

# Case Report of a 62-Year-Old Female with Ischemic Stroke Due to Embolization from Atrial Myxoma

Neeladri Misra\*, Thajus Prasad

Sutter Roseville Medical Center, Roseville, USA

Email: \*misra.neeladri@gmail.com

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## Abstract

Myxomas are primary cardiac tumors of the most common pathology, with 75% of myxomas originating in the left atrium either at the mitral annulus or the fossa ovalis border of the interatrial septum; the remaining 20% come from the right atrium, and about 5% arise from both atria and the ventricle. Atrial myxomas are usually asymptomatic and are often detected when associated with complications due to tumor obstruction or emboli causing stroke. Due to the absence of symptoms, a diagnosis of a myxoma is often delayed until a significant embolic phenomenon, such as a stroke, occurs. We encountered such a scenario when a 62-year-old female presented to our hospital with right arm and leg weakness with her workup of stroke with a brain MRI showing numerous subacute infarcts consistent with embolic etiology. A routine transthoracic echo revealed a 2 × 5 cm atrial myxoma, which then led to the diagnosis of atrial myxoma along with a discovery of a patent foramen ovale (PFO), which subsequent surgical removal and PFO closure for definitive prevention of future embolic events. In this article, we aim to review the clinical presentation of cardiac myxoma along with appropriate investigations and treatment along with validation of the importance of timely echocardiograms with bubble studies in patients presenting with embolic stroke that can detect the atrial myxomas as a rare but potential cause of ischemic stroke.

## Keywords

Embolic Stroke, Cardiac Myxoma, Patent Foramen Ovale

## 1. Introduction

Cardioembolic stroke accounts for about 14% - 30% of ischemic strokes based on research studies [1]. The most common etiologies of embolic strokes are atrial

fibrillation, valvular heart disease, and infective endocarditis; cardiac myxoma is a small but significant source of cerebral emboli [2]. Atrial fibrillation is considered the most common cause of cardioembolic stroke, with a rate of 45% of all cardiogenic embolisms [3].

Cardiac tumors are some of the rarest tumors in oncology. Atrial myxoma, the most common cardiac tumor, is a rare but important etiology for stroke, especially in the young [4]. Depending on the study, the prevalence of cardiac tumors varies between 0.001% to 0.5% as determined by autopsy [5] [6]. Myxomas are the most common cardiac tumors when further distinguishing primary cardiac tumors. It is estimated that 50% - 85% of all primary cardiac tumors are myxomas. There are a variety of explanations for how myxomas are formed. A widely accepted explanation is that myxomas are formed from the embryonic foregut, giving them properties of mesenchymal cells, which means they have both neural and epithelial differentiation. These tumors produce vascular endothelial growth factor (VEGF), which promotes tumor growth through angiogenesis [7].

A delayed diagnosis and untimely treatment may mean the progression of stroke and the development of certain critical consequences like systemic and peripheral embolic events. The clinical features of stroke of a cardiac myxoma origin have not been sufficiently described. This article aims to review the pertinent aspects of this rare condition by presenting the clinical scenario of ischemic stroke due to a left atrial myxoma in a 62-year-old female who presented with right-sided weakness with a review of the diagnosis and treatment options of a cardiac myxoma.

## 2. Case Report

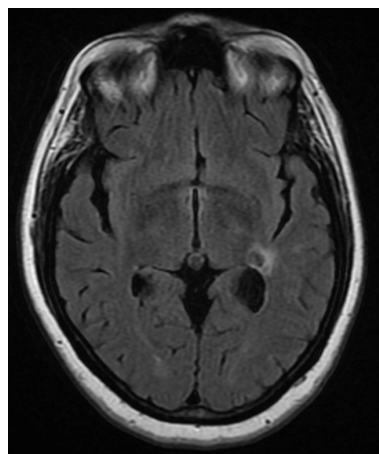
A 62-year-old female presented to our hospital with chief complaints of right arm and leg weakness for one day. The patient mentioned she was out shopping when she noticed her right arm and leg felt weak and somewhat cool to touch. She decided to come into the ER to have her symptoms evaluated since they persisted and did not go away. On arrival, she had vital signs of BP 171/94, Heart Rate 97, Respiratory Rate—18, and Oxygen Saturation—98% on room air. The patient was evaluated with a CT Brain and CT Angiogram of the head and neck that showed no acute intracranial abnormalities. Since she was outside the thrombolytic window, she was admitted to the medical floor for further evaluation.

The patient had no major medical history except recently being diagnosed with hypertension and being put on amlodipine. She denied any history of smoking or drinking, and she worked as a patient service representative.

