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Case Report

Clinical Characteristics of Acute Lower Extremity Ischemia Due to Left Atrial Myxoma: A Rare Case Report with Review of Literature

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Abstract

Emboli caused by cardiac myxomas mostly occur in the cardiovascular or cerebrovascular systems and rarely in the lower extremity vasculature. We introduce the rare case of a patient with left atrial myxoma (LAM) whose right lower extremity (RLE) suffered from acute ischemia due to tumor fragments, along with a review of the relevant literature, and highlight the clinical characteristics of LAM. An 81-year-old female presented with acute ischemia of RLE. Color Doppler ultrasound showed no blood flow signal far from the RLE femoral artery. Computed tomography angiography showed an occlusion of the right common femoral artery. A transthoracic echocardiogram revealed a left atrial mass. Femoral artery embolectomy was performed under local anesthesia, followed by thoracotomy with tumor resection under general anesthesia on postoperative day seven. The tumor was pathologically confirmed as an atrial myxoma. A literature search of the PubMed database returned 58 cases of limb ischemia due to LAM, and the conclusions drawn from the statistical analysis were that emboli from LAM occurred most commonly in the aortoiliac and bilateral lower limb vasculature and were rarely associated with upper extremity and atrial fibrillation. Multisystem embolism is characteristic of cardiac myxoma. The removed embolus should be examined pathologically for signs of a cardiac myxoma. Lower-limb embolisms should be promptly diagnosed and treated to avoid osteofascial compartment syndrome.

Keywords

cardiac myxoma; embolism; limb ischemia; aorta

Introduction

Primary cardiac myxomas (CMs) are rare, with a reported prevalence of 0.03% in the general population. CMs account for approximately 50% of all cardiac tumors, of which 75–85% are located in the left atrium and 15% in the right atrium [1,2]. A few CMs can occur in the right ventricle or left ventricle and may even be biatrial. CMs have a female preponderance, with a female-to-male ratio of approximately 2–3:1, and can occur at all ages, although they mainly occur in middle-aged patients between the 3rd and 6th decades of life. Furthermore, 10–50% of patients with CMs are asymptomatic [1–3]. The clinical manifestations of CMs are characterized by intracardiac obstruction, systemic embolism, and constitutional symptoms. Emboli caused by CMs mostly occur in the cardiovascular or cerebrovascular systems and rarely in the lower extremity vasculature [1,4]. Because of the low incidence of limb embolism caused by CMs, few studies have analyzed the associated clinical characteristics. Therefore, a retrospective analysis based on case reports in the literature is necessary to differentially diagnose and promptly treat CMs. We introduce the rare case of a patient with left atrial myxoma (LAM) whose right lower extremity (RLE) suffered from acute ischemia due to tumor fragments, along with a review of the relevant literature, and highlight the clinical characteristics of LAM.

Methods

Case Report

An 81-year-old female was transferred to our hospital with the chief symptoms of acute onset, severe RLE pain and paralysis for 10 hours and a history of hypertension, diabetes and radical resection of rectal cancer. Her body temperature and blood pressure were within normal limits. The physical examination showed a pale, cold, and insensate RLE with an impalpable femoral artery pulse. Color Doppler ultrasound showed no blood flow signal far from the RLE femoral artery. The electrocardiogram showed no evidence of atrial fibrillation. A transthoracic echocardiogram (TTE) revealed a left atrial mass. Computed tomography angiography (CTA) showed an occlusion of the right common femoral artery and an irregular left atrial mass (Fig. 1).

The patient was diagnosed with LAM complicated with an acute arterial RLE embolism. Given the patient's

