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Atrial-Esophageal Fistula Post-Maze Radiofrequency Ablation

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Background	A 51-year-old man presented with new acute onset aphasia three weeks after completion of maze radiofrequency catheter ablation for atrial fibrillation. The patient was found to have an atrial-esophageal fistula.
Summary	A 51-year-old man with atrial fibrillation presented with acute onset aphasia and upper extremity weakness. Maze radiofrequency catheter ablation had been performed three weeks prior. Computed tomography of the head without contrast at presentation displayed pneumocephalus. Computed tomography of the chest with and without contrast displayed a fistula connecting the left atrium to the esophagus. Urgent upper endoscopy was performed for esophageal stent placement to limit air emboli until surgical stabilization. Esophagogastroduodenoscopy displayed a 2 cm blood clot at the site of the fistula and blood in the stomach. An esophageal stent was placed over the clot. Unfortunately, the patient suffered a fatal cardiac arrest secondary to coronary air emboli prior to surgery. Atrial-esophageal fistulas (AEF) form from insults spanning all histologic layers between the atrium and esophagus. Most patients present with sepsis from esophageal flora translocation three to four weeks after the initial insult. Patients can have neurologic injury from air emboli entering the circulation during peristalsis. The presence of an AEF is an emergency, and focus should be on quickly resuscitating the patient for emergent surgery. Esophageal stents can be placed to occlude the fistula temporarily, but surgery is required for definitive treatment. Survival outcomes significantly favor surgery over esophageal stenting.
Conclusion	Atrial-esophageal fistula is a rare but present complication of maze radiofrequency catheter ablation. Patient survival is dependent on optimizing patient for surgical intervention as fast as possible.
Keywords	Atrial-esophageal fistula, radiofrequency ablation

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Case Description

A 51-year-old man with atrial fibrillation status-post maze radiofrequency catheter ablation presented with acute onset aphasia. The patient was asymptomatic 24 hours prior to presentation. His spouse noticed the patient's speech had changed, and the patient appeared more fatigued, which prompted them to go the hospital. The patient was compliant with anticoagulant therapy and denied any history of stroke, blood clots, or trauma. After failing medical therapy, the patient had undergone a one-hour maze radiofrequency catheter ablation with pulmonary vein isolations without intraoperative complications three weeks prior to presentation. Vital signs at presentation were: temperature 37.5°C, heart rate 119 beats per minute, blood pressure 134/106 mm Hg, respiration 18 breaths per minute, oxygen saturation 100 percent on room air. The physical exam was notable for diffuse diaphoresis and difficulty verbalizing responses to questions. Initial labs were notable for a white blood cell count of 25. Blood cultures were obtained and grew out *Strepococcus mitis* in two of two bottles within 24 hours, and antibiotics were started. A computed tomography (CT) scan of the head without contrast at presentation was negative for a bleed, but displayed extensive right cerebral hemisphere pneumocephalus (Figure 1).

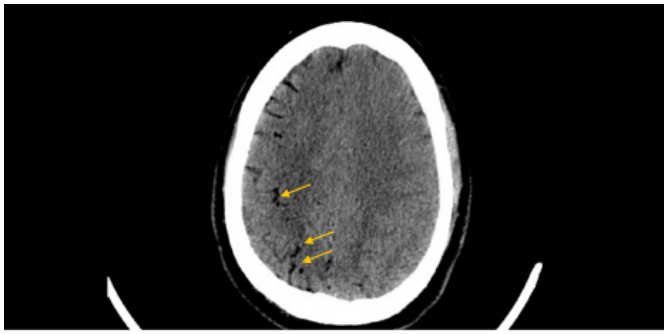

Figure 1. Brain CT without contrast. Transverse-axis image displays scattered air pockets throughout the right cerebral hemisphere consistent with pneumocephalus (arrows).

CT scans of the chest with and without contrast were obtained and displayed a fistula connecting the left atrium to the esophagus (Figure 2).

