

# Intramural Hematoma versus Thrombus: Radiation-induced Heart Disease Results in Mass Formation after Radiofrequency Ablation

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Radiofrequency catheter ablation (RFCA), albeit an effective therapy for drug-refractory atrial fibrillation (AF), can be associated with complications in 3.9–22.0% of cases,<sup>[1]</sup> of which cerebrovascular embolization, cardiac tamponade, and pulmonary vein stenosis are more common, and atrial hematoma is more rare. Here, we presented a case describing an elderly woman diagnosed with an intramural left atrial hematoma after AF ablation.

A 74-year-old female patient was admitted to Zhujiang Hospital complaining of palpitations, lightheadedness, and chest distress. Her medical history was remarkable for chronic AF refractory to amiodarone and breast carcinoma. About 15-day courses of chest cobalt irradiation and cardiotoxic chemotherapeutic agents such as adriamycin were implemented at the age 48. Then delayed sternal osteoradiomyelitis and radiodermatitis came into being 10 years later, treated with postautologous skin flap transplantation. In 2006, three drug-eluting stents (types unknown) were implanted in the left anterior descending, left circumflex and right coronary arteries for coronary artery disease. At current admission, preoperative 12-lead electrocardiography (ECG) showed AF with incomplete right bundle branch block. Transthoracic echocardiography (TTE) revealed moderately enlarged left atrium (LA) with slight reduction of left ventricular myocardial contraction, mild pericardial effusion, and normal left ventricular ejection fraction of 50%. LA thrombus was excluded by transesophageal echocardiography. All laboratory results were within normal limits except for the Subtherapeutic International Normalized Ratio and slightly high level

of carbohydrate antigen 125. Low-molecular-weight heparin (4100 U daily) was administered for anticoagulation 3 days before ablation procedure.

A steerable circular mapping catheter (Lasso, Biosense Webster, Diamond Bar, CA, USA) and a 3.5-mm irrigated-tip ablation catheter (NaviStar ThermoCool, Biosense Webster, Diamond Bar, CA, USA) were introduced into LA through two 8.5-Fr sheaths (Schwartz SL1, St. Jude Medical, MN, USA) after transseptal puncture. Initially, a bolus of 7000 U unfractionated heparin was administered intravenously followed by additional 1000 U according to activated clotting time. LA roof and mitral isthmus lines were blocked together with circumferential pulmonary vein isolation; the mitral isthmus block was obtained by both endocardial and epicardial coronary sinus ablation. AF converted to atrial tachycardia and ultimately to sinus rhythm. Postoperative antiarrhythmic medications (propafenone and bisoprolol) and anticoagulation drugs (warfarin) were prescribed. The following morning, the patient developed shortness of breath, dyspnea, and axillary temperature of 101.3°F. ECG showed sinus tachycardia, and TTE revealed a well-demarcated 7.1 cm × 4.2 cm mass attached to the posterior wall of LA, which occupied approximately

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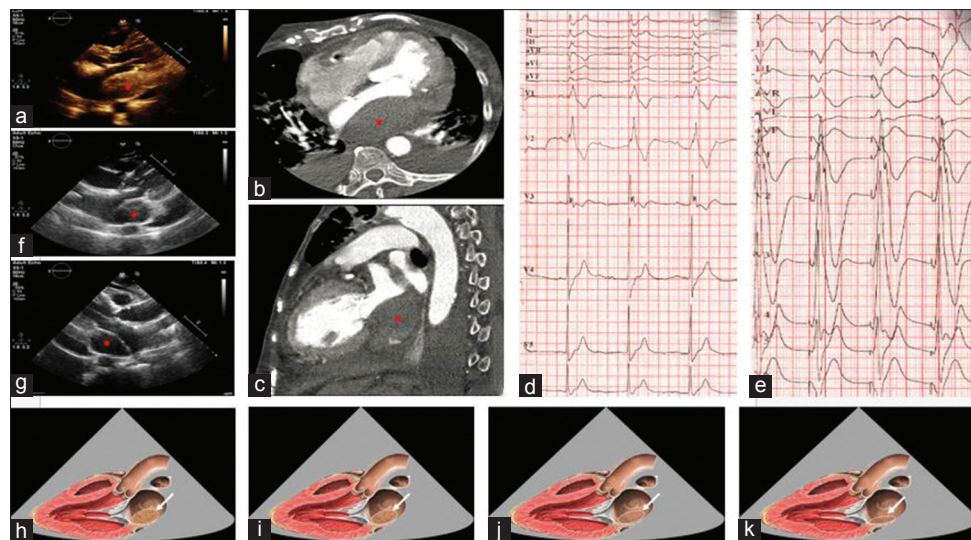
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66% of the cavity and caused severe obstruction of atrial flow [Figure 1a and Video 1]. A giant thrombus was initially suspected, and intravenous urokinase was administered using a loading dose of 100 WU followed by continuous pump infusion at a speed of 10 WU/h for 2 days, which turned out to be ineffective. In computed tomography angiography (CTA), the mass appeared to be subendocardial and the ostia of the pulmonary veins were unaffected, indicating a high possibility of intramural hematoma [Figure 1b and 1c]; potential LA-esophagus fistula was excluded. The patient refused to undergo cardiac magnetic resonance imaging (CMRI), which is considered the ultimate differentiating diagnostic modality. Third-degree atrioventricular block abruptly deteriorated accompanied by hypotension and hypoxia, prompting emergent temporary pacemaker implantation [Figure 1d]. However, the lead was mistakenly placed into the left ventricle [Figure 1e]. Fortunately, the clinical symptoms were relieved to some extent. The patient recovered very slowly because of poor appetite and unwillingness to ambulate. The patient then developed pneumonia with severe cardiac and pleural effusions further exacerbated by hypoalbuminemia, which was relieved by successful pericardial and pleural drainage. Follow-up TTE showed a reduced size (6.8 cm × 2.6 cm) hematoma which progressed into a cyst-like structure [Figure 1f–1k and Video 2]. Unfortunately, the patient did not survive due to multiorgan failure developing 4 weeks later.

