



# Pericardial–Esophageal Fistula: A Rare but Increasing Complication of Cardiac Ablation

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## Abstract

### Keywords

- surgical ablation
- esophageal
- pericardium
- cardiopulmonary bypass
- CPB

Pericardial–esophageal fistula and/or atrial–esophageal fistula after cardiac ablation is nearly universally fatal if not detected and treated expeditiously. This condition should be assumed and ruled out in anyone with a recent history of cardiac ablation presenting with signs of sepsis, pneumomediastinum, pneumopericardium, or chest pain. Computed tomography scan of the chest is a rapid and a sensitive diagnostic modality. Tenets of treatment and repair consist of preventing an air embolism, repairing the esophageal perforation and atrial defect, and interposing autologous tissue between the esophagus and heart.

## Case History

The patient was a 35-year-old woman with atrial fibrillation (AF) for 6 years. She underwent several electrical cardioversion procedures in the past. She has reverted to persistent symptomatic AF. She was electrically cardioverted and underwent successful transcatheter radiofrequency ablation. Two weeks after discharge, she presented to another facility with low-grade fever, general malaise, and substernal chest pain. Computed tomography (CT) scan demonstrated intrapericardial air and fluid (► Fig. 1). Given her history, we suspected a pericardial–esophageal fistula (PEF) or a possible atrial–esophageal fistula (AEF) and emergently transferred her to our center. She was expeditiously transferred to the operating room. She was maintained in Trendelenburg position during this entire process to avoid air embolus in the event of an AEF. Both cardiac and general thoracic teams operated on this patient in concert.

A midline sternotomy and then pericardiotomy was performed. Purulent material and food particles were noted. Ascending aortic and bicaval cannulation were performed and cardiopulmonary bypass (CPB) was initiated. The ascending aorta was cross-clamped and antegrade cardioplegia was administered to obtain cardiac arrest (► Fig. 2). The heart was lifted up to expose the posterior pericardium and left atrium, and a fistula from the esophagus to the pericardium was identified (► Fig. 3). The left atrium was carefully separated from the esophageal defect and was noted to be indurated and fibrotic; however, the left atrium was not perforated and there were no areas of bleeding. Esophagoscopy was performed to carefully evaluate the esophageal defect (► Fig. 4). This was debrided to healthy tissue, separating the esophageal mucosa from the muscle layers. This was closed primarily in two layers with several interrupted 3–0 Vicryl sutures and buttressed with pericardium. The esophagus was insufflated endoscopically

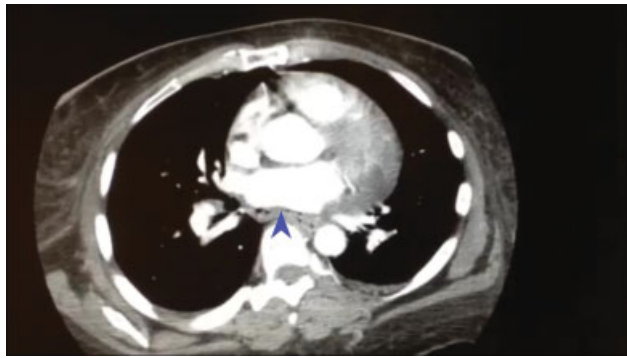
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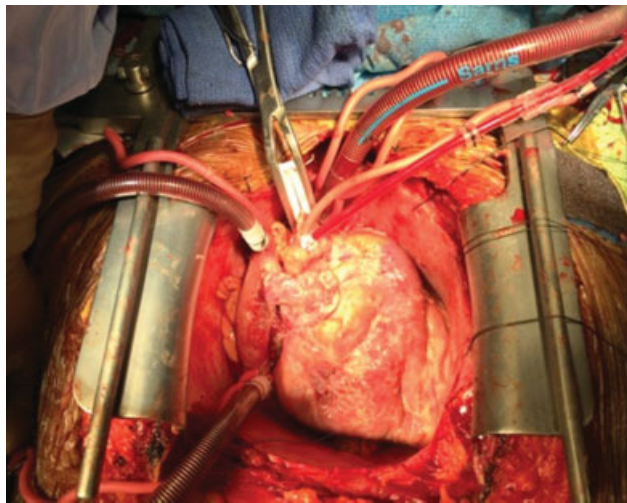
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**Fig. 1** A computed tomography scan with intravenous contrast was performed which demonstrated intrapericardial air adjacent to the left atrium (arrow). No other imaging studies were obtained.