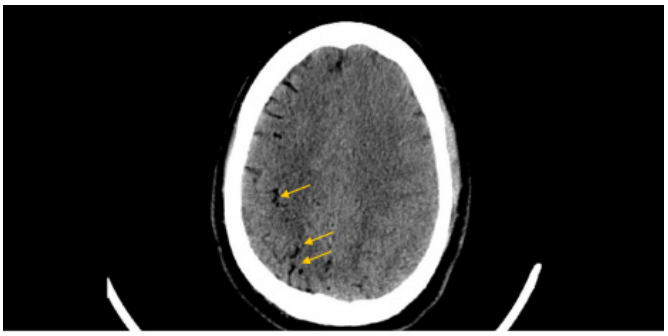

Figure 2. Chest CT with and without contrast. Image displays fistula (arrow) connecting the left atrium to the esophagus.

Contrast-enhanced echocardiography was performed during the cerebrovascular accident (CVA) workup, but stopped after air bubbles were visualized in the left atrium and left ventricle prior to saline agitation (Figure 3).

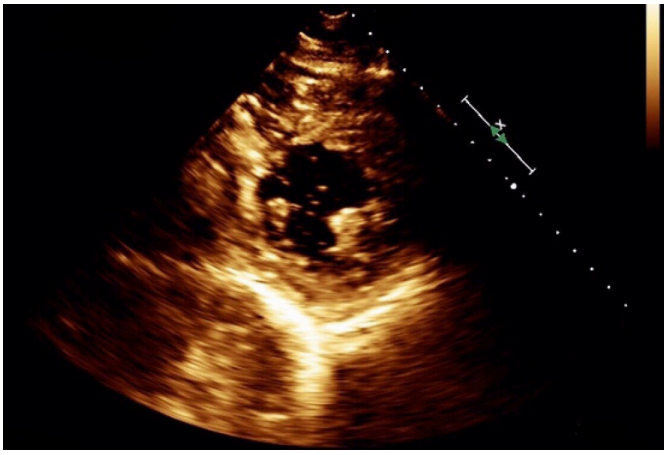

Figure 3. Image from CT echocardiography displays left ventricle in parasternal short-axis with air bubbles (arrows) present prior to infusion of contrast.

Within 24 hours of initial presentation, general surgery was consulted to manage esophageal fistula; this team recommended urgent upper GI endoscopy (EGD) for esophageal stent placement to limit further air emboli. EGD results demonstrated a 2 cm clot on the esophageal wall at the site of the fistula and approximately 450 cc of old blood in the stomach. A 12 cm stent was placed over the blood clot in the esophagus (Figure 4).

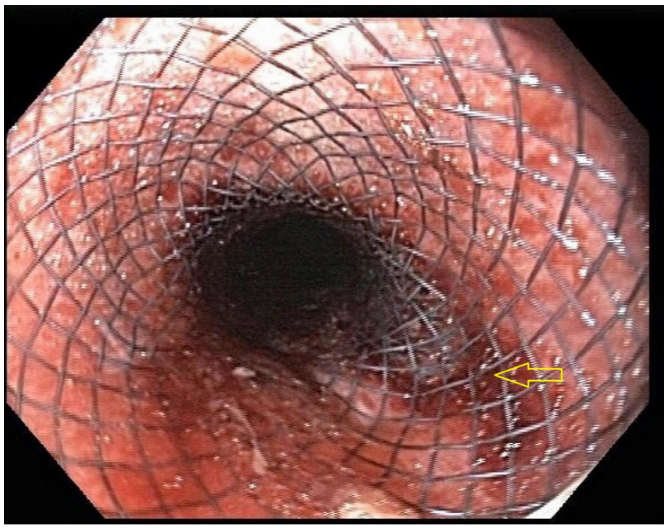

Figure 4. Esophagogastroduodenoscopy displaying stent placement over right-sided esophageal blood clot (arrow).

Post-EGD, CT surgery was consulted for operative correction of fistula, but surgery was cancelled after patient suffered an ST-elevation myocardial infarction from air emboli entering the coronary vasculature while awaiting emergent exploration. Despite efforts to limit neurologic damage, the patient's neurologic and hemodynamic status continued to decline, and his family decided to withdraw care.