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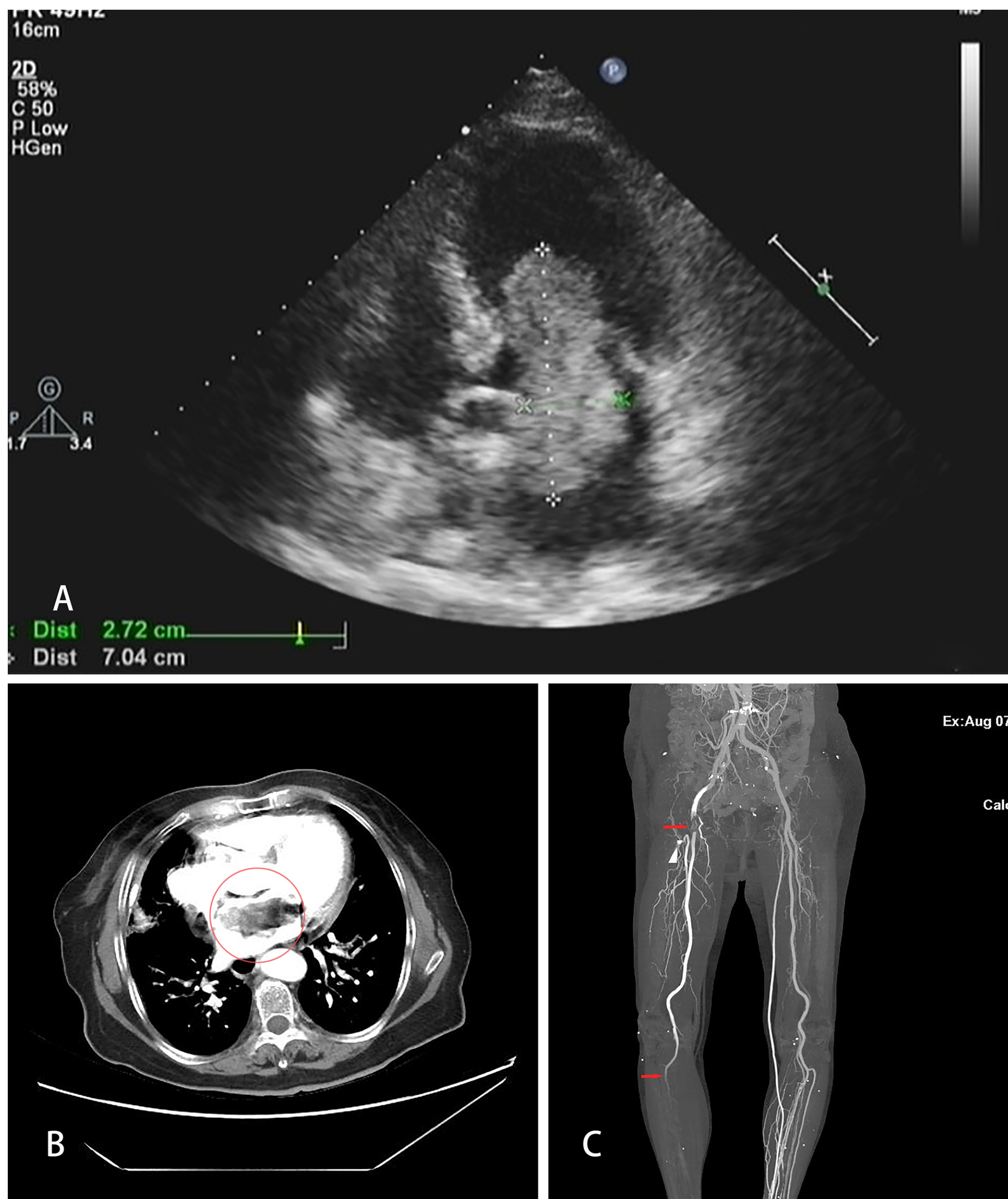


Fig. 1. Echocardiogram and CTA imaging examination. (A) Transthoracic echocardiogram shows an atrial myxoma. (B) CTA shows an atrial myxoma. (C) CTA shows right lower limb artery embolism. CTA, computed tomography angiography.

advanced age, the patient was taken emergently to the operating room for a femoral artery embolectomy under local anesthesia. The pale, gelatinous, and fragile embolus was pathologically confirmed as a myxoma. On postoperative day seven, the patient underwent a thoracotomy and tumor resection surgery under general anesthesia. The 7 $\times$ 2 cm^2 tumor (Fig. 2) was pathologically confirmed as an atrial myxoma and had microscopic findings identical with those of the embolus, which was removed from her right femoral artery (Fig. 3). On postoperative day 17, the patient was discharged without any complications. The post-surgery echocardiography showed slight mitral regurgitation with no residual mass (Fig. 4).

Literature Review

The PubMed database was the source for the literature review. Two groups of keywords are used. The first search terms were “cardiac myxoma”, “case report”, “limb”. The second search terms were “cardiac myxoma”, “case report”, “aorta”. Additional records were identified using citation tracing. All the studies were carefully examined. The search dates were 1980 to 2022. Only case reports with detailed descriptions were selected. Cases included in systematic reviews were excluded from the analysis because of incomplete patient demographics and clinical characteristics. In total, 58 LAM cases with limb ischemia were identified in the literature written in English and French (Fig. 5).