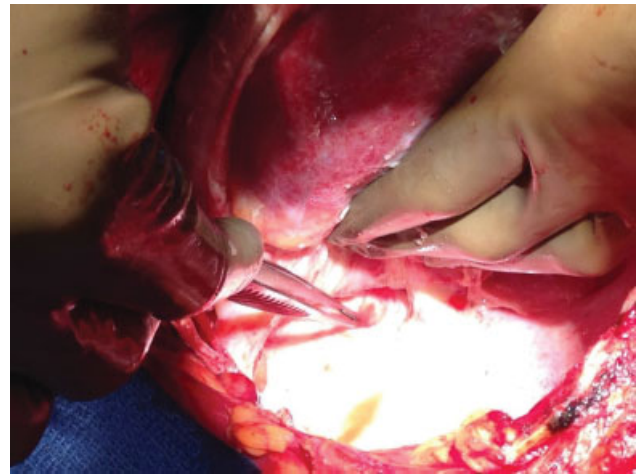


**Fig. 2** The approach was via a sternotomy and laparotomy. Minimal manipulation of the heart occurred before bicaval cannulation and aortic cross-clamp to prevent air embolism.

and the repair was pneumostatic. Next, an upper midline laparotomy was performed. A long, pedicled flap of omentum based on the right gastroepiploic artery was developed (► **Fig. 5**). The omentum was brought into the chest through an iatrogenically created defect in the central tendon of the diaphragm. It was placed posterior to the heart to separate the left atrium from the esophagus (► **Fig. 6**). A feeding jejunostomy tube and a nasogastric tube were inserted. The entire chest and abdominal cavities were copiously irrigated and closed in the usual fashion, with wide drainage of both cavities. A follow-up esophagram demonstrated no contrast extravasation and complete healing without a remnant fistulous tract. The patient was discharged home and made an uneventful recovery.

## Discussion

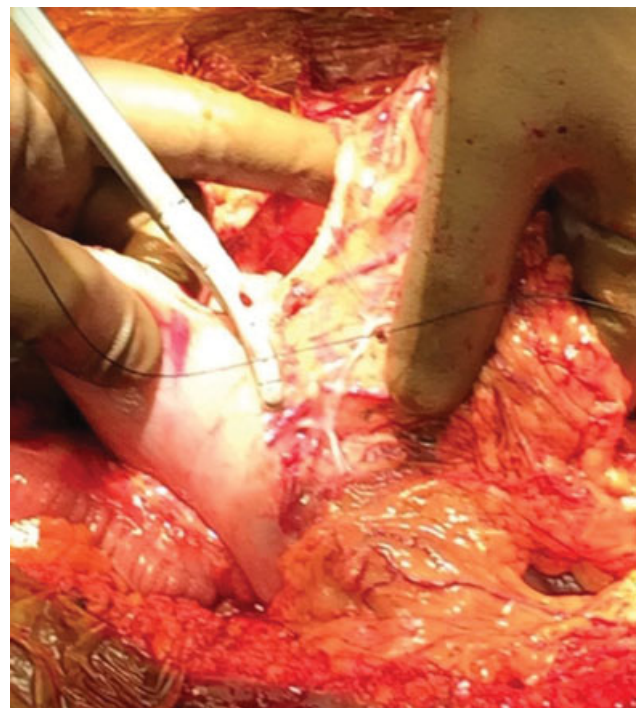
As the prevalence of AF continues to increase worldwide so does the corresponding number of catheter ablative procedures. As a result, one of the most devastating complications, PEF and/or AEF, has also been on the rise.<sup>1,2</sup> PEF/AEF is a rare but potentially fatal complication after AF ablation. It is



