Case Report

Multiple cerebral aneurysms as manifestations of cardiac myxoma: Brain imaging, digital subtraction angiography, and echocardiography

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ABSTRACT

We report a patient with left side atrial myxoma who initially presented with neurological symptoms. Cerebral magnetic resonance imaging and angiography revealed multiple aneurysms with enhancement leading to the final diagnosis of cardiac myxoma. We showed distinctive findings from brain magnetic resonance imaging, digital subtraction angiography, and cardiac echography and the final pathological appearance of cardiac myxoma in this patient. We consider that a correct diagnosis can be made based on an appropriate evaluation of the integrated imaging studies.

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1. Introduction

Neurological manifestations sometimes present at the time of diagnosis of atrial myxoma and may lead to discovery of the primary tumor. They should be considered in the etiologic differential diagnosis of embolic stroke in children and adults [1]. Emboli from cardiac myxomas can lead to cerebral ischemia, infarction, and aneurysm formation [2]. We report a patient with an old stroke who was diagnosed with atrial myxoma based on brain and cardiac imaging.

2. Case report

A 52-year-old woman who had a history of strokes presented with facial palsy 3 years ago. After proper treatment, she completely recovered but complained of intermittent dizziness. No other neurological symptoms were noted. Recently, her brain magnetic resonance imaging (MRI) showed a right middle cerebral artery (MCA) aneurysm. She was referred to our neurosurgery department for further management.

On admission, her physical and neurological examinations were normal. A routine complete blood count and serum biochemistry profile showed no abnormalities except for microcystic anemia. Brain MRI and angiography (Fig. 1) showed multiple homogeneously enhanced aneurysms with a hypointensity rim on T2-weighted images at the bilateral MCAs, anterior cerebral arteries, left posterior cerebral artery, and right posterior inferior cerebral artery. Because of the multiplicity and peripheral location of these aneurysms, a mycotic or oncotic origin aneurysm was suspected. Echocardiography (Fig. 2A) showed an intracardiac mass and myxoma was considered likely. Coronary angiography revealed no abnormalities. Under the impression of left atrium myxoma complicated by multiple cerebral aneurysms, surgery to excise the myxoma was performed. A large translucent jelly-like mass with an irregular surface (Fig. 2B) was resected from the wall of the left atrium above the anterior leaflet annulus. It was about 4.5 cm in diameter with a small pedicle of about 4 mm in diameter. The procedure was completed without any problems. Histological examination of the tumor showed a concentric arrangement of tumor cells around an endocardium-lined space. The tumor cells were surrounded by a large myxoid area. After postoperative wound care, the patient was discharged in good condition. No atrial tumor recurrence was seen on follow-up echocardiography 2 years later.

3. Discussion

Cardiac myxoma is a rare tumor of mesenchymal origin accounting for half of all primary cardiac neoplasms. They reportedly occur in less than 0.05% of the population, but they constitute approximately 50% of primary cardiac neoplasms [3]. The reported...
male to female distribution varies from 1:1 to 1:3 [4]. Left atrial myxoma accounts for 75% of cardiac myxoma cases [4].

Patients with cardiac myxoma have various features of the classic triad of constitutional (30%), cardiac (60%), and embolic symptoms (30–40%) [5]. Constitutional symptoms include fever, weight loss, anemia, elevated erythrocyte sedimentation rate, leukocytosis, and hypergammaglobulinemia [2]. Cardiac symptoms can be attributed to interference with myocardial function by the primary tumor and may include palpitations, dyspnea on exertion, and syncope [2]. Because most myxomas are located in the left atrium, systemic embolism is particularly frequent [6]. The neurological signs and symptoms are usually a result of embolization [7].

Cerebral ischemia resulting from direct tumor embolization is the most common neurological presentation [8]. Emboli composed of tumor, blood clots, or both lodge in cerebral vessels [9]. They most commonly occur in the MCA [2]. Other rare neurological manifestations include parenchymal brain metastasis, intracerebral hemorrhage, and oncotic aneurysm formation [3]. Chronic embolization from cardiac myxoma can lead to progressive dementia [2].

