

MINI-FOCUS ISSUE: ELECTROPHYSIOLOGY

BEGINNER

CASE REPORT: CLINICAL CASE

Left Atrial Intramural Hematoma Post-Ablation of Supraventricular Tachycardia

A Rare Complication Treated Successfully



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ABSTRACT

We report successful management of left atrial hematoma after ablation of supraventricular tachycardia. A 43-year-old female patient experienced chest pain immediately after radiofrequency ablation of a symptomatic left posterolateral accessory pathway. Transthoracic echocardiography demonstrated a large mass occupying the left atrium. Computed tomography and transesophageal echocardiography results were consistent with posterolateral intramural hematoma. She became hemodynamically unstable, requiring emergent surgery. The mass resolved completely by 6 weeks. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2020;2:223-6) Crown Copyright © 2020 Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

PRESENTATION

A 43-year-old female with symptomatic paroxysmal supraventricular tachycardia (SVT) was referred for radiofrequency ablation (RFA) due to refractory palpitations and presyncope. An electrophysiological study was performed with the patient under conscious sedation using local anesthesia to the

groin. Recording catheters were placed in the right atrium, right ventricle (RV), coronary sinus, and His bundle positions. The study demonstrated both dual atrioventricular (AV) nodal physiology and a left posterolateral accessory pathway (AP). Regular SVT was easily induced, and testing was performed in keeping with orthodromic AV re-entrant tachycardia using a posterolateral AP for the retrograde limb. Mapping and ablation were performed through a retrograde aortic approach, using a 4-mm internal irrigation tip catheter without pressure sensing. The mitral annulus was mapped briefly during ventriculoatrial pacing until a site of ventriculoatrial fusion was found in a posterolateral position. Catheter manipulation appeared to be routine. The pathway was successfully ablated with two 30-second applications at 30 W, maintaining a temperature

LEARNING OBJECTIVES

- To understand the role of multimodal imaging in diagnosing and characterizing a left atrial mass after ablation.
- To use a hemodynamic approach to judge the indication and timing of surgical intervention for left atrial intramural hematoma.

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Informed consent was obtained for this case.

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ABBREVIATIONS AND ACRONYMS

AP = accessory pathway

AV = atrioventricular

LAIH = left atrial intramural
hematoma

RFA = radiofrequency ablation

SVT = supraventricular
tachycardia

TEE = transesophageal
echocardiogram

TTE = transthoracic
echocardiogram

of $<30^{\circ}\text{C}$. Heparin (5,000 IU) was administered intraoperatively, and protamine, 25 mg, was given post-ablation. After 30 minutes, there was no evidence of pathway conduction or inducible tachycardia. A repeated electrophysiological study demonstrated only single AV nodal echoes. Therefore, no further ablation was performed. Immediately after the procedure, the patient complained of pleuritic chest pain.

MEDICAL HISTORY

Medical history was remarkable for anxiety. Baseline echocardiography pre-ablation demonstrated normal cardiac structure and function.

SEE PAGE 227

INVESTIGATIONS

Targeted bedside transthoracic echocardiography (TTE) showed no pericardial effusion. Six hours later, her chest pain worsened, and she collapsed without true syncope. Heart rate was 167 beats/min, blood pressure was 119/92 mm Hg, respiratory rate was 18 breaths/min, and oxygen saturation was 95% on 2 l of supplemental oxygen. Electrocardiography demonstrated a regular SVT which broke with 6 mg of adenosine. Chest radiography demonstrated pulmonary venous congestion. Repeated TTE demonstrated a large, echolucent, smooth mass almost completely occupying the left atrium (Figure 1A). Chest computed tomography confirmed a 34- × 65- × 65-mm well-defined homogenous mass within the posterolateral left atrial wall with no contrast uptake (Figure 2). On transesophageal echocardiogram (TEE), the mass appeared to originate from the superior margin of the posterolateral mitral annulus (Figure 3A), corresponding to the site of mapping and ablation. The mass was heterogenous with multiple echo-free spaces and no flow by Doppler. Three of 4 pulmonary veins (right lower and left sided) were compressed with severe pulmonary hypertension (estimated RV systolic pressure of 78 mm Hg) and moderate to severe tricuspid regurgitation but preserved RV function (fractional area change of 45%).

