

MINI-FOCUS ISSUE: IMAGING

INTERMEDIATE

CASE REPORT: CLINICAL CASE

# Atrial Thrombus and Embolic Stroke in a Patient With Surgical Appendage Ligation and Maze Procedure



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## ABSTRACT

This case illustrates the incomplete protection of surgical ligation of left atrial appendage and maze procedure at the time of mitral valve replacement against thromboembolic complications and recurrence of atrial fibrillation. The utility of surgical left atrial appendage ligation as stroke prophylaxis and identification of selected high-risk subjects are reviewed. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2021;3:913-7) © 2021 The Authors. 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/>).

## HISTORY OF PRESENTATION

An 84-year-old male presented with weakness of right upper and lower extremities and decreased

responsiveness, and cardiac exam revealed an irregularly irregular pulse.

## PAST MEDICAL HISTORY

Past history was significant for nonischemic cardiomyopathy with moderately reduced left ventricular ejection fraction of 35% to 40%, long-standing persistent atrial fibrillation (AF), severe aortic stenosis, and severe mitral regurgitation with no intracardiac thrombus. Two years prior to current presentation, he underwent bioprosthetic aortic and mitral (Epic 31 mm, Abbott Cardiovascular, Plymouth, Minnesota) valve replacements with concurrent surgical (cryoablation) maze procedure and epicardial left atrial appendage (LAA) suture ligation. Post-surgically, aspirin was commenced and anticoagulation was discontinued. AF recurred 6 months after his maze procedure and was managed medically with aspirin and amiodarone.

## DIFFERENTIAL DIAGNOSIS

Differential diagnosis for his stroke included cardioembolic source of thrombus in the residual LAA,

## LEARNING OBJECTIVES

- To appreciate that in patients with non-valvular AF, surgical LAAO at the time of other planned cardiac surgery including maze procedure is well supported by current societal guidelines.
- To recognize that there is a paucity of studies regarding the initiation and duration of anticoagulation post-surgical atrial appendage ligation and trials are underway to address this.
- To acknowledge the risk factors for recurrence of AF after a maze procedure including duration of pre-operative AF, enlarged LA size and concomitant mitral valve surgery and to monitor such patients for recurrence of AF as it may be reasonable to consider initiating anticoagulation to prevent disabling strokes.

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**ABBREVIATIONS  
AND ACRONYMS**

**AF** = atrial fibrillation  
**CT** = computed tomography  
**LAA** = left atrial appendage  
**LAAO** = left atrial appendage  
occlusion

LA, or left ventricle. Other considerations included carotid plaque with subsequent embolization, carotid dissection, cryptogenic stroke from an atrial septal defect, or a hemorrhagic stroke.

**INVESTIGATIONS**

An electrocardiogram showed AF with right bundle branch block and a ventricular rate of 60 beats/min (Figure 1). Coagulation profile showed a prothrombin time of 14 s, activated partial thromboplastin time of 31.7 s, and internal normalized ratio of 1.08. Computed tomography (CT) of the head showed an acute ischemic infarct in the left middle cerebral artery territory. Transthoracic echocardiogram revealed reduced left ventricular ejection fraction (25% to 30%) with a severely dilated LA (LA volume index of 75 ml/m<sup>2</sup>) and an echogenic mass, attached to the back wall of the LA (Figure 2, Video 1). Transesophageal echocardiogram revealed a large thrombus in the LA cavity with both mobile and mural components. LAA ligation appeared incomplete and a residual stump was detected by color flow Doppler (Figure 3, Videos 2 and 3). A repeat CT of head

revealed stable hemorrhagic transformation of the ischemic area (Figure 4).