Stoane et al. [10] reported the first cerebral aneurysm associated with cardiac myxoma in 1966. Aneurysms from cardiac myxomas

![Image](image1.png)

**Fig. 1.** (A) Axial T2-weighted image (TR/TE, 4000/120) shows multiple lesions with a hypointensity rim (arrows) within the bilateral subarachnoid space accompanied by edematous changes in the right frontoparietal region. (B) Axial postcontrast T1-weighted image (TR/TE, 400/21.2) at the corresponding level shows enhancement of these lesions (arrows). (C) Digital subtraction angiography of the right internal carotid artery (anteroposterior and lateral views) shows multiple fusiform aneurysms (arrows) in the territory of the anterior and middle cerebral arteries. The largest one is at the right M1–2 bifurcation. TR = repetition time; TE = echo time.

![Image](image2.png)

**Fig. 2.** (A) Cardiac echography shows a mosaic irregular mass (3.95 x 2.3 cm) with a stalk near the annular ring of the anterior mitral leaflet. (B) Gross pathology of the myxoma. It is a pink 4.5 cm mass with hemorrhagic foci (arrow).
most commonly occur in the MCA with a mild preponderance of the left side over the right [2].

Transesophageal echocardiography is invasive but particularly helpful, as it gives unimpeded views of the atria, the atrial septum, and portions of the ventricles and can detect small tumors (1–3 mm in diameter) [5].

CT and MRI are modalities to detect myxomatous cerebral aneurysms [5]. These lesions are often characterized by vascular dilatation and may be surrounded by edema and hemorrhage. They are usually fusiform but may have a saccular component. Multiple fusiform arterial dilatations are noted on MRI, with associated areas of ischemic changes. Hwang et al. [11] concluded that notable MRI features on both T1- and susceptibility-weighted sequences are probably attributed to chronic recurrent hemorrhage. Cerebral angiography provides a better demonstration of their dilated morphology and peripheral distribution.

New et al. [12] clearly showed that the aneurysmal dilatations and vessel irregularities occurred because of the neoplastic properties of a myxoma. The proposed mechanism for the pathogenesis of these oncotic aneurysms is embolism of the tumor mass, which causes weakening of the vessel wall and allows penetration of the myxoma cells into the wall [1]. The disrupted vascular wall then dilates in an aneurysmal manner [3]. Both fusiform and saccular aneurysms can be detected on angiography and they can be from 3 to 7 mm [2].

In our experience, features leading to the correct diagnosis of atrial myxoma based on cerebral images are as follows:

1. Prominent susceptibility artifact on T2-weighted images.
2. Aneurysms with homogeneous enhancement on T1-weighted images.
3. Multiple fusiform peripheral aneurysms on angiography.
4. Perifocal ischemic changes and parenchymal edema.

These aneurysms are also identified on follow-up magnetic resonance angiographic images.

The treatment of choice for myxomas is surgical removal; it is usually curative [6]. Surgery should be performed as soon as possible as the risk of further tumor embolism and valve obstruction is very high [5]. Although cardiac surgery to remove the primary cardiac tumor usually eliminates neurologic symptoms, in some cases, an aneurysm appears after resection of the primary myxoma, presumably as a result of metastatic seeding before surgery. There is still no definitive treatment of aneurysms caused by cardiac myxomas. The response of a myxomatous embolism to thrombolysis is unpredictable [13]. Common approaches include the use of anticoagulants and antiplatelet agents [5].

Stöllbergera et al. [14] reviewed 40 patients with myxoma and cerebral aneurysms and concluded that patients with cardiac myxoma should be observed for myxoma-related cerebral aneurysms. Furthermore, we suggest that patients with multiple cerebral aneurysms should be evaluated for cardiac myxoma as in our patient.

4. Conclusion

The diagnosis of atrial myxoma could be made based on typical features on brain MRI and clinical presentation with focal neurologic deficits despite an absence of cardiac symptoms. The multiplicity distribution and distinctive MRI and angiographic imaging characteristics of new cerebral lesions should raise suspicion of an underlying cardiac source. In conclusion, patients with multiple cerebral aneurysms should routinely be evaluated for cardiac myxoma and vice versa. Physicians should be familiar with the unusual imaging pattern of cerebral aneurysms and find the cardiac focus as soon as possible.

References