MANAGEMENT. The patient developed worsening pulmonary edema requiring furosemide and underwent emergency surgery through a median sternotomy to evacuate blood from the false atrial cavity through the epicardium. A total of 100 ml of blood was drained, and the left atrium was not entered. Surgery confirmed an intramural hematoma arising from the posterolateral left atrial wall, extending into the

pulmonary vein origins. There was no blood in the pericardial space. No active bleeding was identified. Intraoperative TEE showed partial resolution of the mass with normalization of pulmonary pressures. A 19-F pericardial drain was placed and remained in situ for 48 h with minimal output. The patient was transferred to the intensive care unit. Six hours postoperatively, TEE demonstrated interval reaccumulation of the mass (Figure 3B) without pulmonary vein obstruction. Right ventricular systolic pressure was 27 mm Hg with only mild residual tricuspid regurgitation. At 24 h post-operatively, the mass had again increased in size from 11- × 47-mm intraoperatively to 26- × 53-mm. The patient was managed conservatively as she remained hemodynamically stable. Serial TTE demonstrated gradual resolution of the mass with complete resolution by day 12.

DIFFERENTIAL DIAGNOSIS

Differentials included both localized pericardial effusion with tamponade and left atrial thrombus; however, imaging was consistent with left atrial intramural hematoma.

DISCUSSION

Radiofrequency catheter ablation is a widely accepted strategy in the treatment of symptomatic SVT, with high success rates (95% to 99%) and a low rate of serious complications ($<1\%$) (1). To the present authors' knowledge, this is the first reported case of left atrial intramural hematoma (LAIH) following ablation of a left posterolateral accessory pathway using a retrograde aortic approach. LAIH, also commonly referred to as left atrial dissection, has been most frequently associated with mitral valve repair and replacement (in more than one-half of cases) as well as post-RFA for atrial fibrillation and left atrial tachycardia (2-9). Up to 10% of cases may occur spontaneously (8). Prior to routine perioperative TEE, LAIH was almost exclusively diagnosed at surgery or postmortem (8). With TEE and increased frequency of catheter-based procedures, LAIH has been more frequently reported, including among asymptomatic patients (8). Despite this, LAIH likely still remains underreported.

Intra-atrial hematomas originate from the posterior left atrial wall in 81% of cases (7,8). This is thought to be due to the lower quantity of fibrous tissue and higher degree of calcification in the posterior leaflet, making it more susceptible to damage from trauma applied at the vulnerable AV junction. Presentation of LAIH varies widely from dyspnea, chest pain, and hemodynamic instability to incidental diagnosis. Although most cases present in the

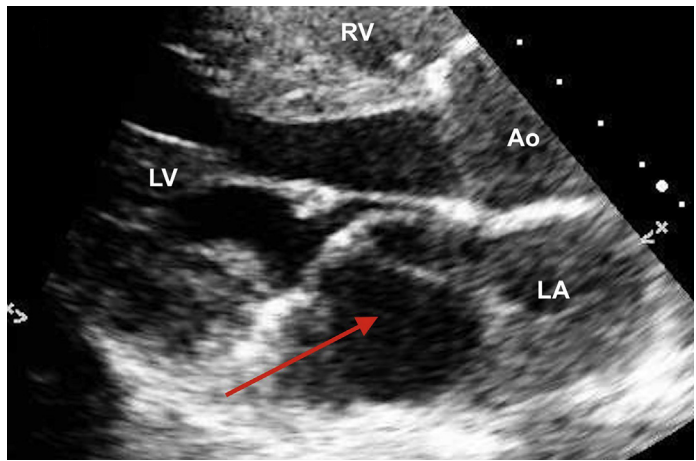
immediate or early postoperative period, it may be diagnosed for up to several years after the procedure (8). The reported mortality is up to 13.8% (8).

There are several proposed mechanisms for left atrial dissection or intramural hematoma which the present authors believe to be the same or similar entity pathologically. Primarily, mechanical trauma to the lateral and posterior mitral annulus may result in epicardial and endocardial separation of the left atrium, allowing pressurized blood from the left ventricle into these separated left atrial layers, creating a dissection flap. This is postulated to be the most likely mechanism in this patient. An alternative explanation involves disruption to the subendocardial microvasculature, causing a contained low-pressure bleed (2,8). This has been described in trauma as well as after percutaneous coronary intervention (2). This is less likely in the present patient due to the low total thermal energy delivered. In addition, there is unlikely to have been an injury involving the left circumflex coronary artery or coronary sinus, as no regional wall motion abnormalities were detected and due to the nature of low-pressure flow.

In the present case, no patient or procedural factor raised concern as a potential precipitant of hematoma. Atrial fibrillation ablation is more frequently associated with LAIH due to delivery of higher thermal energy and increased manipulation and trauma to multiple walls of the left atrium than focused ablation of a small segment of the mitral annulus in AP ablation.

