ESC European Society of Cardiology

European Heart Journal - Case Reports (2024) **8**, ytae615
https://doi.org/10.1093/ehjcr/ytae615

CASE REPORT
Cardiovascular imaging

A pair of two atrial myxomas mimic thrombus in left atrial appendage and cause ischemic stroke in a young adult: a case report

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Received 7 July 2023; revised 28 November 2023; accepted 12 November 2024; online publish-ahead-of-print 22 November 2024

Background Stroke is one of the leading causes of mortality and disability and can be rarely caused by cardiac myxoma.

Case Summary Here, we report about a 56-year-old man who suffered from a stroke presented with acute dysarthria and left hemiparesis. Magnetic resonance imaging (MRI) of the brain revealed an acute stroke. Atrial fibrillation (AF) was assumed the cause of stroke. Because of contraindication to anticoagulation due to previous cerebral haemorrhage with rivaroxaban the patient was admitted to interventional occlusion of left atrial appendage. Echocardiography revealed two left atrial masses suggestive of atrial myxomas. The patient was transferred to remove the two myxomas operatively with simultaneous resection of left atrial appendage.

Discussion Atrial myxomas should be considered as a possible differential diagnosis of cardioembolic stroke. They should be managed early to prevent recurrent strokes.

Keywords Transesophageal echocardiography' • 3D- TOE • left atrial appendage • 'left atrial appendage occlusion' • cardioembolic stroke • case report

ESC curriculum 2.2 Echocardiography • 5.3 Atrial fibrillation

Learning points

- This case demonstrates the importance of considering atrial myxoma as a possible cause and reveals the importance of doing relevant investigations in a stroke patient in particularly young patients for ruling out cardiac causes of stroke.
- Atrial myxoma should be considered as a possible differential diagnosis of echocardiographically proven thrombosis in particular in anticoagulation resistant thrombosis.
- It also demonstrates the importance of early management of atrial myxomas to prevent recurrent strokes.

Introduction

Atrial myxomas are the most common primary tumors found in the atrium. While the majority of patients present with symptoms related to obstruction of the mitral valve and systemic embolization, a minority may be asymptomatic.[1] Although cardiac myxoma is a rare cause of cardioembolic stroke, accounting for just 0.5% of cardiac emboli, it should be considered in young individuals who experience stroke.[2] Ischemic stroke is the most common neurological manifestation of cardiac tumors, often resulting from cardioembolism due to the migration of

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Handling Editor: David Oxborough
Peer-reviewers: Vasilios Giampatzis; Megha Agarwal
Compliance Editor: Giorgia Benzoni

blood clots or tumor fragments.[3] Here, we describe a case of acute ischemia in the left corona radiata with clinical manifestation of dysarthria in a patient with two left atrial myxomas.

Summary figure

Day 1	Presentation of a 56-year-old patient occurred due to acute dysarthria and left hemiparesis. Emergency multimodal cranial computed tomography (CCT) showed no acute infarction demarcation and no bleeding, no perfusion deficit and no vascular occlusion.
Day 2	Supplementary cerebral MRI detected an acute infarction in corona radiata explaining the symptoms.
Day 3	Because of permanent AF and contraindication to anticoagulation due to previous cerebral haemorrhage the patient was admitted to our cardiology department for interventional closure of LAA.
Day 4	TEE was performed in catheterization laboratory and showed a mass closed to the LAA which was interpreted as a thrombus in LAA. In spite of history of intracerebral bleeding an anticoagulation with Apixaban was initiated and a control TEE was arranged.
Day 28	Follow up—TEE was performed in echocardiography laboratory in 3D-technique and revealed two echo-rich masses close to the entrance of LAA, corresponding two atrial myxomas (sizes of approx. 18 × 16 mm and 20 × 11 mm).
Day 29	The patient was referred to cardiac surgery for surgical resection of these two atrial myxomas and simultaneous excision of LAA in permanent atrial fibrillation.

