Case Reports

An avoidable cause of cardioembolic stroke

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Abstract

Left Atrial Ablation for Atrial Fibrillation is safe and effective for most patients. However a rare complication is thermal damage to the integrity of the normal physical barriers between the left atrium and the adjacent oesophagus due to the ablation process. This can lead to formation of an Atrial-Oesophageal fistula with sepsis, haemorrhage and systemic cardioembolism occurring even up to 2 months post procedure. The presentation is similar to endocarditis but localised instrumentation specifically Transoesophageal echocardiography (TOE) can provoke systemic cardioembolism. This is an important differential in those presenting acutely with a Pyrexia of Unknown Origin or endocarditis-like picture within 2 months of ablation therapy.

Keywords

Atrial-Oesophageal fistula, ablation, atrial fibrillation, stroke, embolism

Key points

- Atrial-Oesophageal fistula (AOF) is a rare complication of left atrial radiofrequency ablation for atrial fibrillation with mortality up to 80%
- AOF may present with pyrexia of unknown origin (PUO), sepsis, stroke or local oesophageal haemorrhage
- AOF is more common than valvular endocarditis following a radiofrequency ablation procedure.
- Oesophageal instrumentation in patients with undiagnosed AOF can lead to catastrophic cardioembolism of air, thrombus or infected material.
- Management is emergency thoracic surgery and repair and closure
- TOE should be avoided in patients with PUO and a recent history of radiofrequency ablation until AOF can be excluded, where the diagnosis is considered

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Case Report

A fit and independent 79 year old retired nurse with a history of hypertension underwent left atrial radiofrequency catheter ablation for refractory and symptomatic AF. The ablation procedure was uneventful and successful as she remained in sinus rhythm. She was discharged on Warfarin, which she had been taking prior to the ablation procedure. Seven weeks later she presented with pyrexia, rigors and back pain. Examination was normal. A chest X-ray demonstrated old pulmonary TB, which had been successfully treated when she was 20. Her C-reactive protein (CRP) was 100. She was initially treated with oral antibiotics for suspected lower respiratory tract infection and discharged from hospital.

She returned to the acute medical unit 4 hours later with ongoing pyrexia, tachycardia and rigors. Blood cultures grew *Streptococcus viridans*. Transthoracic echocardiogram showed mild mitral regurgitation but no evidence of vegetations. She remained pyrexial despite appropriate antimicrobial therapy. A CT scan of chest, abdomen and pelvis was reported as normal. Dentition was noted to be poor and an orthopantomogram suggested a possible dental abscess. Repeated blood cultures on antibiotics showed mixed growth including *Streptococcus* viridans, *Streptococcus* Oralis and *Neisseiria* spp and *Candida glabrata* and *Streptococcus mutans*. She was treated empirically for infective endocarditis, including antifungals, but despite this, her inflammatory markers remained raised with ongoing pyrexia.

A transoesophageal echocardiogram (TOE) was undertaken, which showed no vegetations or valve disease, and no clot in the left atrial appendage; however within a few hours of the procedure she became drowsy with aphasia and left sided weakness. A non-contrast CT brain showed a right frontal lobe haematoma with mass effect and oedema (figure 1); a subsequent MRI with DWI showed areas of attenuation consistent with ischaemic stroke with restricted diffusion in the left frontal lobe along with a haematoma in the right frontal lobe (figure 2). Her INR was within the therapeutic range but was normalized using intravenous (IV) vitamin K and Octaplex.

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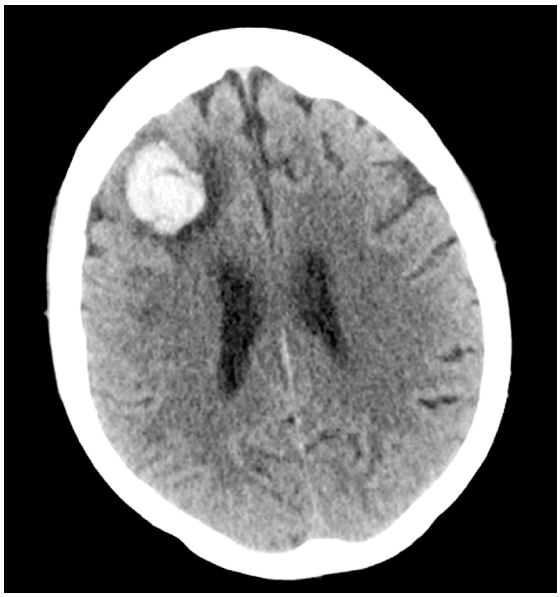


Figure 1.