This case highlights several important learning points. First, LAIH should be maintained as an important differential for chest pain or hemodynamic compromise post-RFA. This may occur in the absence of precipitating factors and following an apparently routine procedure. Second, the present authors recommend a multimodal imaging approach to characterize a left atrial mass. Although TTE and particularly TEE remain first-line studies, computed tomography may also be a useful adjunct in defining the mechanism and extent of the LAIH and guiding prompt management. Finally, the timing of surgery poses a management challenge with little previous experience and no established protocols to guide practice. The need for emergent surgical intervention is ultimately determined by hemodynamic instability. This reflects rapid expansion of the mass with occlusion of left atrial inflow and outflow. Acute and unstable presentations almost always require prompt surgical relief of the obstruction (2,5,7,8). In a review by Fukuhara et al. (8), surgical repair was undertaken in 73% of patients. This is aimed at relieving the hematoma, obliterating the false lumen, and addressing the entry site if possible, in order to

FIGURE 1 Transthoracic Echocardiogram



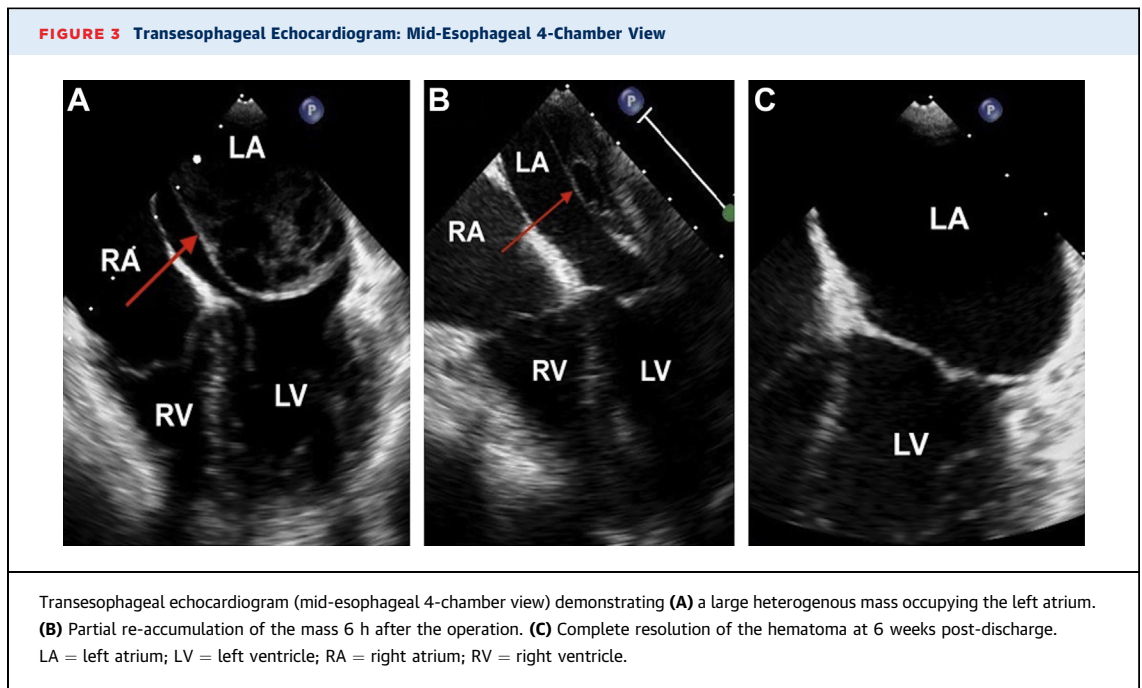
Transthoracic echocardiogram (parasternal long-axis view) demonstrating a 30- x 50- mm left atrial mass (arrow). Ao = aorta; LA = left atrium; LV = left ventricle; RV = right ventricle.

prevent recurrence. Conversely, stable presentations managed expectantly may have good outcomes, with a tendency toward natural regression of the mass over time (4,6,8). In the present case, operative intervention was guided by the patient's deteriorating hemodynamics. Subsequently, when partial reaccumulation of the mass occurred, conservative management was pursued in light of the patient's stable hemodynamic state and considering the

FIGURE 2 Contrast Thoracic Computed Tomography



Contrast thoracic computed tomography (transverse section) demonstrating a large echo-dense mass (star) originating from the posterolateral left atrial wall.



high-risk of surgical reintervention. This strategy in the present case facilitated a successful outcome.

FOLLOW-UP

The patient improved and remained in sinus rhythm. She was discharged home on day 14. Follow-up TEE 6 weeks later demonstrated complete resolution of the mass (Figure 3C). She made a complete recovery.

CONCLUSIONS

This case highlights the importance of recognizing left atrial intramural hematoma as a rare and

potentially life-threatening cause of hemodynamic compromise after RFA. A multimodal imaging approach may be useful in defining the mechanism of a left atrial mass and promoting prompt diagnosis and intervention. The decision for operative versus conservative management should be guided by the patient's hemodynamic status.

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KEY WORDS atrial fibrillation, accessory pathway, atrioventricular, computed tomography, electrophysiological study, left atrial intramural hematoma