A CBC, CMP, PT, and INR were done that were unremarkable, and 12 lead EKG showed normal sinus rhythm. Permissive hypertension was maintained, and she underwent an MRI, which revealed numerous subacute infarcts consistent with embolic etiology (**Figure 1**). The patient was started on aspirin, atorvastatin, and clopidogrel while awaiting a complete stroke workup. She did not have any arrhythmias noted on her cardiac monitor, and her symptoms showed signs of

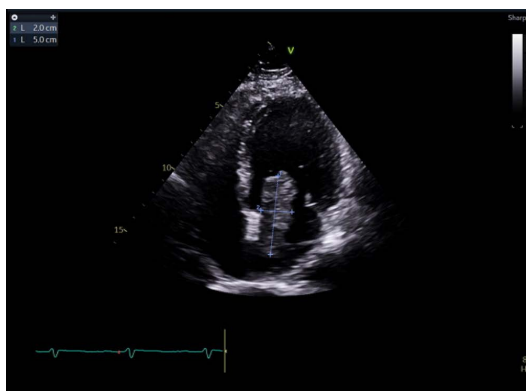
minor improvement the following day.

A transthoracic echo was performed for a complete stroke workup, and the echo findings revealed a  $2 \times 5$  cm mass consistent with a left atrial myxoma on the septal aspect attached to the anterior mitral valve leaflet, causing prolapse into the left ventricle (**Figure 2**).



**Figure 1.** MRI Brain with new subacute infarcts.

MRI Brain Contrast showed new subacute infarcts in the left insula and right parietal lobe.



**Figure 2.** TTE showing Atrial Myxoma.

TTE showing left atrial myxoma measuring  $2 \text{ cm} \times 5 \text{ cm}$ .

These findings were reviewed by the neurology and cardiology team, who recommended a referral to cardiothoracic surgery for resection. After clopidogrel interruption, she underwent a left heart catheterization revealing patent coronary arteries, giving the patient the option to proceed with open heart surgery to remove the myxoma as recommended by AHA guidelines.

Removal of her left atrial myxoma was done with the placement of a 50 mm atrial appendage clip. During the surgery, it was revealed that the patient had an undiagnosed PFO, which was closed and confirmed with a transesophageal echo

that showed no residual intracardiac air.

Post-surgery, the patient remained in the intensive care unit for neurological and cardiovascular recovery. At that time, she developed atrial flutter with a rapid ventricular response requiring IV amiodarone to convert her to sinus rhythm. Cardiac monitoring showed no recurrences of atrial flutter. The patient was started on anticoagulation with apixaban. She subsequently recovered completely, and on discharge, she was instructed to continue daily amiodarone and apixaban 2.5 mg twice a day for 3 months upon recommendations by cardiology for DVT prevention since she had a left atrial appendage clip already in place. The patient continues to be followed by cardiology and is now one-year post-surgery.

### 3. Discussion

Atrial myxoma is a benign neoplasm of mesenchymal origin. The tumors are composed of scattered cells within a mucopolysaccharide stroma [8]. Cardiac myxomas are the most common, and 75% - 90% of the cardiac myxomas occur in the left atrium. The incidence is more commonly between the 3rd and 6th decades of life [9]. About 90% of atrial myxomas are sporadic with no known cause. In the remaining 10%, a familial pattern due to an autosomal dominant pattern named Carney complex characterized by multiple tumors-atrial and extracardiac myxomas, cutaneous spotty pigmentation, non-myxomatous extracardiac tumors, schwannomas, and various endocrine tumors, through a mutation of the *PRKAR1 $\alpha$*  gene that is located on the long arm of chromosome 17 (17q22-24 region) [10]-[12].

Cardiac myxoma presents characteristically in patients with triad-obstructive symptoms (30%), constitutional symptoms (60%), and embolic phenomenon (30% - 40%) [13]. The more common clinical scenario is the embolic phenomenon that presents with stroke, pulmonary embolism, or paradoxical embolism, while constitutional symptoms present as fever, weight loss, arthralgia, or Raynaud's phenomena. Neurological manifestations of atrial myxoma vary widely, ranging from embolic, recurrent infarctions, and even progressive multi-infarct dementia to a massive embolic stroke causing sudden death. Since tumor fragments may embolize, early anticoagulation may not be protective in reducing disability and mortality [14]-[16].

While atrial myxomas can be asymptomatic, there can be neurological manifestations in 30% of cases. It is a rare cause of stroke in young patients but is an even rarer cause of stroke in older patients. One study indicates that it is found after a TIA/stroke in 1/250 young patients compared to 1/750 in older patients [8] [17] [18]. After reviewing other case reports of atrial myxomas in older patients, our case aligns with others in that a lack of EKG changes was noted. Atrial myxomas in isolation do not typically cause EKG changes. There have been some reports of larger atrial myxomas causing left atrial enlargement, which could be identified in EKG tracings [19]. However, our patient's EKG did not display any EKG changes prior to myxoma removal.

