of palpitation and chest discomfort. We decided to perform thoracoscopic ablation. We performed transesophageal echocardiography after induction of anesthesia to rule out intracardiac thrombus. Before induction, defibrillator pads were placed appropriately. With the right lung deflated, the initial 10-mm port was placed in the sixth interspace at the anterior axillary line (Fig. 1). After thoracoscopic examination, two additional ports were inserted. Under thoracoscopic control, the pericardium was opened by electrocautery approximately 2 cm anterior to the right phrenic nerve. Pericardial traction was executed using an endoscopic suturing device (Endostitch; Covidien Inc., Norwalk, CT, USA). The oblique sinus was entered by gentle blunt dissection through the pericardial reflections under the inferior vena cava. A light dissector was used for encircling the pulmonary venous antrum. The antral area was ablated using a bipolar radiofrequency clamp (EMR; Atricure Inc.,

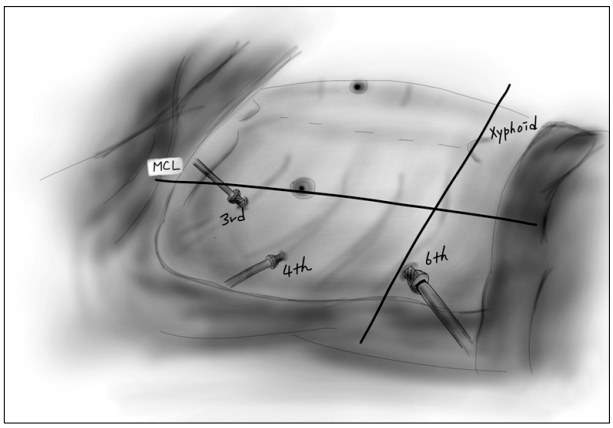

Fig. 1. Patient position for a total thoracoscopic ablation. MCL, midclavicular line.

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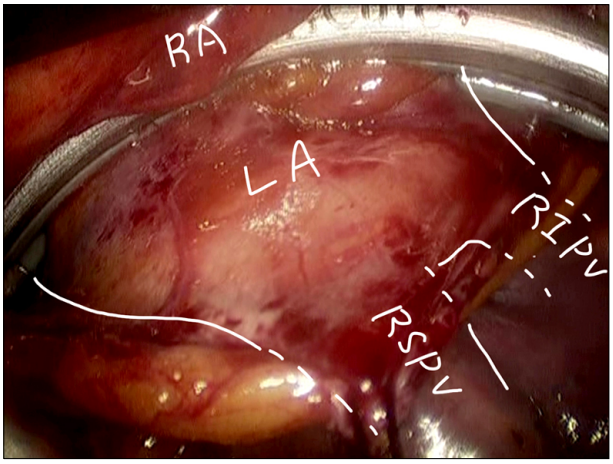

Fig. 2. Thoracoscopic view during right pulmonary vein isolation with bipolar clamp. RSPV, right superior pulmonary vein; RIPV, right inferior pulmonary vein; LA, left atrium; RA, right atrium.

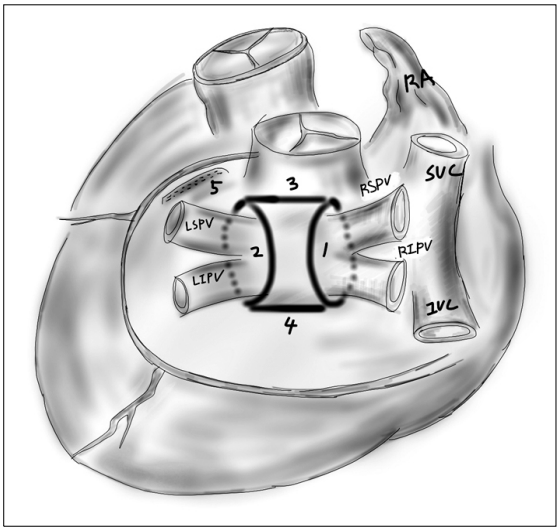

Fig. 3. Ablation lines. 1, left side pulmonary vein (LSPV) isolation; 2, right side pulmonary vein (RSPV) isolation; 3, superior line; 4, inferior line; 5, excised site of left atrial appendage; RIPV, right inferior pulmonary vein; RA, right atrium, SVC, superior vena cava; LIPV, left inferior pulmonary vein; IVC, inferior vena cava.