In the present case of an intramural hematoma after AF ablation, a giant LA thrombus was first suspected on the basis of echocardiographic images; however, aggressive anticoagulation therapy failed to resolve the mass. The fact that the misplaced temporary pacemaker lead did not disrupt the mass also argued against the presence of a cardiac

thrombus. An atrial intramural hematoma was suspected, and the diagnosis was underscored by observations during follow-up. Other differential diagnoses should include atrial myxoma,<sup>[2]</sup> a gradually growing cardiac tumor, and hydatidosis,<sup>[3]</sup> which would be supported by the presence of hydatid cysts in lungs and liver and positive serologic tests. CMRI might be the most useful invasive differentiating modality, and surgical exploration to clarify the nature of left atrial masses is usually reserved for cases with hemodynamic instability or collapse. The patient in the present report was hemodynamically stable and was not suit for a surgical exploration due to pneumonia; noninvasive conservative treatment, focusing on symptomatic improvement, was effective with partial hematoma absorption during follow-up.

LA hematoma after RFCA successfully treated with surgery has been documented in literature.<sup>[4]</sup> The patient in the present report experienced a similar history of breast carcinoma radiation with the case of intramural hematoma reported by Kelly *et al.*,<sup>[5]</sup> which implied a potential role of chest radiation in the genesis of intramural hematoma. Radiation-induced heart disease (RIHD), which is unavoidably caused by radiotherapy for thoracic tumors regardless of the extent of heart tissue exposed to the radiation field, manifests with accelerated atherosclerosis, myocardial fibrosis and cardiomyopathy, conduction abnormalities, valvular disease, and pericardial disease.<sup>[6]</sup> RIHD may cause both acute and chronic injury to cardiac tissue, and the latter is much more detrimental, progressive over time, and may exacerbate 10 years later. Radiation exposure leads to endothelial cell damage, further microvascular injury, and ultimately tissue fibrosis and myocardial necrosis, which might affect the conduction system and atrial substrate. The 15-day courses



**Figure 1:** Transthoracic echocardiographic parasternal long-axis view revealed a giant mass (asterisk) attached to the posterior wall of the left atrium, which had progressed into a cyst-like structure at follow-up, suggestive of an intramural hematoma (a, f and g). In computed tomography angiography, the mass (asterisk) appeared to be extracardiac, strongly supporting the diagnosis of intramural hematoma (b and c). Electrocardiography showed complete atrioventricular block (d) and left ventricular pacing rhythm (e). Schematic diagram elucidated the evolution of the left atrial hematoma (h–k).

of chest cobalt irradiation might render the atrium more vulnerable to transseptal puncture and radiofrequency energy, with the consequence of intramural hematoma.

In conclusion, a left atrial intramural hematoma might develop after AF ablation; therefore, cautions should be emphasized for patients who had undergone radiotherapy for chest tumors, such as breast, lung and esophageal cancer and mediastinal malignant lymphomas. TTE or CTA is valuable for early recognition, and CMRI might establish a definitive diagnosis.

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### Conflicts of interest

There are no conflicts of interest.

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