Renal Replacement Therapy

CASE REPORT

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Rapidly growing right atrial myxoma in an older patient with advanced chronic kidney disease: a case report

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Abstract

Background Right atrial myxoma is a rare cardiac tumor, with few reports on its growth rate.

Case presentation We found a right atrial myxoma in a male patient in his 80s with chronic kidney disease on the second echocardiogram that was performed for the creation of an arteriovenous fistula at 9 months after the initial echocardiogram, which showed no evidence of myxoma. Echocardiography revealed a mass measuring 37 mm × 28 mm in the right atrium. The patient was asymptomatic, and the tumor was surgically removed.

Conclusions To the best of our knowledge, our patient is the oldest compared with all the patients in previously reported cases of rapidly growing right atrial tumors.

Keywords Right atrial myxoma, Chronic kidney failure, Growth rate

Background

Primary cardiac tumors are rare, with 75% being benign. The incidence of these tumors ranged from 0.0017% to 0.19% in unselected patients at autopsy, and 72% of the patients were asymptomatic [1]. Further, 75% of all myxomas occur in the left atrium and 15–20% occur in the right atrium, with rare occurrences in the ventricles. Although myxomas can occur in individuals of all age groups, they are particularly common in the third and sixth decades of life.

We present the case of a patient who underwent multiple echocardiograms during treatment for advanced chronic kidney disease (CKD). The patient was diagnosed with and surgically treated for a rapidly enlarging right heart myxoma over a 9-month period. To the best of our knowledge, this case represents an instance of rapidly growing right atrial myxoma in the oldest known patient.

Case presentation

The patient was an 80-year-old male with type 2 diabetes mellitus, chronic atrial fibrillation, chronic heart failure, hypertension, one-toe amputation because of diabetic foot gangrene, and chronic kidney disease (stage G5A3); he was an outpatient at our clinic. A total of 9 months earlier, his echocardiogram, conducted for preoperative evaluation for arteriovenous fistula (AVF) creation, showed normal left ventricular function and no evidence of a cardiac tumor (Fig. 1a). Owing to preserved renal function, the patient continued to attend the outpatient clinic without undergoing the AVF creation. After 9 months, AVF creation was planned. However,

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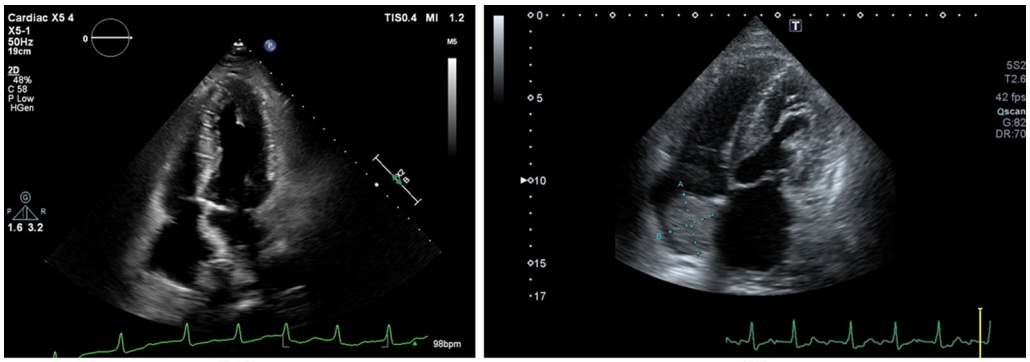

Fig. 1 Echocardiogram image of right atrial myxoma. **a** Image at 9 months before diagnosis; **b** image at diagnosis

during the subsequent echocardiogram, a mass measuring 37 mm × 28 mm was identified in the right atrium. Consequently, the patient was admitted to the cardiovascular surgery department on the same day.

His physical examination revealed blood pressure of 113/65 mmHg, pulse of 88 beats per minute (bpm), temperature of 36.6 °C, oxygen saturation of 90%, no yellowing of the ocular conjunctiva, no pallor of the eyelid conjunctiva, clear breath sounds, no left–right difference, normal heart sounds, no heart murmur, flat and soft abdomen with no spontaneous pain or tenderness, no increased or decreased bowel peristalsis, and pitting edema in the bilateral lower legs. The patient reported decreased exercise tolerance and dyspnea on exertion.

Blood exam showed a red blood cell count of 275×10^4/μL, hemoglobin level of 8.6 g/dL, prothrombin time-international normalized ratio of 3.28, total protein level of 6.9 g/dL, albumin level of 3.4 g/dL, serum creatinine level of 4.57 mg/dL, creatine kinase level of 540 U/L, estimated glomerular filtration rate of 10.4 mL/min/1.73 m^2, hemoglobin A1c rate of 7.4%, brain natriuretic peptide level of 293.3 pg/mL, and C-reactive protein level of 0.34 mg/dL; chest radiography showed a cardiothoracic ratio of 56%, and the costophrenic angle was sharp; his cardiac electrogram was irregular with a heart rate of 92 bpm and no ST–T changes. Echocardiography revealed a mass measuring 37 mm × 28 mm in the right atrium (Fig. 1b), ejection fraction (EF) of 65%, right atrium dimensions of 66 mm × 48 mm, estimated right ventricular systolic pressure (eRSVP) of 45 mmHg, tricuspid regurgitation pressure gradient (TRPG) of 37 mmHg, mild tricuspid regurgitation, left atrial diameter (LAD) of 51 mm, left ventricular end-diastolic diameter (LVDd) of 45 mm, left ventricular end-systolic diameter (LVDs) of 25 mm, and inferior vena cava (IVC) diameter of 25 mm. A cardiac magnetic resonance imaging (MRI) (fast imaging employing steady-state acquisition) was also performed for differential diagnosis. The MRI revealed a well-defined dark mass lesion in the right atrium with adhesions to the atrial septum. Based on these findings, a diagnosis of cardiac myxoma was made.