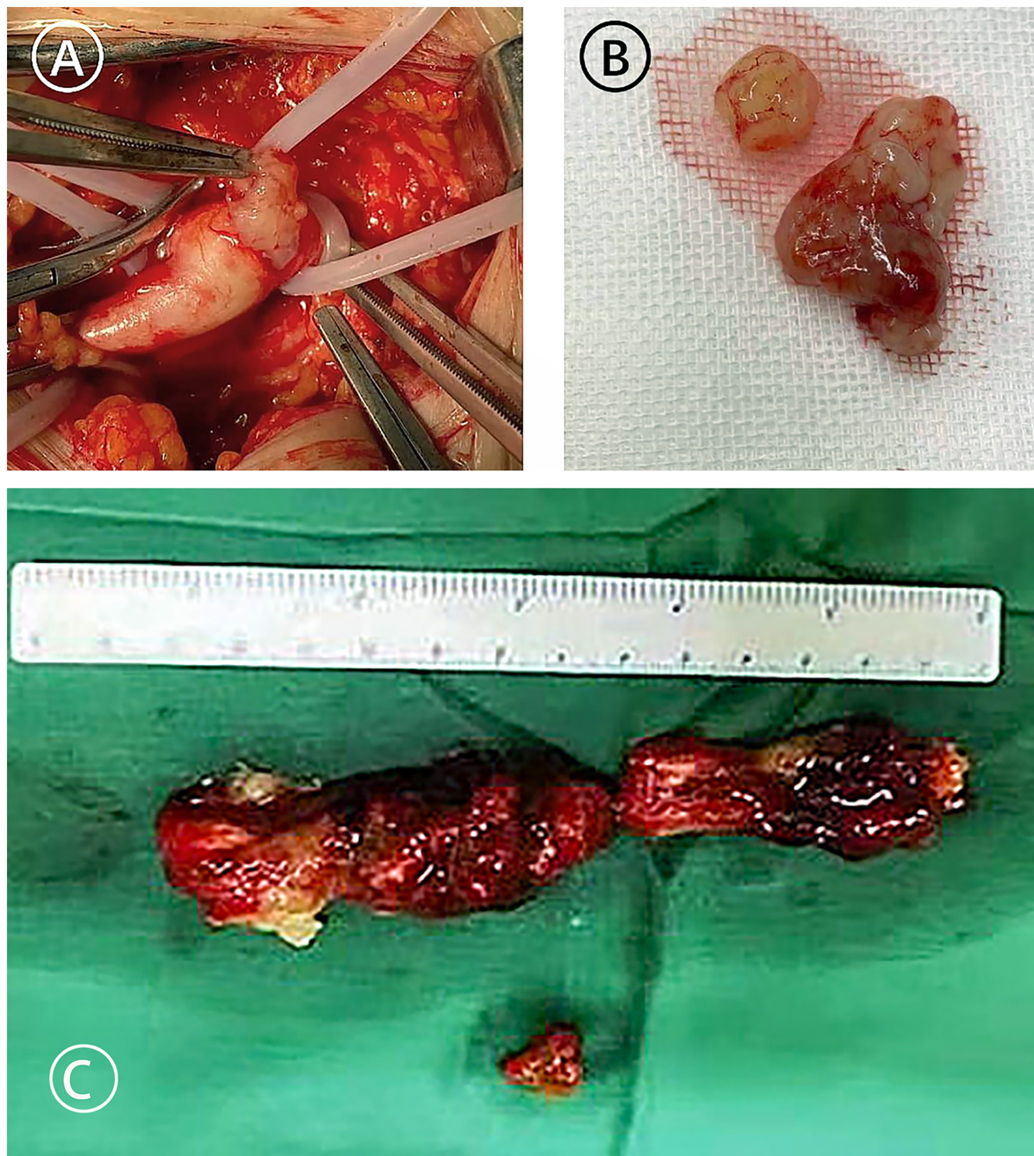
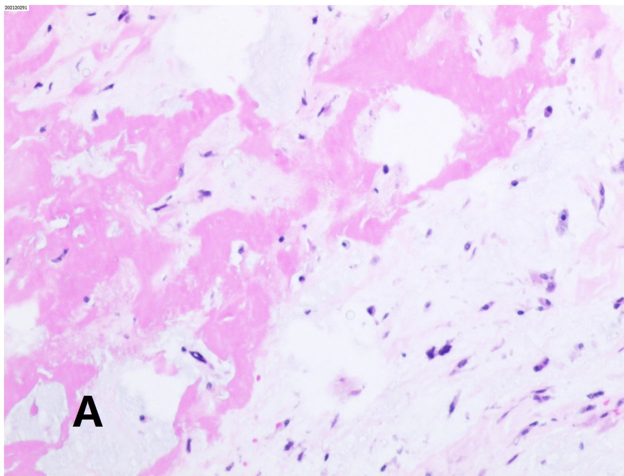


Fig. 2. Masses removed from femoral artery and heart. (A,B) The embolism was removed from Femoral artery and shown as a myxoid tumor. (C) The tumor is removed from the left atrium.

The data extracted from the literature included patient demographics, location of emboli causing limb ischemia, non-limb emboli locations, history of chronic issues, intracardiac mass size and outcome.