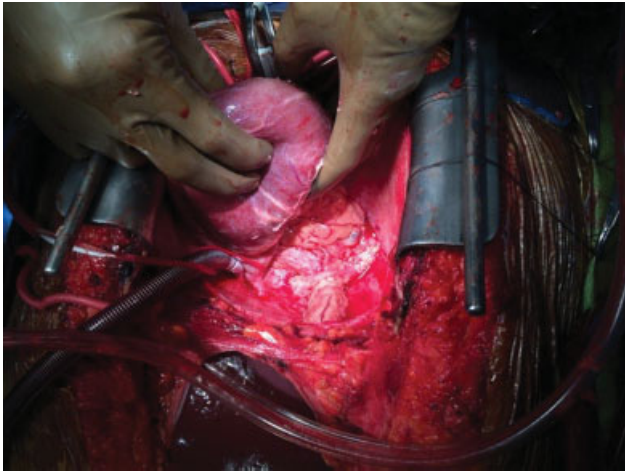
**Fig. 3** With the aorta cross-clamped and the heart completely empty, the heart is lifted to reveal the communication from the esophagus to the pericardium. The left atrium appears uninvolved.



**Fig. 4** Esophagogastroduodenoscopy is performed only after the aorta is cross-clamped to decrease the risk of air embolism in the event of an atrial–esophageal fistula. The identification of the esophageal injury/fistula by endoscopy is facilitated by introduction of a probe from the pericardium.



**Fig. 5** Omentum was harvested (based on the right gastroepiploic artery), and brought into chest through the diaphragm.



**Fig. 6** The esophageal defect is primarily repaired and covered with omentum that is brought into the pericardial space through the diaphragm.

reported to occur in 0.04 to 0.25% of AF cardiac ablations.<sup>2,3</sup> In one systematic, multicenter study involving more than 45,000 procedures, AEF was the second leading cause of death.<sup>4</sup> No definitive risk factors have been identified predicting fistula formation. Intraoperative strategies have been proposed to help limit esophageal injury.<sup>2</sup> These injuries have been reported with use of various energy sources such as radiofrequency ablation, cryoablation, ultrasound, and surgical ablation.<sup>1–3</sup> A high index of suspicion must be maintained to make the diagnosis. However, the majority of patients presenting with this complication do not survive.<sup>1–5</sup> Potential mechanisms of injury include direct thermal injury and vagal injury and resultant increased acid reflux. Eventually, esophageal ulceration, ischemia, and necrosis develop. Patients may present with a myriad of signs and symptoms, including but not limited to chest pain, leukocytosis, fever, stroke, dysphagia, odynophagia, hematemesis, heartburn, septic or hemorrhagic shock.<sup>1–3,5</sup> Symptom onset may occur days to months after the ablative procedure. CT scan of the chest is the test of choice to make a diagnosis of AEF or PEF. Suggestive findings include

pneumopericardium, pneumomediastinum, intra-atrial air, or hemothorax.<sup>1,2,5</sup> In cases in which there is a connection between the left atrium and the esophagus, the patient may present with bleeding, and/or sequelae of air or food embolism. Endoscopy and esophageal insufflation and trans-esophageal echocardiography are avoided until after the aorta is cross-clamped to minimize risk of air embolism. It is safest to approach this condition through a sternotomy or thoracotomy, and with CPB support to deal with any fistulous connection between the esophagus and the atria that may exist. In cases where the left atrium defect cannot be closed primarily, reconstruction with bovine pericardium may be necessary.

## Conclusion

Autologous tissue should be used to buttress and protect repairs. In rare cases like ours, it is imperative to collaborate with numerous subspecialists. Patients undergoing ablation should be educated about potential symptoms that may suggest a serious complication.

## Conflict of Interest

None declared.

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