Discussion

An atrial-esophageal fistula (AEF) is defined as an aberrant anastomosis connecting the atrial cavity to the esophageal lumen. AEF requires an insult, spanning all histologic layers, between the atrial wall and the esophageal wall in order to form. Most common insults include trauma (gunshot wound, blunt penetration), surgical incisions or cautery, and systemic inflammatory disease (such as inflammatory bowel disease). Most patients present three to four weeks after the initial insult with sepsis from esophageal flora entering the blood through the fistula.[1] Patients can also present with neurologic deficits from air emboli entering the circulation during peristalsis.[1] As in this case, emergent exploration is often delayed in patients presenting with cerebrovascular accident symptoms due to time to image and identify the sources of air emboli. Air emboli can quickly progress to diffuse pneumocephalus requiring urgent endoscopic or surgical intervention to limit neurologic damage. Often, endoscopy will visualize a clot in the esophagus at the fistula site and the presence of old blood in the stomach from blood leaking through the fistula. Esophageal stents can be placed to temporarily occlude the fistula until surgical correction can be performed, but stents should be generally understood as a temporary measure until surgery and not a definitive treatment.[2] Furthermore, endoscopy poses a risk of worsening air emboli due to insufflation; however, in order to do so, insufflation pressure must overcome luminal fistula pressures. Therefore, endoscopic treatment of AEF should limit insufflation time and be reserved for skilled endoscopists.[3] AEF survival outcomes significantly favor surgery over esophageal stenting, which makes quickly identifying fistulas and resuscitating the patient for surgery of utmost importance.[4] Surgical correction typically includes cardiopulmonary bypass with open atrial repair to limit and excise tissue necrosis, followed by esophageal repair or resection for fistula resolution.[5,6] Regardless of initial treatment option, early time to diagnosis and treatment improves survival. Without endoscopic or surgical intervention, mortality rates of 83 percent have been reported.[1]

Maze catheter ablation is a minimally-invasive surgical procedure that utilizes an energy source, such as microwaves, radiofrequencies, or cryothermy, to create a superficial scar on the heart to block conduction from pathologic electrical foci. Radiofrequency ablation is often chosen over other energy sources for the correction of atrial fibrillation due to radiofrequency being reported to have a lower rate of atrial fibrillation recurrence.[7] Maze procedures for the treatment of atrial fibrillation have reported a small risk of AEF due to the proximity of the esophagus to the atrial cavities. Literature has reported an AEF incidence in maze procedures (depending on the energy source) of 0.03 to one percent. [1,2] Often, a diagnosis will be made with the use of chest CT with and without contrast displaying the presence of a fistula. Less commonly, contrast-enhanced echocardiography can make a diagnosis by visualizing air bubbles prior to saline agitation. This case demonstrates a rare complication of maze radiofrequency catheter ablation and how swiftly a patient can deteriorate from AEF if emergent surgery isn't performed in time. Esophageal stents and surgery can hopefully limit more air emboli from entering circulation, but cannot prevent present emboli from causing catastrophic events like myocardial infarction, as in this patient. The presence of an AEF diagnosis should be treated as an emergency, with a primary focus on quickly resuscitating the patient for surgery.

Conclusion

Atrial-esophageal fistula is a complication of maze radiofrequency catheter ablation that can result in high mortality if not urgently corrected. Patients can present with an array of symptoms (with sepsis being the most common presentation). Emergent surgical intervention is necessary to provide the highest likelihood of survival.

Lessons Learned

Fistulae connecting the gastrointestinal tract to the bloodstream have high percentages of morbidity and mortality. There is limited time for survival in AEF patients presenting with signs of sepsis or stroke, whose workup often inadvertently delay time-to-surgery. Resuscitating AEF patients for surgical intervention is of utmost importance to improve survival outcomes. CT surgery should be immediately involved with patient care at time of AEF identification.

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