Case presentation

A 56-year-old man was referred to our neurology department with acute dysarthria and left hemiparesis. His cardiovascular risk factors included arterial hypertension. He had a history of permanent atrial fibrillation (AF) and was not on therapeutic anticoagulation due to a previous intracerebral hemorrhage. Physical examination revealed cardiac arrhythmia. Neurological examination showed an oriented patient, with intact cranial nerves and residual spastic hemiparesis on the left side, difficulty with arm and leg holding tests on the left side, left-sided ataxia in knee-heel and finger-nose tests, slurred speech, without aphasia, meningeal signs and calvarial tenderness with intact sensation. His medications on admission were: Atorvastatin 40 mg, Bisoprolol 5 mg, Lercanidipine 10 mg, Moxonidine 0.3 mg, and Ramipril 5 mg. Cranial computed tomography (CCT) showed no acute infarction, bleeding, perfusion deficit, or vascular occlusion. Cranial magnetic resonance imaging (cMRI) revealed diffusion restriction on the left in the corona radiata extending into the precentral gyrus with corresponding signal reduction in the ADC maps and mild hyperintensity in the T_2 sequences and hemosiderin deposition in the right thalamus indicative of a past haemorrhage. Non-specific peri- and paraventricular white matter gliosis, most likely of microangiopathic origin, was detectable. Multiple lacunar defects in the basal ganglia region on both sides without disturbance in cerebrospinal fluid circulation and herniation could be detected. Free basal cisterns with a midline interhemispheric fissure were noted. Time-of-flight angiography revealed a strong right vertebral artery, a hypoplastic left vertebral artery with PICA termination, and small-calibre posterior cerebral arteries on both sides with arteriolosclerosis. No evidence of vessel occlusion or aneurysm was detected. As a summary, the cMRI showed acute ischaemia in the left corona radiata extending into the precentral gyrus without haemorrhagic transformation, with a post-haemorrhagic defect in the right thalamus and small-calibre flow signal, most likely due to atherosclerosis, in the posterior cerebral arteries on both sides (*Figure 1, A and B*). Neurosonography did not show significant stenosis. The initial diagnostic investigations suggested that the ischemic stroke (IS) was likely due to a cardiac thrombus secondary to non-anticoagulated AF. Consequently, the patient was referred for left atrial appendage closure (LAAO) due to contraindications for oral anticoagulant therapy (OAC).

During the TOE, which performed to exclude blood clots in the left atrial appendage (LAA) and to accurately measure the LAA, a mass close to the LAA was detected and initially interpreted as a thrombus. Based on clinical and laboratory findings, the possibility of vegetation was ruled out (*Table 1*). LAAO was postponed, and anticoagulation with Apixaban was initiated.

Three-dimensional transesophageal echocardiography (3D-TEE) performed four weeks later revealed two distinct echo-rich structures. The first was a spherical, pedunculated mass near the entrance of the left atrial appendage (LAA), consistent with an atrial myxoma, measuring approximately 18 × 16 mm. The second was an echo-rich, inhomogeneous structure, measuring about 20 × 11 mm, located in the LAA, but without evidence of thrombi. (*Figure 2*) (see Supplementary material online,

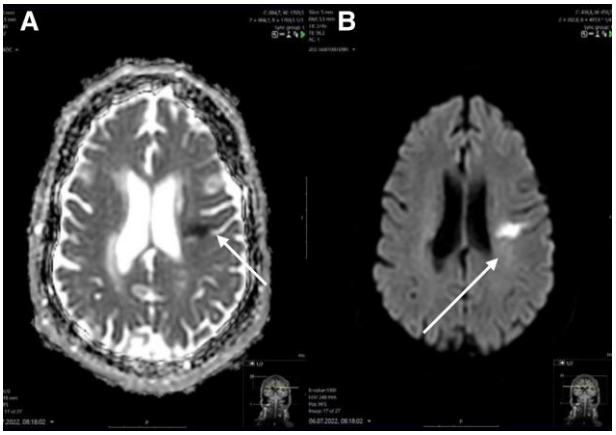

Figure 1 Magnetic resonance imaging of the brain, axial DWI (*A*) and ADC sequence (*B*). Diffusion restriction on the left in the corona radiata extending into the precentral gyrus with corresponding signal reduction in the ADC maps and mild hyperintensity in the T_2 sequences. Hemosiderin deposition in the right thalamus indicative of a past haemorrhage. Non-specific peri- and paraventricular white matter gliosis, most likely of microangiopathic origin. Multiple lacunar defects in the basal ganglia region on both sides. Assessment: Acute ischaemia in the left corona radiata extending into the precentral gyrus. No haemorrhagic transformation. Post-haemorrhagic defect in the right thalamus.

