Periesophageal vagal nerve injury following catheter ablation of atrial fibrillation: A case report and review of the literature

Sandeep A. Saha, MD, Richard G. Trohman, MD

From the Division of Cardiology, Department of Medicine, Rush University Medical Center, Chicago, Illinois.

Introduction

Percutaneous catheter ablation is an established rhythm control strategy for the treatment of atrial fibrillation (AF).[1,2] Recent clinical trials show that catheter ablation of atrial fibrillation reduces the risk of recurrence of symptomatic AF, atrial flutter, or atrial tachycardia, and may also reduce subsequent hospitalizations and improve quality of life compared to antiarrhythmic drug therapy.[3,4] Catheter ablation has garnered a class I recommendation for patients with symptomatic paroxysmal AF who are refractory or intolerant to at least one class I or III antiarrhythmic medication, and has a class IIa recommendation as a reasonable initial rhythm control strategy in the 2014 guidelines published by the American College of Cardiology/American Heart Association/Heart Rhythm Society.[5]

Catheter ablation for AF is widely regarded as a safe procedure. A recently published retrospective analysis of AF catheter ablation (performed in 83,236 patients enrolled in a total of 192 published clinical trials) reported an overall periprocedural complication rate of 2.9%. The majority of the complications were vascular in nature with an incidence of 1.4%.[6] Gastrointestinal (GI) complications following catheter ablation for AF are exceedingly rare. The most serious GI complication after catheter ablation is formation of an atrioesophageal fistula, which has a very low incidence (0.03%-0.1% of cases). However, atrioesophageal fistulae can lead to potentially life-threatening sequelae including catastrophic bleeding, septicemia, cerebrovascular accidents, and air embolism, and carry a mortality rate exceeding 80%.[7,8]

KEYWORDS Acute gastric hypomotility; Radiofrequency ablation; Esophageal temperature monitoring

ABBREVIATIONS **AF** = atrial fibrillation; **3D** = 3-dimensional; **EPS** = electrophysiology study; **GI** = gastrointestinal; **ICE** = intracardiac echocardiogram; **LET** = luminal esophageal temperature; **PVI** = pulmonary vein isolation; **RF** = radiofrequency; **TEE** = transesophageal echocardiogram

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Address reprint requests and correspondence: Dr Sandeep A. Saha, Rush University Medical Center, Division of Cardiology, 1750 West Harrison St, Jelke 1021, Chicago, IL 60612. E-mail address: sandeep_a_saha@rush.edu.

In recent years there have been several reports of other complications that affect the upper GI tract following catheter ablation for AF. One of these complications is periesophageal vagal nerve injury, which leads to acute onset of upper GI symptoms that typically develop within hours after ablation. Clinicians need to be aware of and recognize this complication, quickly distinguish it from other potentially life-threatening conditions such as esophageal perforation or bowel obstruction, and institute an appropriate treatment plan.

Case report

A 56-year-old man with hypertension, type 2 diabetes mellitus, hyperlipidemia, obstructive sleep apnea, chronic kidney disease, and diastolic heart failure was admitted for an elective catheter ablation for recurrent paroxysmal AF. A transesophageal echocardiogram (TEE) with echo-contrast performed 2 months prior demonstrated a thrombus within the left atrial appendage, and he was prescribed rivaroxaban at a renal-adjusted dose of 15 mg daily. The night prior to the procedure, rivaroxaban was discontinued and a weight-based continuous infusion of unfractionated heparin was started periprocedurally. Repeat TEE showed no residual thrombus in the left atrial appendage. A commercially available non-deflectable transesophageal temperature probe (Level 1 Acoustascope® with temperature sensor ES400-18; Smiths Medical ASD, Inc, Rockland, MA) was inserted to monitor luminal esophageal temperature (LET). A 10F SOUNDSTAR® (Biosense Webster, Diamond Bar, CA) intracardiac echocardiogram (ICE) catheter was placed in the right atrium for anatomic mapping of the left atrium, left atrial appendage, and pulmonary veins, and under ICE guidance a double transseptal puncture was performed using a Brockenbrough needle assembly. Three-dimensional (3D) mapping was performed using a 7F variable-curve Lasso catheter (Biosense Webster, Diamond Bar, CA) inserted through an SL1 sheath (St. Jude Medical, St. Paul, MN), and the CARTO® 3 mapping platform was used along with the CARTOSOUND® module, which enabled integration of the ICE images with the 3D mapping images (Figure). Pulmonary vein isolation (PVI) was performed using an 8F bidirectional 3.5-mm-tip THERMOCOOL® SF catheter (Biosense Webster, Diamond

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KEY TEACHING POINTS

- Periesophageal vagal nerve injury manifests as acute onset of nausea, vomiting, abdominal pain and distension within 3–12 hours after pulmonary vein isolation for ablation of atrial fibrillation (AF).
- This condition should be rapidly differentiated from other serious gastrointestinal complications after AF ablation, such as esophageal perforation or development of atrioesophageal fistula.
- Most cases will respond to conservative management, which includes complete bowel rest, mechanical decompression of the upper gastrointestinal tract, and oral or intravenous prokinetic agents.
- Various strategies can be employed to reduce the risk of periesophageal vagal nerve injury during AF ablation; these include avoiding ablation of the posterior left atrial wall, use of irrigated-tip catheters, reduction in power output and/or duration of delivery of radiofrequency energy, and use of esophageal temperature monitoring devices.