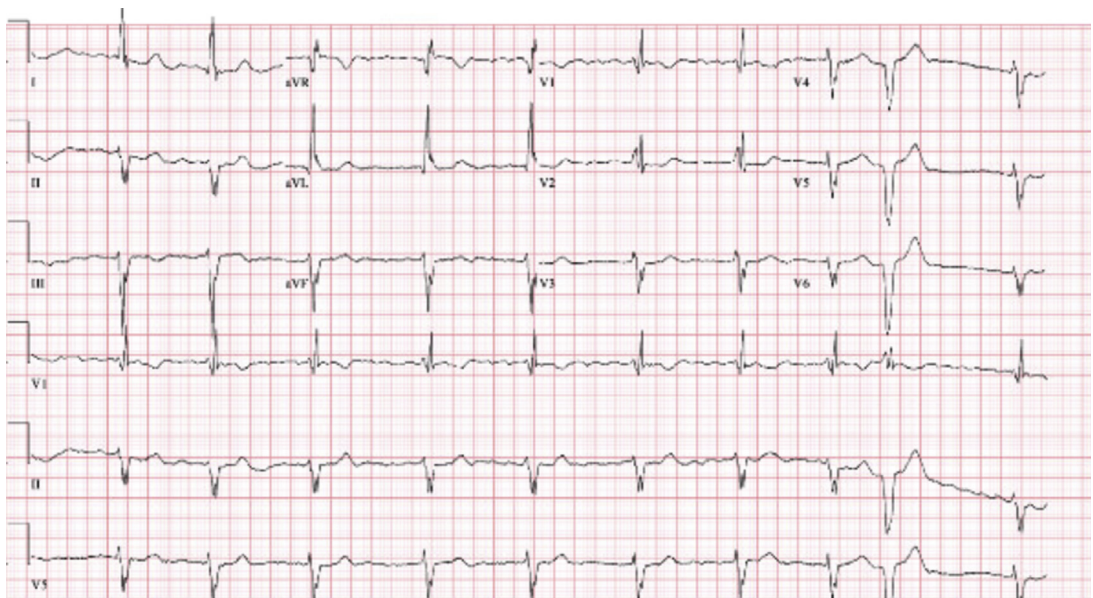
**MANAGEMENT**

Our patient received a full dose of tissue plasminogen activator within the window of thrombolysis. However, there was minimal improvement in his mental status. He was treated with therapeutic dose of heparin for his atrial thrombus but was subsequently ceased after his head CT showed stable hemorrhagic transformation.

**DISCUSSION**

LAA is the primary site for thrombus formation in 90% of patients with AF (1). Successful isolation of LAA can be done using either a surgical approach as in this case or a percutaneous approach. Despite the lack of clinical trials comparing various surgical techniques, data from observational study has shown LAA amputation followed by epicardial suture closure is the most effective surgical strategy to ensure complete closure of the appendage (2). Left atrial appendage occlusion (LAAO) was first

**FIGURE 1** Electrocardiogram



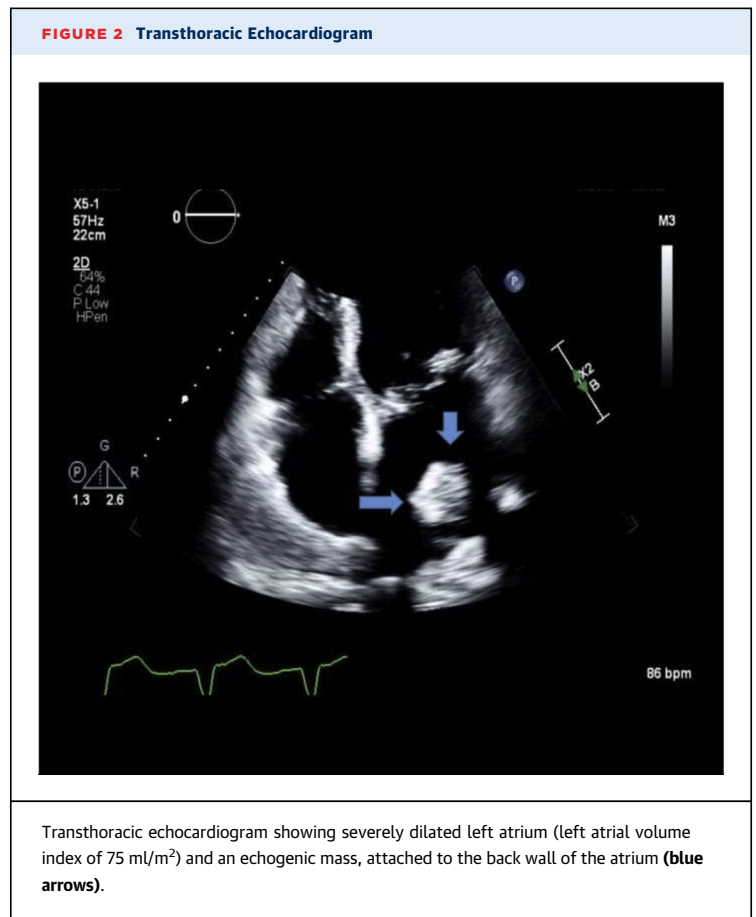
Electrocardiogram showing atrial fibrillation with rate of 60 beats/min.