A literature search of the PubMed database returned 58 cases of limb ischemia due to LAM over the past 40 years, as summarized in Table 1 (Ref. [2,5–59]).

The mean age at presentation was 44 ± 18 years (range: 1–82 years). The female to male ratio was 1.1:1. Of the 58 cases of limb embolism from the literature, only 3 (5.2%) occurred in the upper extremities, and 66.1% (37/56) of emboli causing lower limb ischemia were lodged in the aortoiliac artery. The bilateral lower limb embolism rate was 80.4% (45/56), with 7 (63.6%) of the 11 unilateral lower limb embolism cases occurring in a right limb artery. Of all limb embolisms, 30 cases (55.7%) were complicated with cerebral or visceral embolism, of which 76.7% (23/30) and 56.7% (17/30) occurred in the internal organs and brain, 10 (17.2%) had a history of chronic lower limb pain or cerebral infarction, and only 1 (1.7 %) had a history of atrial fibrillation. Of the 37 cases with aortoiliac embolism, 15 (40.5%) had paraplegia as the initial manifestation. The intracardiac mass disappeared in 17 (29.3%) cases at the time of the acute embolism onset. Among them, the embolus lodged in the aortoiliac, bilateral popliteal, and femoral arteries in 15 (88.2%), 1 (5.9%), and 1 (5.9%) cases, respectively. The LAM size varied from 20 mm in diameter to a three-dimensional size of $100 \times 28 \times 15$ mm^3. The size of residual intracardiac mass was recorded in 47 cases with a mean size 11.8 ± 14.3 cm^2, of which the mean size was 7.6 ± 12.4 cm^2 (n = 30) in cases with aortoiliac embolism and 19.4 ± 14.7 cm^2 (n = 17) in cases with a limb embolism.



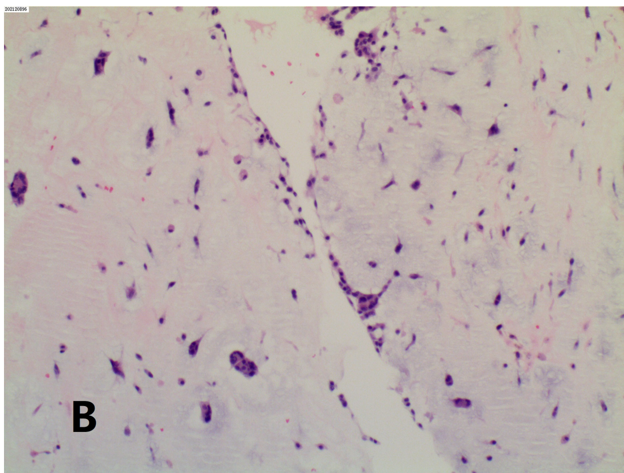


Fig. 3. Histopathological examination showing atrial myxoma. (A) is pathological sections of emboli taken from the right femoral artery. (B) is pathological sections of the tumor taken from her heart, which had microscopic findings identical with those of the embolus (H & E staining, magnification 100×).

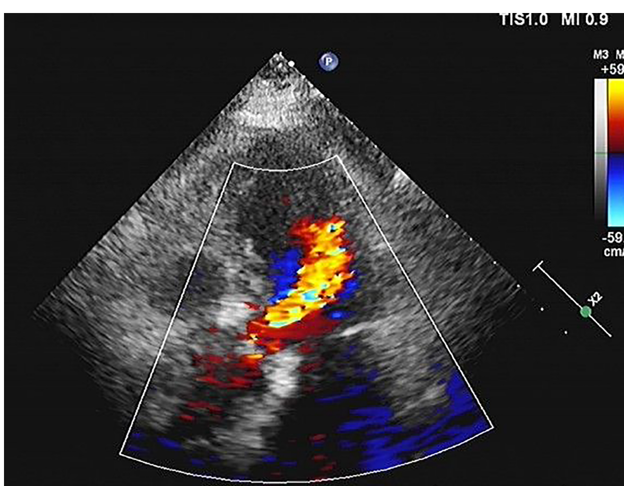


Fig. 4. The post-surgery echocardiography showed slight mitral regurgitation.

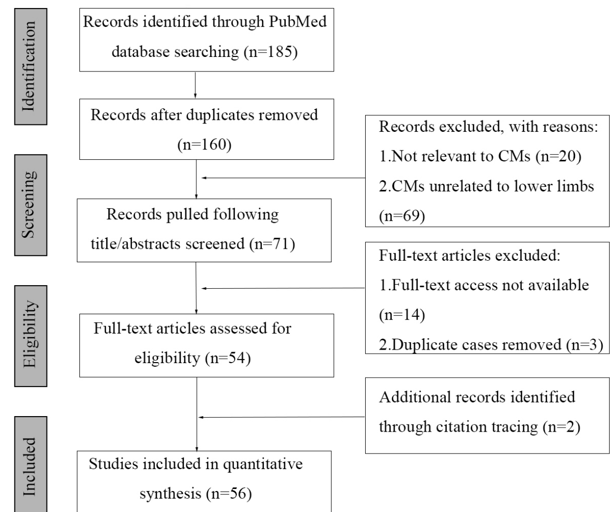


Fig. 5. Retrieval flowchart of lower-extremity ischemia caused by cardiac myxomas. CMs, Primary cardiac myxomas.