Table 1 Laboratory data of patient

	Unit	Reference Range	Day 1	Day 2	Day 3
Leukocytes	Tsd/µL	4.3–10	7.71	6.43	6.3
Erythrocytes	Mio/µL	4.50–5.90	4.80	4.50	4.55
Hemoglobin	g/dL	14.0–17.5	16.1	14.5	15.1
Haematocrit	%	40–52	46	42	42
MCV	fl	82–101	96	92	93
MCH	pg	27–34	34	32	33
MCHC	g/dL	31.5–36.0	35	35	36
Platelets	Tsd/µL	140–440	211	167	155
INR			1.0		
aPTT	sec	25.1–37.7	24 (–)		
Sodium	mmol/L	136–145	143	140	142
Potassium	mmol/L	3.5–4.5	3.8	3.4 (–)	3.2 (–)
Magnesium	mmol/L	0.74–0.99	0.77	0.73 (–)	0.71 (–)
GOT	U/L	<35	15	13	19
GPT	U/L	<50	16	13	17
Bili total	mg/dL	0–1.0	2.31 (+)		
Uric acid	mg/dL	2.6–7.2	7.8 (+)		
Urea-N	mg/dL	7–18	15	12	13
Creatinine	mg/dL	0.70–1.30	1.44 (+)	1.15	1.35 (+)
GFR (CKD-EPI)	mL/min	>90	54	71	58
Triglycerides	mg/dL	<150		113	191
Cholesterol	mg/dL	<200		133	
HDL cholesterol	mg/dL	35–60		26 (–)	
LDL cholesterol	mg/dL	<100		96	
LDH	U/L	<247	203	173	
Creatine kinase	U/L	<171	48	43	95
Blood sugar	mg/dL	74–106	127 (+)	107 (+)	
CRP	mg/dL	<0.3	0.1	0.1	0.1
ESR1	mm	<20		4	
Blood sugar	mg/dL	74–106	127 (+)	107 (+)	
TSH 3 Ultra	µIE/mL	0.55–4.78	2.65		
HbA1cE	%	<5.7		5.1	
HbA1cE	mmol/mol	<39		33	
Calcium++	mmol/L	2.12–2.53	2.45	2.27	
Troponin High-Sensit	ng/L		18.0 (+)		

MCV, mean corpuscular volume; MCH, mean corpuscular Haemoglobin; MCHC, mean corpuscular/cellular hemoglobin concentration; INR, International Normalized Ratio; aPTT, activated partial thromboplastin time; GOT, Glutamat-Oxalacetat-Transaminase; GPT, Glutamat-Pyruvat-Transaminase; GFR, glomerular filtration rate; HDL, high-density lipoprotein; LDL, low-density lipoprotein; LDH, Lactate dehydrogenase; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; TSH, Thyroid-stimulating hormone; HbA1c, Glycated hemoglobin.

Video S1). Consequently, the patient was referred for surgical management of the atrial myxomas, with concomitant surgical LAAO.

Discussion

We report an unusual case of atrial myxoma presenting as acute ischemia in the left corona radiata, resulting in acute dysarthria and left hemiparesis in a young patient. While cardioembolic stroke is common in younger individuals, myxoma as a cause is rare. The patient was treated with surgical removal of the myxoma and appropriate medical management.

