Esophageal Fistula Formation Despite Esophageal Monitoring and Low-Power Radiofrequency Catheter Ablation for Atrial Fibrillation

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Esophageal fistula is a rare but devastating complication that may occur after catheter ablation of atrial fibrillation. The mechanism of esophageal injury is not known. Potential mechanisms for injury include direct thermal injury and ischemic injury from damage to the esophageal blood supply. Current ablation strategies use various methods to avoid esophageal injury. We describe an unusual manifestation of esophageal injury despite multiple preventive measures.

Case Report

A 45-year-old man with a medical history of hypertension, mild aortic stenosis, body mass index of 26.78 kg/m² (weight, 192 pounds; height, 5 feet, 11 inches), and symptomatic recurrent persistent atrial fibrillation refractory to amiodarone for 4 years underwent a radiofrequency catheter ablation procedure under general anesthesia using sevoflurane, fentanyl, midazolam and rocuronium. A preprocedure computed tomography (CT) scan was used to create 3D reconstruction of the left atrium and pulmonary veins. Intracardiac echo (Carto Sound, Biosense Webster, Diamond Bar, Calif) was used to create left atrial and pulmonary vein geometry, and this was merged with the CT image (Figure 1). An orogastric tube was placed in the esophagus at the level of left atrium, and barium was injected to obtain fluoroscopic images of the esophagus in left and right anterior oblique projections to be used as reference images (Figure 2).

Figure 1. A, 3D reconstruction of left atrium and pulmonary veins using intracardiac echo and ablation catheter (Carto Sound). B, This image is merged with reconstructed 3D image of left atrium from a CT scan previously obtained. The esophagus is created in real time using intracardiac echocardiography as shown. Ablation lesions were placed circumferentially around the pulmonary veins closer to the ostia.
Echocardiographic reconstruction of the esophagus also correlated with midline location of the esophagus away from the pulmonary veins (Figure 1). Double transseptal puncture was performed with a deflectable Agilis (St Jude Medical, St. Paul, Minn) and a 55-degree curve Convoy (Boston Scientific, Natick, Mass) sheaths and a Carto Navistar Thermocool (Biosense Webster, Calif) 3.5-mm open irrigation ablation catheter and a Lasso (Diamond Bar, Calif) catheter were placed in the left atrium. Circumferential linear ablation was performed around the left common pulmonary vein and the right pulmonary veins during atrial fibrillation (Figure 1). The posterior wall lesions were performed at least 1 cm away from the esophageal border as visualized by fluoroscopy and intracardiac echocardiography images at a power of 25 W for no more than 30 seconds’ duration with maximum temperature of 45°C. A total of 15 lesions (radiofrequency duration of 7 minutes) were placed in the posterior wall. An esophageal temperature probe placed at the level of the ablation catheter during posterior wall lesions did not demonstrate a signif-

Figure 2. Barium was injected through an orogastric tube to visualize the location of the esophagus in 2 fluoroscopy projections and used as reference images during ablation. The Lasso catheter is located at the ostium of the left common pulmonary vein. The ablation catheter is just inside the ostium of the right superior pulmonary vein.

Figure 3. CT scan of the chest, obtained on presentation of the patient to the emergency room with severe chest pain and fever, revealed air and fluid in the pericardium (arrow) anterior to the esophagus.
significant rise (>0.4°C) in esophageal luminal temperature. At the completion of each encircling linear ablation, the superior and inferior pulmonary veins were completely isolated. All 4 pulmonary veins remained isolated after a waiting period of 30 minutes. The postprocedure course was uneventful, and the patient was discharged on the second postprocedure day on warfarin and esophageal prophylaxis with omeprazole (20 mg twice daily) and Carafate (1 g four times daily).

The patient presented 10 days later to a nearby hospital with severe chest pain, low-grade fever, and hypotension. White blood cell count was elevated at 22,000, and a CT scan of the chest revealed a small amount of fluid and air in the pericardium (Figure 3) and air in the right superior mediastinum. Urgent right thoracotomy revealed posterior pericardium adherent to the esophageal wall at the level of the junction of right superior and inferior pulmonary veins. There was pus in the pericardium under pressure suggesting tamponade physiology. A small fistula was identified on the anterior wall of the esophagus with communication into the pericardium without any involvement of the left atrium or pulmonary veins (Figure 4). This was successfully repaired, and a jejunostomy feeding tube was placed. The patient improved and was discharged home 2 weeks later. He recovered with no documented recurrence of atrial fibrillation, receiving amiodarone 5 months after the procedure.

This case report demonstrates the continued risk of esophageal fistula formation presenting with pericardial and mediastinal drainage despite modification of the ablation protocol to reflect current strategies to reduce the risk of esophageal injury. An esophageal fistula developed in our patient despite monitoring of esophageal location in real time using barium esophagography and intracardiac echocardiography and 3D reconstruction; esophageal luminal temperature monitoring during left atrial posterior wall ablation with repositioning of the temperature probe at the level of the ablation catheter; restriction of posterior wall lesions to a power of 25 W and a duration of 30 seconds; and prophylactic treatment with proton-pump inhibitors and sucralfate. Recent reports suggest that general anesthesia during catheter ablation of atrial fibrillation may increase the risk of esophageal wall injury. We hypothesized that ablation under general anesthesia and excellent tissue contact using a deflectable sheath may have increased the risk of esophageal injury. Development of catheters with contact-force sensors, esophageal cooling, and alternative power sources are necessary to limit esophageal injury.

Disclosures
None.

References
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