Of the 58 cases of limb embolism, 19 (32.8%) developed osteofascial compartment syndrome (OCS) and underwent fasciotomy, of which 9 (47.4%) recovered uneventfully, 8 (42.1%) were left with a physical disability, and 2 (10.5%) died due to multiple organ failure. Meanwhile, 15 (78.9%) of the 19 OCS were caused by aortoiliac occlusion and iliac occlusions, and the other 4 (21.1%) were caused by femoral and popliteal arteries. In total, 10 (17.2%) of the 58 patients died, including 1 patient died due to myocardial infarction. In addition, 7 (12.1%) cases had amputations because of the late presentation to the emergency department.

This retrospective study complied with the Helsinki Declaration (2000), and was approved and exempted by the local Ethics Committee because of the retrospective nature of the case report. Informed consent was obtained from the patient. All patients' privacy information was protected.

Discussion

Embolism occurs in 30–50% of patients with CMs. Embolic cerebral infarction is the most common complication among all embolic events in CMs, accounting for approximately 15–29% of cases. Correspondingly, peripheral embolism only accounts for 6–13% of cases [1,4,5]. However, arterial embolism of limbs caused by CMs only accounted for 0.8–0.9% of all arterial limb embolisms [5,60]. The risk factors of embolic events are the tumor location, appearance, mean platelet volume, and having a high platelet count [4].

This literature review does not show that female dominate the incidence of CM. Only one case occurred over the age of 80 years. Thus, patients with an advanced age and an LAM complicated with limb embolism are rare.

Table 1. Summary of cases of acute limb ischemia caused by left atrial myxoma.

No./Reference	Year	Age (y)/Sex	Location of embolus causing limb ischemia	With embolus of other locations	History of chronic issues	Mass size in heart (mm)	Outcome
1. Yeoh [57]	1981	61/F	Saddle embolus			No description	Death
2. Yeoh [57]	1981	68/M	Abdominal aorta		Previous subendocardial anterior myocardial infarction.	Small residual	Normal
3. Aota [12]	1984	17/M	Right common femoral artery		Intermittent paralysis of the legs, severe lumbosacral pain, urinary retention and paralytic ileus 3 yrs ago	No description	OCS. Nerve injury
4. Weerasena [52]	1989	14/ F	Saddle embolus			30	OCS. Footdrop
5. Romisher [40]	1991	44/M	Right femoral artery	Coronary embolus. Cerebral infarcts		20	Death
6. Eriksen [17]	1992	41/F	Saddle embolus	Middle cerebral artery		No mass	Death
7. McMullin [32]	1993	50/M	Aortic occlusion			No mass	Normal
8. Tornvall [46]	1979	20//F	Left external iliac artery and right popliteal arteries	Embolus to the liver		40 × 60	OCS. Myatrophy
9. Wilson [53]	1997	43/F	Both superficial femoral arteries. Both profunda femoral arteries		Bilateral calf and thigh pain for 3 yrs	No description	Normal
10. Horn [22]	1997	42/F	Infrarenal abdominal aorta Bilateral iliac arteries.			20 × 20	Paralysis
11. Kao [24]	2001	79/M	Abdominal aorta			No description	Normal
12. O'Sullivan [38]	2001	57/F	Saddle embolus			No description	OCS. Normal
13. Veroux [50]	2002	54/M	Abdominal aorta. No peripheral embolization.			No mass	MOF. Death
14. Ouattara [39]	2002	50/M	Saddle embolus			No description	MOF. Paralysis
15. Val-Bernal [48]	2003	55/F	Left superficial femoral artery		Weight loss, paroxysmal nocturnal dyspnea with orthopnea for 1 mon	55 × 45 × 20	Normal
16. Val-Bernal [48]	2003	37/F	Left humeral and femoral arteries		Dyspnea with exertion for 2 yrs	70 × 50 × 30	Normal
17. Fang BR [18]	2004	53/M	Infrarenal aorta	Right renal artery		No mass	Normal
18. Ali [11]	2004	58/M	Saddle embolus			"Stalk" residual	OCS. Normal
19. Coley [16]	2005	53/F	Left superficial femoral, iliac, and right common iliac arteries			No mass	OCS. Normal
20. Shavit [42]	2007	42/M	Abdominal aorta. Both common and internal ileac arteries	Both renal and splenic arteries	Episodes of amaurosis fugax for 2 mons	75	Normal
21. Van der Mieren [49]	2007	50/M	Infrarenal aorta. Right common iliac and the left common femoral arteries	Both kidneys, spleen and liver emboli		3 mm stalk	Normal
22. Neff [35]	2008	45/F	Infrarenal aorta	Right middle cerebral artery		No description	Death
23. Ohgo [37]	2008	30/M	Saddle embolus	Cerebral infarction		"Stalk" residual	MOF.Death
24. Ahmed [9]	2008	45/F	Right distal external iliac, Common femoral artery			30 × 20	Normal
25. Hofer [6]	2009	51/F	Infrarenal aorta	Embolism in the lower part of the left kidney.		No residual mass	Normal

