

Iatrogenic cerebral air embolism revealing an atrial-esophageal fistula

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A 69-year-old man was admitted with sepsis and stroke. Thirty days prior to admission, he had undergone percutaneous radiofrequency ablation (RFA) for atrial fibrillation (AF) in another hospital. Due to sinus-atrial node disease, an internal pacemaker was inserted after the procedure. He was anticoagulated with acenocoumarol, and had a slightly supra therapeutic international normalized ratio (INR) documented recently.

Three hours prior to this admission, he was found with a transient loss of consciousness, generalized tremors, and right-sided weakness. Clinical examination in the emergency department disclosed right flaccid hemiplegia and a high fever (39.5 °C). He was fully conscious, and the neck was supple. A head computed tomography (CT scan) was consistent with an ischemic stroke (left thalamic and right cerebellar low density foci). Due to activity consistent with a seizure, levetiracetam (1000 mg, twice daily) was initiated.

On the second hospital day, his mental status started to deteriorate, and he became comatose (GCS 6/15). Cheyne–Stokes respiration was present. A new head CT scan disclosed new foci of low density, with some ischemic lesions presenting signs of hemorrhagic transformation. Blood cultures from admission grew gram-positive cocci. Transthoracic echocardiogram (TTE) disclosed abnormal echogenic material in the left atrium; valve vegetation was not found.

He was intubated for airway protection and antibiotics were started. Because he had melena with fresh blood aspirated from his nasogastric tube, an upper digestive endoscopy was performed, demonstrating a small ulcer in the esophagus-gastric junction with no active bleeding. During endoscopy, the patient suddenly developed a massive circulatory collapse with signs of further neurological deterioration (dilated pupils, abnormal brainstem reflexes). After immediate hemodynamic stabilization, an emergent third CT scan was performed displaying massive cerebral air embolism (Fig. 1).

The patient was pronounced dead soon thereafter, after a decision was made for comfort measures due to the poor neurologic prognosis, in agreement with the relatives. The necropsy revealed an atrial-esophageal fistula (Fig. 2).

Left atrial-esophageal fistula (AEF) is a rare, but often fatal complication of RFA for AF. The incidence ranges from 0.01 to 1.5% [1, 2], and overall mortality has been reported at 40–80% with most survivors having significant neurological deficits [1–3]. Although well known to interventional cardiologists, this complication is not very familiar to many specialists in acute care medicine, internists, or neurologists. Therefore, diagnosis is often evoked too late to enable proper management and improve outcome.

Typically, the diagnosis should be sought whenever a patient develops neurological manifestations, upper gastrointestinal hemorrhage, or fever within several weeks after pulmonary vein isolation. Average latency between RFA and onset of clinical manifestations is reported to be 20 days in a recent review of 53 published cases [1]. In seven cases, however, manifestations occurred after more than a month, a delay that makes diagnosis more difficult, as illustrated in our case [1].

Symptoms are ascribed to migration of food, air or bacteria from the lower esophagus to the arterial circulation

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Fig. 1 Brain CT scan shows extensive air emboli in cerebral vessels, subarachnoid space, and cerebral parenchyma

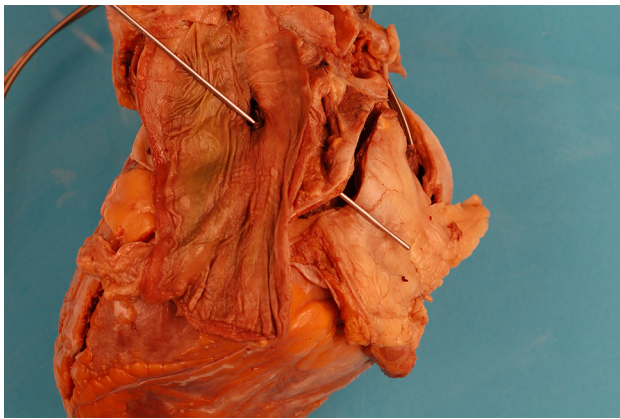


Fig. 2 Necropsy revealing an atrial-esophageal fistula. En bloc resection of the esophagus and the heart: the probe demonstrates a communication between the esophagus (*left entrance*) and the opened left atrium (*right*)

(including cerebral vasculature), via the left atrium. Thrombus generation in the left atrium is also contributing. Neurological manifestations include strokes or transitory ischemic attacks (71%), seizures (18%), and coma (12%). Fever is almost always present, with possible bacteremia caused by organisms that originate in the oropharynx. Gastrointestinal bleeding is sometimes encountered (16%), although rarely does massive hemorrhage occur [3].

The fistula is thought to result from a focal necrosis of the left atrial and adjacent esophageal walls, due to excessive increase in local tissue temperature during RFA [3]. A close proximity between the left atrium and the esophagus (a distance often as small as 5 mm) has been demonstrated. Although the left atrial pressures are higher than esophageal pressures at rest, the opposite is seen during coughing, vomiting, or retching. This may explain the mechanisms by which air, food, and bacteria can enter the heart, and cause arterial embolization in case of AEF [2]. Insertion of a nasogastric tube, performance of trans-esophageal echocardiogram (TEE) or upper GI endoscopy is therefore strictly contra-indicated whenever AEF is feared present [1–3]. GI

endoscopy is particularly harmful since it requires air insufflation, and thus creates a pressure gradient that favors the passage of air via the left atrium into the arterial circulation, possibly involving cerebral vasculature as seen in our patient. We are aware of two previous cases of massive cerebral air embolism resulting from endoscopy that are reported in a patient with RFA-related AEF [4, 5].

The diagnosis of AEF is thus to be made by noninvasive imaging such as magnetic resonance imaging (MRI) or thoracic CT scan with contrast media. Once the diagnosis is made, immediate surgical intervention is required although more than a third of patients will die in the perioperative period [1].

In conclusion, we describe a case of massive cerebral air embolism originating from an atrial-esophageal fistula complicating percutaneous radiofrequency ablation for atrial fibrillation, and precipitated by air insufflation during upper GI endoscopy. The high latency between radiofrequency ablation and the appearance of first symptoms may make diagnosis difficult, all the more so because the patient may consequently be admitted to a hospital different from that where the procedure was performed. Better knowledge of this complication by non-cardiologists, (and particularly by specialists in acute care and internal medicine) might contribute to earlier diagnosis, proper management, and improved outcome of atrial-esophageal fistulas.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Research involving human participants or animals This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Written informed consent for case report publication was obtained from the relatives.

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