The differential diagnosis of an intracardiac mass encompasses several possibilities, including anatomical variants, implanted devices, thrombi, vegetations, and both primary and metastatic tumors, as well as artifacts. (*Table 2*)

Myxoma is the most common primary cardiac tumor, with diagnosis often based on its morphology and attachment site.[4,5] In this case, we report an unusual presentation involving two atrial myxomas, which led to acute ischemia in the left corona radiata, resulting in acute dysarthria and left hemiparesis. Although cardioembolic stroke is common in younger patients, myxomas as a cause of stroke are relatively rare. Despite their benign nature, cardiac myxomas are associated with embolic events, frequently related to cardiac rhythm abnormalities such as atrial fibrillation (AF). Recurrence of cardioembolic events due to myxomas has been documented in several studies.[3,6] Saaf *et al*. reported a previous ischemic stroke in the same location in a patient's history, which supported the diagnosis of a cardioembolic event.[3]

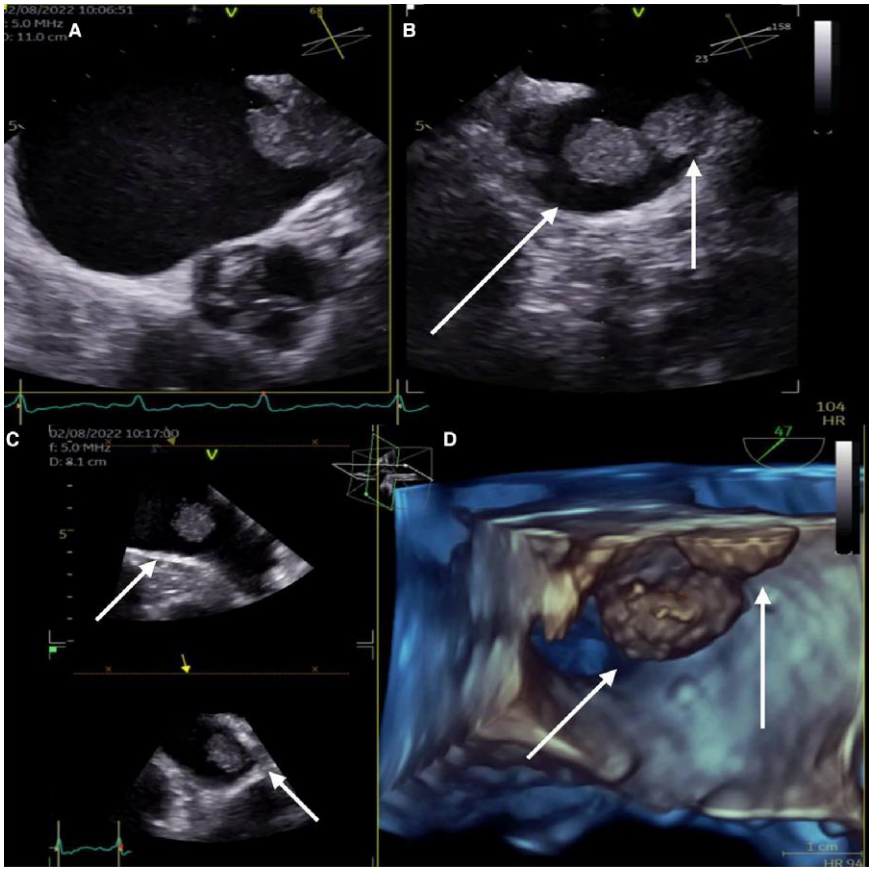

Figure 2 3D-TOE showed two low-echo to echoinhomogeneous structures in LA near the transition LA to LAA: mainly two atrial myxomas, one pedunculated and mobile (approx. 1.8 × 1.6 cm), the other wall-adhering (approx. 2.0 × 1.1 cm).