Table 1. Continued.

No./Reference	Year	Age (y)/Sex	Location of embolus causing limb ischemia	With embolus of other locations	History of chronic issues	Mass size in heart (mm)	Outcome
26. Yadav [55]	2009	62/F	Infrarenal aorta	Renal and splenic infarcts. Pulmonary emboli. Embolic cerebral infarction		48 × 22	OCS.Amputation. Death
27. Lin [29]	2010	63/M	Abdominal aorta			70 × 32 × 30	Normal
28. Azghari [13]	2010	42/M	Infrarenal aorta			No description	OCS. Death
29. Tan [45]	2010	23/F	Bilateral iliac arteries segmental stenosis and right iliac artery thrombosis.	Multiple cerebral infarcts	Fever, repetitive cerebrovascular events and ischemic extremities signs for 5 yrs.	80 × 50 × 60	Normal
30. Tsao [47]	2010	55/M	Occlusion of descending aorta	Poor flow in coeliac trunk, superior mesenteric and renal arteries		"Stalk" residual	MOF, Death
31. Vogel [51]	2011	43/F	Abdominal aorta	Splenic and bilateral renal artery infarction. Acute media infarction	Ischemia of posterior circulation region and small intestine segment for 6 wks	10 × 5 × 5	Amputation
32. Zhang [58]	2012	29/M	Aorta below the celiac trunk level	Kidneys and spleen infarcts		3 mm residual	OCS. Normal
33. Chiba [15]	2012	38/M	Right brachial artery			100 × 28 × 15	Normal
34. Nicholls [36]	2012	44/M	Bilateral femoral artery	Renal and splenic infarcts		50 × 27 × 50	OCS. Amputation
35. Huang [5]	2012	56/M	Aorta proximal celiac trunk level	Superior mesenteric and bilateral renal arteries		"Stalk" residual	MOF, Death
36. Martínez-Mira [30]	2012	73/F	Left brachial artery			55 × 40 × 12	Normal
37. Hong [21]	2012	41/F	Infrarenal abdominal aorta			44 × 26	Normal
37. Muhammad Amin [34]	2013	21/F	Infrarenal aorta	Vertebrobasilar infarction. Bilateral renal and splenic infarcts		50 × 50	OCS. Normal
39. Min [33]	2014	36/F	Saddle embolus	Spleen and bilateral renal infarctions. Multifocal cerebral infarction		Left atrium: 38 × 20 Right atrium: 57 × 30	Normal
40. Habbab [19]	2014	52/F	Infrarenal aorta and iliac arteries	Right internal carotid artery. Multifocal infarcts of the spleen and both kidneys. Right hemisphere infarction		48 × 25	Neurological deficits
41. Lee [27]	2015	9/M	Saddle embolus		Intermittent left calf pain for 4 wks	60 × 50 × 45	Normal
42. Kawabata [25]	2015	0.5/F	Abdominal aorta			16 × 10	OCS. Normal
43. McGowan [8]	2016	21/F	Abdominal aorta	Superior mesenteric, left renal, and middle cerebral arteries		No description	Amputation
44. Salimi [41]	2017	78/M	Left common femoral artery	Multifocal cerebral infarction		No description	Normal
45. Zuin [59]	2017	63/M	Infrarenal aorta	Splenic and bilateral renal infarctions		No mass	Normal

Table 1. Continued.