When looking for myxomas, there are a variety of modalities, including echocardiography and cardiac MRI. Echocardiography is the most common. TTE (transthoracic echo) is usually the first diagnostic modality to be performed due to its cost and low risk to the patient. The sensitivity of TTE has advanced considerably since its invention in the 1970s, with sensitivities nearing 95%. However, TEE is the most sensitive test, with values approaching 100% [20].

TEEs (transesophageal echo) are more invasive and are usually performed when suspicion is high for a cardiac tumor. Cardiac MRI is another modality that is gaining use in myxoma identification. This imaging technique provides physicians with information about the size and shape by using T1 and T2 weighted imaging [18] [21]. However, cardiac MRI is not available in all facilities, leading to echocardiography being the most predominant tool in helping identify cardiac tumors.

When a myxoma is discovered, the next step is determining the treatment options. Depending on the guidelines, the course of action varies. Surgical resection is required because of the risk of embolization or cardiovascular complications, including sudden death [22]. The results of surgical resection of myxomas are generally excellent, with most series reporting an operative death rate of <5% [23]. A cardiac myxoma needs surgical excision, often on an emergency basis. This is to reduce the risk of embolization of the tumor. Surgery involves the removal of the root of the stalk and the full thickness of the adjacent interatrial septum, and the consequent atrial septal defect is closed accordingly. Data published over the past decades show excellent overall outcomes in operative mortality, short- and long-term survival, and tumor recurrence [24].

Interestingly, our patient also had a PFO found during her surgery. Guidelines recommend PFO closure if the patient is between the ages of 18 and 60. Once the patient exceeds that age, the guidelines diverge. Some do not provide any guidance due to the lack of clinical trials, but others state to still pursue closure if the patient has suffered from a PFO-associated stroke. A majority of clinical trials that compared PFO closure to medical therapy (*i.e.*, antiplatelet or anticoagulation alone) showed that PFO closure showed a significant reduction in recurrent ischemic stroke events [25]. Based on published guidelines, we assume a bubble study was not ordered in this case due to the patient being above the age of 60. In this circumstance, the patient was transferred to a facility with cardiothoracic surgery for myxoma removal. Earlier identification of the PFO would not have altered the outcome, as the TTE showed an atrial myxoma that needed surgical removal. Hypothetically, if the TTE did not reveal a myxoma and the MRI showed embolic etiology, then the bubble study would have made a difference, as its omission would have delayed care.

A mention of familial cardiac myxoma is a rare condition that tends to form a syndrome, e.g., carney complex. Carney complex is a term for a rare multiple neoplasia syndrome that is characterized by pigmented lesions of the skin and mucosa, cardiac and extracardiac myxomatous tumors, and multiple endocrine and

non-endocrine neoplasms condition can be distinguished from the more common sporadic forms by their presentation at a young age, multicentricity of the lesions and its unusual location. A higher rate of recurrent lesions is associated with the familial form of the disease [26] [7].

A recurrence rate of 1% - 3% is associated with sporadic cases of atrial myxoma, often because of inadequate resection [12] [28]. These patients require annual review for a period of 3 - 4 years with echocardiography when the risk of recurrence is most significant. A yearly review lifetime with familial screening is recommended for the Carney complex, which has a recurrence rate of up to 25% [23] [28].

In this case, the patient presented with right arm and leg weakness with only a past medical history of hypertension. Before this episode, the patient displayed no symptoms of her myxoma. When going down the stroke workup pathway, the MRI pointed to an embolic source, with the TTE later revealing the atrial myxoma. Interestingly, a TTE with a bubble study was not performed, which would have most likely shown the PFO earlier than when the patient underwent surgical correction. A recommendation to prevent undiagnosed PFOs would be to order a TTE with bubble study if imaging shows embolic findings or if suspecting a stroke with a cardiac cause.

#### 4. Conclusion

This case demonstrates how a common presentation can have an uncommon cause. This was shown as the patient had an embolic ischemic stroke, a sequela from an atrial myxoma. By following the stroke workup pathway, the source of embolization was found through echocardiography. However, even though the patient was above the age of 60, which is usually the cutoff for PFO closure, it would have been recommended to order a TTE with bubble study to check for a PFO and not have it discovered during surgical removal of the myxoma. This outcome shows the need for current PFO diagnosis guidelines to be revisited, as PFO closure has been shown to reduce recurrent ischemic events compared to medical therapy. Potentially, more patients can benefit from expanded PFO closure criteria. However, due diligence must be applied to optimize the outcomes for PFO closure in older patients further. Ultimately, the patient had a successful outcome and, as of 2024, has not shown any recurrent neurological signs.

#### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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