Table 2 Structures potentially mimicking cardiac masses in echocardiography

Non-neoplastic:
Thrombus (intracavitary)[a]
Thrombus within ventricular aneurysm or pseudo-aneurysm
Lipomatous hypertrophy of the interatrial septum
Anatomic variants (e.g. Chiari's network, prominent crista terminalis or pulmonary vein orifice)
Valvular vegetation
Ruptured papillary muscle
Rheumatoid nodule
Extracardiac structures (e.g. fat in the atrioventricular groove)
Neoplastic
Primary cardiac tumors
Myxoma[b] Atrioventricular nodal tumors
Lipoma Paragangliomas
Papillary fibroelastoma
Fibroma Plasma cell
Rhabdomyoma
Primary cardiac sarcomas
Lymphoma Sarcoma
Granuloma Angioma
Hemangiopericytoma
intracardiac pheochromocytoma
Secondary cardiac tumors[c]
Bronchogenic carcinoma
Breast Stomach
Colon Lymphomas
Leukemia Cervical
Hepatocellular carcinoma
Thyroid Carcinoid tumor
Renal cell carcinoma
Musculoskeletal Renal angiomyolipoma
Germ cell tumor (e.g. testicular teratoma)
Embryonal cell carcinoma
Choriocarcinomas

[a]Thrombi are the most common intracardiac mass.
[b]Secondary cardiac tumors are 20–30 times more common than primary cardiac tumors.
[c]Myxomas are the most common benign cardiac tumors.

A recent review of 130 patients with left atrial myxomas found that 22 patients initially presented with neurological symptoms, with cerebral vascular events most commonly affecting the middle cerebral artery.[7] Our patient, however, experienced an ischemic stroke in the left corona radiata, a white matter structure involved in various neural pathways and functions, which was later linked to an underlying myxoma.

Suraci *et al*. described a case of a 52-year-old woman with dysarthria and right-sided weakness, who underwent thrombolytic therapy with mild symptom resolution.[8] Neurological symptoms in these cases usually manifest as cerebral infarctions rather than hemorrhagic strokes, which may occur post-tumor excision.[1]

The diagnosis of myxoma typically relies on its morphology and attachment site. Echocardiographically, myxomas often appear as mobile, heterogeneous, polypoid, or papillary masses with a lucent core and a smooth or villous surface. The most common attachment site is the left atrial aspect of the interatrial septum.[9] While several imaging modalities can diagnose cardiac myxomas, echocardiography remains the preferred method. Transesophageal echocardiography (TOE) provides detailed information on morphological features and attachment sites, and can detect even small tumors, making it superior to transthoracic echocardiography (TTE).[10] In this case, TOE findings were deemed sufficient for diagnosis. However, despite echocardiography's high accuracy, misdiagnoses can occur and occasionally, thrombi confirmed histologically have been misclassified as myxomas.[11] Cardiac CT and cardiac MRI are alternatives when echocardiography is inconclusive, but they are not infallible.[12–15]

Surgical removal is the treatment of choice for cardiac myxomas, which should be performed promptly to prevent complications such as systemic embolization.[6] In this case, surgical management of the atrial myxomas with concomitant left atrial appendage closure (LAAO) was recommended due to the tumor's size and the risk of neurologic recurrence. However, we lost follow-up with the patient and were unable to obtain further outcome data.

It is recommended that first-degree relatives of patients with documented myxomas undergo screening for occult myxomas, even though most cases are sporadic.[16] Our patient had no known familial history of myxoma.

Conclusion

Cardioembolic stroke secondary to atrial myxoma is rare in young individuals. This case underscores the importance of considering atrial myxoma as a potential cause of stroke and highlights the need for thorough investigations in stroke patients, particularly the young, to rule out cardiac causes. It also emphasizes that atrial myxoma should be considered in the differential diagnosis of echocardiographically proven thrombosis, especially in cases resistant to anticoagulation. Early management of atrial myxomas is crucial to prevent recurrent strokes.

It is recommended that first-degree relatives of patients with documented myxomas undergo screening for occult myxomas, even though most cases are sporadic.[16]

Lead author biography

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Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

Consent: The authors confirm that consent for submission and publication of this case report has been obtained from the patient in line with COPE guidance.

Conflict of interest: None declared.

Funding: None declared.

Data availability

The data underlying this article cannot be shared publicly due to privacy of individuals that participated in the study. The data will be shared on reasonable request to the corresponding author.

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