No./Reference	Year	Age (y)/Sex	Location of embolus causing limb ischemia	With embolus of other locations	History of chronic issues	Mass size in heart (mm)	Outcome
46. Cho [7]	2017	24/M	Abdominal aorta			31 × 30	OCS. Amputation
47. Yamashita [56]	2018	45/M	Right deep femoral artery	Multifocal cerebral and splenic infarctions	Pallor in the third and fourth left fingers for 2 yrs	85 × 20 × 20	Normal
48. Jawaid [23]	2018	48/M	Right common iliac artery	Multifocal cerebral infarction	Chronic right lower leg pain for 1 yr	61 × 44 × 35	Normal
49. Wu [54]	2018	16/M	Right popliteal artery. Left anterior tibial artery	Multifocal cerebral infarction	Left-sided hemiplegia for 2 mons	70 × 60 × 40	Normal
50. Alam [10]	2018	55/F	Right dorsalis pedis artery		Numbness and weakness in the right arm and leg for 1 wk	30 × 30 × 20	Normal
51. Bernatchez [14]	2018	45/M	Saddle embolus	Right renal and superior mesenteric arteries		18 × 22	OCS. Normal
52. Mohamed [2]	2018	55/M	Right common femoral and popliteal arteries			No description	OCS. Normal
53. Silva [43]	2018	21/F	Aortoiliac occlusion	Middle cerebral, basilar and left renal arteries	Intracranial tumor	No mass	OCS. Amputation
54. Latifi [26]	2019	61/F	Right external, internal iliac, and left distal common femoral arteries	Spleen and kidneys		34	Normal
55. Szymanska [44]	2019	82/F	Left femoral artery		Atrial fibrillation	16 × 22; Complete detachments	Normal
56. Mathew [31]	2019	18/F	Infrarenal aorta			20 × 57	OCS. Amputation
57. Ho [20]	2020	50/F	Bilateral popliteal occlusions	Bilateral segmental renal infarcts		No mass	OCS. Normal
58. Li [28]	2021	21/F	Aortoiliac occlusion	Left internal carotid and middle cerebral arteries. Multifocal renal and splenic infarctions		32 × 22 × 12	OCS. Nerve injury

OCS, osteofascial compartment syndrome; MOF, multiple organizational failures.

Upper limb ischemia caused by CM is rare. Most emboli causing lower limb ischemia were lodged in the aortoiliac artery. The bilateral lower limb embolism rate was higher than that of the unilateral lower limb embolism. Of the unilateral lower limb embolism cases, 63.6% occurred in the right limb artery, which has an uncertain clinical significance. More than 50% of all limb embolisms were complicated with cerebral or visceral embolism. The affected internal organs included the kidney, spleen, liver, superior mesenteric artery, and coronary artery. Multiple cerebral infarctions might be caused by embolism of the internal carotid artery, middle cerebral artery, basilar artery and arterioles. Statistically, arterial embolism caused by LAM is usually not a single event, and the lower limb embolism as an acute manifestation is only one of its complications, which is commonly called an "embolic shower".

Aortoiliac and bilateral lower limb arterial occlusions are also characteristics of embolism caused by LAM, and differ from those caused by non-tumor factors, which occur mainly in medium- and small-sized unilateral limb arteries. This difference can be explained by the larger and more numerous emboli of LAM, compared with emboli caused by atrial fibrillation. This conclusion is supported by a report from Karapolat *et al*. [60] in which 730 patients with an average age of 58.7 years were diagnosed with acute arterial embolism of the limbs, of which 33.2% of emboli occurred in the upper extremities and 66.8% occurred in the lower extremities. Emboli in the iliac artery accounted for only 11.9% of the cases, while as many as 89.1% of emboli were in the brachial, axillary, femoral, and popliteal arteries. The rate of bilateral arterial emboli in only the limbs was 2.8%. In the underlying cause of the arterial embolism, atrial fibrillation accounted for 59.3% and cardiac tumors only accounted for 0.8% of cases. Similar peripheral artery embolization results were mentioned by Wasilewska *et al*. [61]: atrial fibrillation was diagnosed in 60–95% of surgical patients with acute limb ischemia; 7%, 29%, 9%, and 2% of extra-cerebral embolic events occurred in the aorta, mesenteric arteries, pelvic arteries, and renal artery, respectively; and 13.8% of patients had bilateral embolic episodes. By contrast, atrial fibrillation only accounted for 1.7% of cases in the literature review.

Emboli from LAM may consist of a thrombus attached to the tumor surface, a completely or partially detached tumor fragment, or both. In addition, some peripheral artery emboli may also be secondary thrombosis caused by small arteritis, because some CMs are commonly associated with constitutional symptoms similar to those in connective tissue disease, including fever, weight loss, anemia, leukocytosis, Raynaud's phenomenon, and arthralgia [1,6]. The literature review showed that a small subset of patients had a history of chronic lower limb pain or cerebral infarction, and only 1 had a history of atrial fibrillation. Therefore, for patients with acute limb thrombosis without a history of atrial fibrillation, especially young patients with chronic limb pain, constitutional symptoms and clinical manifestations of "embolic shower" warn of the possibility of atrial myxoma. The removed embolus should be examined pathologically for atrial myxoma [7]. Of course, negative microscopic findings should not rule out atrial myxoma.