reported in 1949 by John L. Madden for rheumatic AF and later adopted as a strategy of potential value for stroke prophylaxis in nonrheumatic AF during surgical procedures including surgical maze, mitral valve replacement, and coronary bypass surgery (3).

The Society of Thoracic Surgery clinical practice guidelines for AF gave a Class IIa recommendation (Level of Evidence: C; limited data) for suture ligation of LAA at time of cardiac surgery, whereas American College of Cardiology/American Heart Association recommends it as Class IIb (4,5). These recommendations were based on a meta-analysis that demonstrated significant reductions in stroke at 30 days and all-cause mortality in patients with AF undergoing LAAO during cardiac surgery versus those with AF not undergoing this additional procedure (6).

Restoration and/or maintenance of sinus rhythm can be achieved by the surgical maze procedure using either cryoablation or radiofrequency. About 83% of patients did not require antiarrhythmic therapy at 12 to 24 months after the cryomaze procedure (7). Factors predicting AF recurrence after surgical maze procedure include the duration of pre-operative AF, enlarged LA size, and concomitant mitral valve surgery. The European Society of Cardiology/European Association of Cardiothoracic Surgery has a Class I recommendation for continuing anticoagulation after surgical LAAO (6). However, the American College of Cardiology/American Heart Association guidelines do not provide specific guidance on anticoagulation due to the lack of evidence. Discontinuation of oral anticoagulation may be considered in patients who are at increased risk of bleeding undergone successful surgical ablation of AF and LAA excision or exclusion and who remain in sinus rhythm for at least 3 months during which they have been anticoagulated (8).

Recently, the success of the pilot LAAOS (Left Atrial Appendage Occlusion Study) II has led to the LAAOS III trial that aims to assess the impact of LAAO on the incidence of ischemic stroke or transient ischemic attack detected by neuroimaging and/or systemic arterial embolism in patients with AF and  $\text{CHA}_2\text{DS}_2\text{-VASc} \geq 2$  undergoing cardiac surgery with cardiopulmonary bypass (9). The result of this trial will hopefully better address the clinical dilemma of best possible strategy and duration of anticoagulation