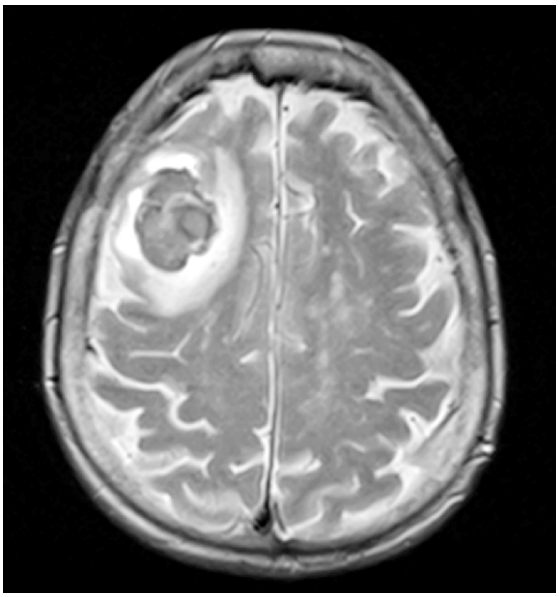


Figure 2.

Dentition was reviewed and three carious teeth were extracted but no abscess was detected. She was commenced on oral antiseptic mouthwash (Corsadyl). From this point her pyrexia and CRP settled. A review of her previous imaging suggested a 'mediastinal gas bubble' on previous CT imaging between oesophagus and left atrium, suggestive of atrial-oesophageal fistula (figure 3). She was treated with IV antibiotics for 6 weeks and remained apyrexial and inflammatory markers settled. However she has remained aphasic with persistent weakness requiring ongoing care with activities of daily living, 6 months after the event.

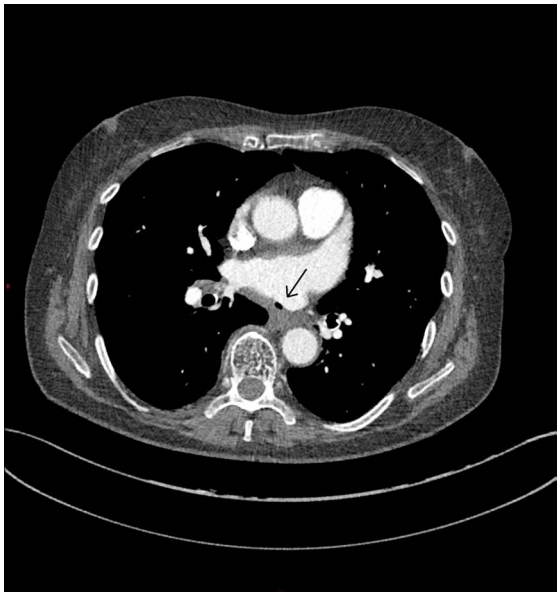


Figure 3. CT chest showing mediastinal gas bubble between oesophagus and left atrium (arrow).

Discussion

Left atrial radiofrequency catheter ablation for AF involves delivering thermal damage to the endocardial surface, isolating the pulmonary vein. It is usually reserved for symptomatic patients with AF who have not responded to medication.[1] The procedure is usually both safe and effective in the elderly and reduces the symptoms and incidence of AF.[2,3] Potential complications include cardiac tamponade, ventricular arrhythmias, subclavian or pulmonary vein perforation and post-operative pneumonia. A rarer complication is the development of an atrial-oesophageal fistula (AOF) which is seen in less than 1% of procedures[4] but it is associated with a mortality of over 80%. Presentations are varied and include persistent pyrexia, acute delirium, seizures, meningitis, focal cortical signs, and postprandial transient ischemic attacks associated with fever and stroke and oesophageal haemorrhage. These symptoms can be delayed for up to 2 months post procedure.[5,6]

Oesophageal mucosa is heat sensitive and injury is seen in 36-48% of these patients; when the probe is placed against the left atrial endocardium the thermal energy can be transmitted to adjacent oesophagus. An actual fistula is seen in a tiny minority however a transient breakdown in normal mucosal and endocardial integrity and an acute and chronic inflammatory process related to the burn could allow transmural spread of infection. In this case there was a perfect storm in that loss of mucosal integrity and potential fistula formation was combined with the poor state of oral dentition and constant microbial seeding of the lower oesophagus.[7] Blood cultures grew normal

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oral commensals, which raised the suspicion of endocarditis, despite normal transthoracic echocardiogram. However, it was not until after the transoesophageal echocardiogram that she developed signs of stroke. The strokes were likely due to septic emboli with haemorrhagic transformation of a right frontal infarct related to her anticoagulation. Cardioembolism related to her previous AF was considered to have been unlikely, given that she had been anticoagulated since before her ablation procedure and no thrombus was identified in the left atrial appendage on TOE.