CMs without peripheral embolism may not be easily diagnosed. But for an acute limb embolic event, even an acute visceral embolism, we often first consider whether the cause is atrial fibrillation. Thus, it is not difficult to find intracardiac tumors. TTE is the most practical method for the early detection of myxoma and can provide adequate information on the location, size, shape, narrow-stalked, compact, and gelatinous appearance. In addition, computed tomography and cardiac magnetic resonance imaging are techniques that can be used for differential diagnosis [1,3]. However, LAM sometimes disappears when the mass is completely detached, and only a pedunculated nodular structure (residual "stalk") on the left side of the interatrial septum is identifiable by TTE. In this literature review, no intracardiac mass was found in one third of the patients at the time of the acute embolism onset, or only a residual "stalk" remained. Among them, 88% of the emboli were lodged in the aortoiliac artery. Meanwhile, paraplegia was also the most common manifestation, occurring in 40% of the cases with aortoiliac occlusion, except for a combination of abdominal or back pain. Therefore, disastrous paraplegia is commonly caused by complete detachment of CM. Early literature reported that complete CM detachments typically result in aortoiliac artery embolism [8].

In this literature review, the LAM size varied from 20 mm in diameter to a three-dimensional size of 100 $\times$ 28 $\times$ 15 mm^3. In fact, these sizes may not reflect the actual tumor size because of the tumor detachment. The average size of the residual intracardiac mass was 11.8 $\pm$ 14.3 cm^2. The CM size as an embolism risk factor is unclear. A study showed that apparently large myxomas (>25 mm^2) were associated with a higher risk of embolic events in univariate analysis, but there were no significant size differences between embolic and non-embolic groups [4]. Another study showed that a tumor size $\leq$4.5 cm (optimal cut-off) was an independent risk factor for embolism [62].

Surgical management is strongly recommended, regardless of CM size and location. Complete excision of CM and its pedunculated nodular structure is the basic principle. Usually, simultaneous transthoracic CM resection and thrombectomy can be performed, but it is sometimes necessary to choose staged surgery according to the evaluation of the patient's status. It is very important for patients with acute limb ischemia to recover the blood supply of the limbs by timely thrombectomy and revascularization, because reperfusion and osteofascial compartment syndrome (OCS) are fatal complications. In this literature review, one third of the cases developed OCS and underwent fasciotomy, of which the aortoiliac occlusion was the

main risk factor. Fortunately, half of the cases recovered uneventfully without any complications, 40% of cases left with a physical disability, and 10% died due to multiple organ failure. In addition, the 17% mortality rate associated with limb ischemia caused by CMs remains a tragic outcome.

In our case report, the advanced-age patient had severe symptoms of lower limb ischemia and could not undergo simultaneous transthoracic CM resection. Thus, thrombectomy under local anesthesia was the first choice. Considering that the residual tumor in the heart is still large and there is a risk of detachment at any time, after evaluating the patient's surgical tolerance, a selective transthoracic CM resection was successfully performed.

The CM recurrence rate is low, approximately 1–6% in patients treated surgically. The relapse-free survival rates at 5, 10, 15, and 20 years are 95.5%, 93.5%, 92.4%, and 91.6%, respectively [3].

This literature review has certain limitations due to the nature of case reports, which tend to report rare, difficult and complicated cases. It is also possible that some cases were not included because they were not available in the PubMed database, or because they did not return the results when searching using English keywords. In addition, several reports were excluded from this review because the complete information was unavailable. The CARE checklist was used when writing our report **Supplementary table 1**.

Conclusions

The embolus from LAM is most commonly lodged in the aortoiliac artery and bilateral lower limbs, and is rarely associated with atrial fibrillation. This differs from emboli caused by non-tumor factors, which are mainly in medium- and small-sized arteries of unilateral limbs, and atrial fibrillation is the main cause. Multisystem embolism is characteristic of cardiac myxomas. The removed embolus should be examined pathologically for signs of CMs, because some masses may be completely detached. As one of the manifestations of multiple systemic embolization, lower limb embolism should be promptly diagnosed and treated to avoid ischemia reperfusion and OCS, which are fatal complications. Although patients with lower extremity ischemia may experience different vital sign states, embolectomy and tumor resection surgery are routine surgical management choices.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

HZ designed this study and made a major contribution to the acquisition, analysis, and interpretation of data and drafting of the manuscript. YY collected and analyzed the data. ZS was involved in interpretation and revision. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

Ethics Approval and Consent to Participate

This case report is a retrospective study that did not involve clinical trials and was exempt from the Institutional Review Board of Weihai Municipal Hospital. The need for informed consent was waived. All privacy information of the patient was protected.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.59958/hsf.5607.

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