Cincinnati, OH, USA) (Fig. 2). The end point for pulmonary vein antral ablation was a complete exit block from the pulmonary veins. The autonomic ganglia plexuses (GPs) were ablated. High-frequency testing of the GPs was performed. Each of the testing sites was stimulated at a rate of 1,000 Hz and an amplitude of 18 V with at least a doubling of the R-R interval qualifying as a positive response. The right GP travels toward the right pulmonary veins and the interarterial groove. The left GP travels in the direction of the base of the left atrial appendage and the left upper pulmonary vein. Bipolar radiofrequency energy at 15 W was delivered through the bipolar pen (Isolator multifunctional pen; Atricure Inc.) to the GPs. After dissecting the transverse sinus, additional lines, which were a superior line through the transverse sinus and an inferior line through the oblique sinus, were made with the aid of a Cool Rail (Atricure Inc.). After the left lung was deflated, three trocars were inserted and were placed more posteriorly. Marshall's ligament was divided after left pericardiotomy. The previously performed line of ablation (superior line) across the transverse sinus was easily visualized and extended onto the left superior pulmonary vein, and the previously performed ablation line (inferior line) in the oblique sinus from the right chest was clearly identified. The linear probe created a line of ablation connecting the caudal margins of the two pulmonary isolation boxes (Fig. 3). The left atrial appendage exclusion was performed using a stapler (Ethicon Endo-Surgery Inc., Cincinnati, OH, USA) after the absence of flow was confirmed by intraoperative transesophageal echocardiography. Normal sinus rhythm was converted intraoperatively. A single chest tube was placed for draining each pleural space. The patient was extubated in the operating room. The operative time was 125 minutes. Postoperatively, coumadine and amiodarone were continued. The length of the hospital stay was 7 days. She resumed normal sinus rhythm two months after total thoracoscopic ablation, which was confirmed by 24-hour electrocardiogram monitoring.

DISCUSSION

AF is the most common form of arrhythmia. Its prevalence increases sharply with age, from approximately 1% among people aged 55 to 59 years to more than 10% among those in the age group of 80 or more years [1]. Although Cox Maze III surgery is the gold standard for the surgical treatment of AF, this procedure has failed to achieve widespread adoption because of its complexity and highly invasive nature [2]. As the electrophysiological mechanisms of AF have become better understood, ablation strategies have been refined

to target the pulmonary vein antrum. The landmark work of Haissaguerre et al. [3] identified the pulmonary veins as the sources of AF. Pulmonary vein isolation has emerged as a successful technique for the ablation of paroxysmal AF. In addition, Scherlag et al. [4] have demonstrated that the parasympathetic and sympathetic efferent neurons present in epicardial ganglionic plexi and the intrinsic cardiac autonomic nervous system may play an important role in triggering pulmonary vein firing. Marshall's ligament may also play a role in triggering AF in some individuals [5]. Catheter ablation has become an established invasive procedure in patients with AF. The efficacy of catheter ablation may vary considerably depending on the strategy and technology used and the stage of the electroanatomic disease. For paroxysmal AF, ＞70% single-procedure efficacy is considered achievable, whereas for persistent AF, additional target ablation and multiple procedures are required to achieve reasonable results. In 2006, Wolf et al. [6] described video-assisted thoracoscopic surgical ablation involving pulmonary vein isolation from the epicardial side with a bipolar radiofrequency clamp, ablation of the ganglia over the left atrial surface, and excision of the left atrial appendage. The initial efficacy of this minimally invasive surgery has been reported to be ＞90% in selected populations. In 2012, Boersma et al. [7] reported the first prospective randomized clinical trial to provide a head-to-head comparison of catheter ablation and minimal thoracoscopic ablation in a well-described population of AF patients. They reported that the primary efficacy end point of freedom from any left atrial arrhythmia of ＞30 s in the absence of antiarrhythmic agents after 12 months was achieved in 36.5% of the catheter ablation and in 65.6% of the surgical ablation group (p=0.0022). In the non-paroxysmal group, the efficacy was higher in the thoracoscopic ablation group than in the catheter ablation group. They noted that it was not proven whether additional lines and GP ablation were necessary. Our patient had non-paroxysmal AF. Although the normal sinus rhythm conversion rate after ablation in non-paroxysmal AF is lower, here, we report the acute procedural success of normal sinus conversion. As the follow-up period was short, however, we should obtain the longer outcomes. Further, it is necessary to consider more cases in order to reach a definitive conclusion.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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