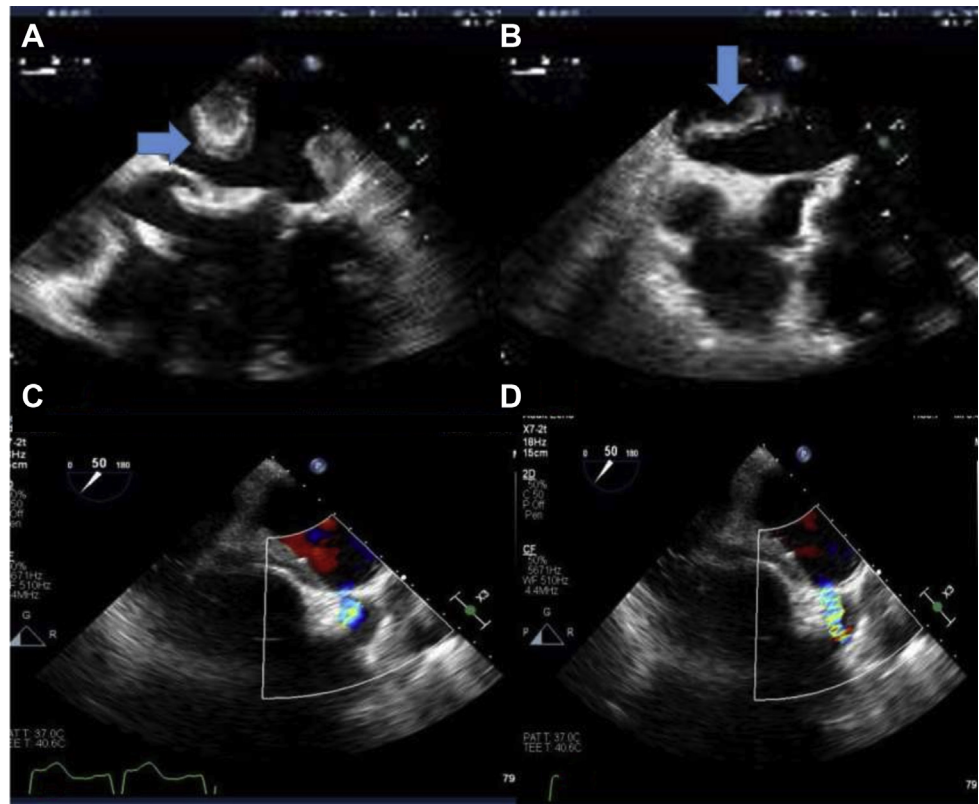
versus antiplatelet management in these patients, particularly those with recurrence of AF.

### FOLLOW-UP

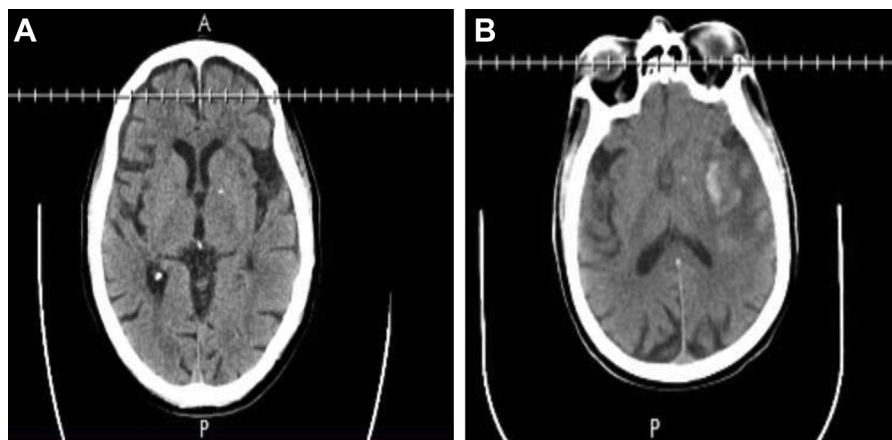
Our patient showed minimal neurological improvement and after a month of hospitalization, his family decided to withdraw care.

### CONCLUSIONS

In accordance with the current societal recommendations, patients with AF undergoing mitral valve surgery, coronary artery bypass graft, and maze procedure should have surgical LAAO performed. However, risk factors such as long-standing history of AF, LA size, and mitral surgery predict a higher post-operative rate of recurrence of AF. Close monitoring and early reinitiation of anticoagulation therapy in patients with recurrence of AF may prevent future embolic stroke.

**FIGURE 3** Transesophageal Echocardiogram

Transesophageal echocardiogram showing large thrombus in the atrial cavity with both mobile and mural components as shown by **blue arrows (A and B)**. Left atrial appendage ligation appears incomplete and a residual stump was detected by color flow Doppler (**C and D**); however, no thrombus, is seen in the residual left atrial appendage.

**FIGURE 4** Head Computed Tomography Scan

The computed tomography scan showing, at presentation, **(A)** ischemic infarct of the left middle cerebral artery with **(B)** stable hemorrhagic transformation a few days later. A = anterior; P = posterior.

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**KEY WORDS** left atrial appendage, left atrial thrombus, maze procedure, mitral valve replacement, stroke, surgical ligation

**APPENDIX** For supplemental videos, please see the online version of this paper.