Repeated reports have shown that oesophageal instrumentation in proximity to the lower oesophagus in the area coterminous with the LA ablation where there is possibly a fistula can provoke a sudden septic, thrombotic or air embolism. The mechanism is unknown but the TOE probe will be at the level of any fistulous connection during attempts to visualize the left atrium and mitral valve; movement of the probe head may physically dislodge any amalgam of clot and non-sterile granulation tissue and debris related to the prior burn. This is not well recognised or mentioned in even the current Echocardiography textbooks.[8] Endocarditis following ablation is less common than fistula formation and so fistula should be the initial suspicion.[9] The diagnostic test is CT imaging of the thorax showing pneumomediastinum or intra-atrial air.[10,11] Careful inspection of images is required to identify small bubbles of gas, which may initially be missed, as in this case.

Traditional management of AOF is immediate open surgery and repair of any fistulous communication; in view of our patient's ongoing disability this was deemed not to be appropriate, following discussion with her family.

In a patient with a PUO or focal stroke presentation seeking a cardiac source, a history of recent AF ablation procedure should raise suspicions of the possibility of AOF; TOE should be avoided until this possibility has been reliably excluded.

Patient Consent

The patient has lost capacity due to severe dysphasia and cognitive issues. Her family are in contact with me by email and are keen for this to be published.

References

1 Johnson TW, Jadick EA, Knippers L. Atrial fibrillation ablation. *The American journal of nursing* [Internet]. 2011;**111(2)**:58–61.
2 Corrado A, Patel D, Riedlbauchova L, Fahmy TS, Themistoclakis S, Bonso A, *et al.* Efficacy, safety, and outcome of atrial fibrillation ablation in septuagenarians. *Journal of cardiovascular electrophysiology* [Internet]. 2008;**19(8)**;807–11.
3 Bunch TJ, Weiss JP, Crandall BG, May HT, Bair TL, Osborn JS, *et al.* Long-term clinical efficacy and risk of catheter ablation for atrial fibrillation in octogenarians. Pacing and clinical electrophysiology : *PACE* [Internet]. 2010;**33(2)**:146–52.
4 Cappato R, Calkins H, Chen S, Davies W, Iesaka Y, Kalman J, *et al.* Prevalence and Causes of Fatal Outcome in Catheter Ablation of Atrial Fibrillation. 2009;**53**;19
5 Stöllberger C, Pulgram T, Finsterer J. Neurological consequences of atrioesophageal fistula after radiofrequency ablation in atrial fibrillation. *Archives of neurology* [Internet]. 2009;**66(7)**:884–7.
6 Pappone C, Oral H, Santinelli V *et al.* Atrio-esophageal fistula as a complication of percutaneous transcatheter ablation of atrial fibrillation. *Circulation* [Internet]. 2004;**109(22)**:2724–6.
7 Norder Grusell E, Dahlén G *et al.* Bacterial flora of the human oral cavity, and the upper and lower esophagus. Diseases of the esophagus : *official journal of the International Society for Diseases of the Esophagus / I.S.D.E* [Internet]. 2013; **26(1)**;84–90.
8 Otto, CM. Textbook of Clinical Echocardiography, 5th Edition 2013 Elsevier Health Sciences
9 Scheinman MM, Huang S. The 1998 NASPE prospective catheter ablation registry. Pacing and clinical electrophysiology : *PACE* [Internet]. 2000;**23(6)**:1020–8.
10 Dagres N, Hindricks G, Kottkamp H *et al.* Complications of atrial fibrillation ablation in a high-volume center in 1,000 procedures: still cause for concern? *Journal of cardiovascular electrophysiology* [Internet]. 2009;**20**:6.
11 Williams TL, Parikh DR, Hopkin JR *et al.* Teaching NeuroImages: cerebral air embolism secondary to atrial-esophageal fistula. *Neurology* [Internet]. 2009;**24**;72(12):e54–5.

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