Bar, CA) inserted through an 8.5F large-curl long (71 cm usable length) Agilis™ NxT sheath (St Jude Medical, St Paul, MN), with bidirectional steering to facilitate maneuverability, improve access to difficult-to-reach sites, and assure optimal tissue contact in the absence of direct quantitative contact force measurement. Radiofrequency (RF) energy delivery to the posterior wall was initiated at 20 W and titrated (maximum of 35 W) until a 10 Ω drop in impedance and an 80% reduction in electrogram size was achieved. Energy delivery at other sites was limited to 35–50 W. Energy delivery to lesions near the esophagus was limited to $\leq$30 seconds and was stopped immediately if the LET increased by 1°C above baseline. No esophageal temperature recordings of more than 40°C were recorded during the entire procedure. An empiric bidirectional cavo-tricuspid isthmus ablation was also performed. The patient tolerated the procedures well, and he was admitted to the cardiac intensive care unit for postprocedure monitoring.

About 6 hours after the procedure, the patient developed intractable nausea and vomiting that was unresponsive to intravenous ondansentron and trimethobenzamide. In addition, he developed generalized abdominal pain and distension. On inquiry, he denied any GI symptoms prior to the ablation procedure. Physical examination revealed tenderness in the epigastric and periumbilical regions and hypoactive bowel sounds throughout the abdomen. An abdominal radiograph demonstrated prominent gas-filled "stacked"-appearing loops of small bowel consistent with early ileus. A computed tomographic scan of the chest did not demonstrate any air or swelling within the mediastinum. A nasogastric tube was inserted and connected to intermittent suction, which reduced his vomiting and abdominal pain, but the nausea and abdominal distension persisted. Gastroenterological consultation was requested, and he was started on intravenous erythromycin 3 mg/kg thrice daily, along with intravenous metoclopramide 5 mg every 6 hours as needed. Over the next 48 hours, his nausea and

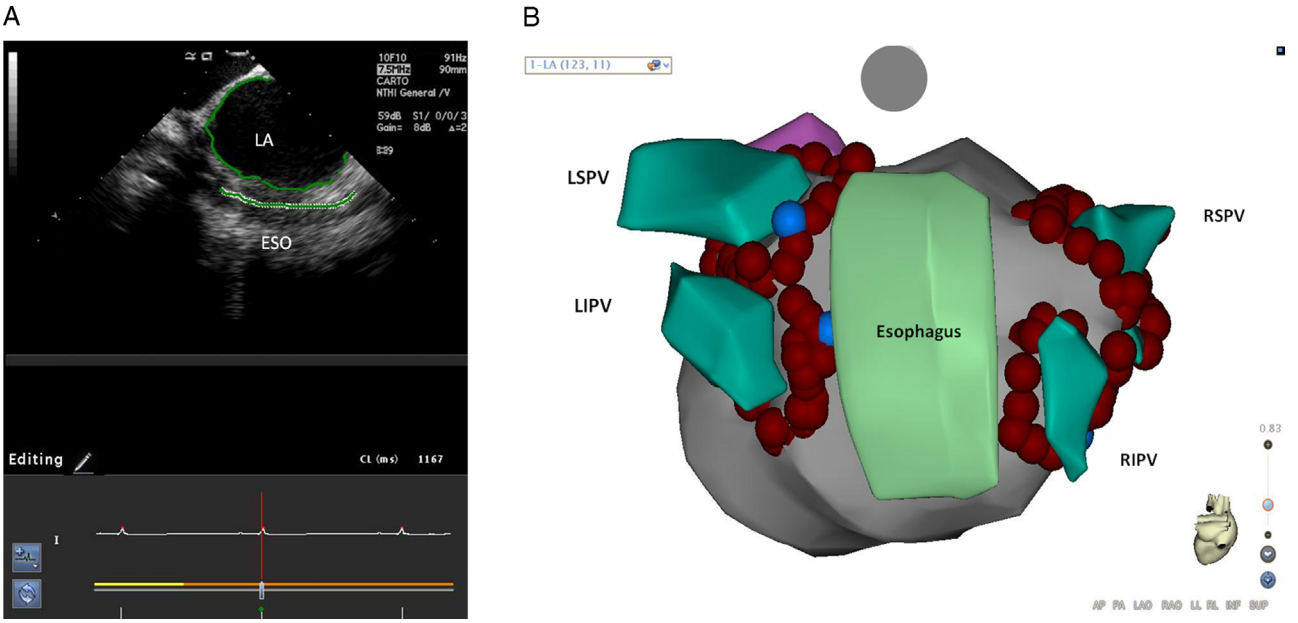

Figure Relationship of the lower esophagus, posterior left atrium, and pulmonary veins in our patient. **A:** Intracardiac echocardiogram image of the left atrium (LA) and the esophagus (ESO) as it courses close to the posterior atrial wall in our patient. **B:** Posterior view of the 3-dimensional map of the left atrium and the pulmonary veins, and the anatomic relationship between the esophagus and the ablation sites around the ostia of the pulmonary veins. Note the proximity of the esophagus to the ostia of the left upper and lower pulmonary veins. RSPV = right superior pulmonary vein; RIPV = right inferior pulmonary vein; LSPV = left superior pulmonary vein; LIPV = left inferior pulmonary vein.