The patient had been using warfarin to prevent the development of blood clots owing to atrial fibrillation, which was replaced with heparin after hospitalization. On the sixth day of hospitalization, the patient underwent right atrial tumor resection, left atrial appendage closure, and tricuspid annuloplasty. The intraoperatively excised tumor measured 40 mm × 30 mm × 20 mm, with a dark red stalk arising from the fossa ovalis (Fig. 2). Microscopic examination revealed migration of stellate myxoma cells and mucus secretion in the interstitium, with interstitial hemorrhage (Fig. 3). The pathological findings confirmed the diagnosis of myxoma with hemorrhagic changes.

Continuous renal replacement therapy was initiated because of oliguria from the first to third postoperative day and discontinued upon restoration of urine output.

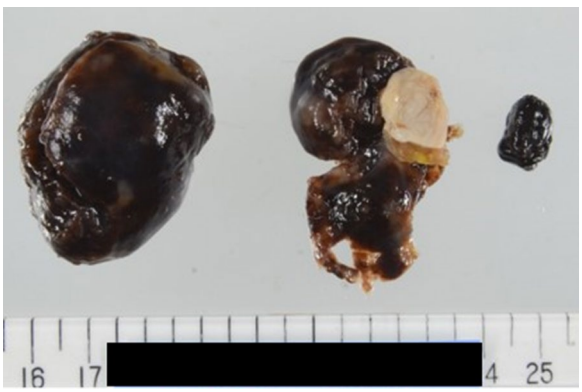

Fig. 2 Atrial mass excised from the right atrium, measuring 3.7 cm × 2.8 cm

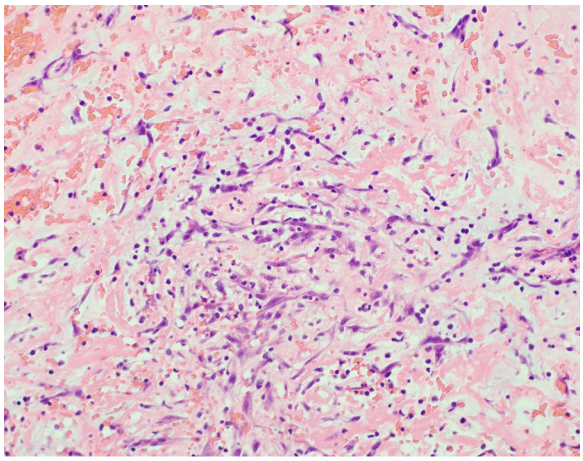

Fig. 3 Microscopic image of an atrial myxoma, showing stellate myxoma cells and mucus in the interstitium, with interstitial hemorrhage

Subsequently, the patient was discharged on the 44th day after surgery, following rehabilitation and adjustment of the diuretic dosage. However, after 30 days, the edema worsened, necessitating maintenance hemodialysis.

On the eighth day postoperatively, electrographic findings displayed irregularities, with a heart rate of 88 bpm. The EF was 65%, and mild mitral regurgitation, an LAD of 43 mm, an LVDd of 39 mm, an LVDs of 24 mm, and an IVC diameter of 20 mm were observed. On the 36th day postoperatively, the electrographic findings remained irregular, with a heart rate of 89 bpm. The EF was 58%, and mild mitral regurgitation, an LAD of 50 mm, an LVDd of 45 mm, an LVDs of 26 mm, and an IVC diameter of 16 mm were observed.

Discussion and conclusions

Here, we present the case of a patient with advanced renal failure who underwent two echocardiograms for AVF formation. Surprisingly, the right atrial myxoma was identified on the second echocardiogram, and the patient did not present with any symptoms of pulmonary thrombosis. In this case, no discernible symptoms attributable to right atrial myxoma were observed. While lower extremity edema was observed, it preceded the first echocardiogram, and there was no rapid deterioration before surgery. Embolic symptoms are less frequently caused by myxomas originating in the right heart than by those originating in the left heart [1]. Warfarin, which he was taking for his chronic atrial fibrillation, might have contributed to the prevention of emboli, although emboli are often caused by thrombi.

Differentiating myxoma from a thrombus can pose a significant challenge in the diagnostic process. Contrast-enhanced MRI has been documented to exhibit the highest diagnostic accuracy in distinguishing myxoma from a thrombus [2]. However, our patient presented with severe renal dysfunction, rendering the use of gadolinium contrast media unfeasible. Cardiac MRI findings associated with myxedema have been reported to predominantly display a smooth contour, in contrast to the extensive and irregular contour observed in cases of a thrombus [3]. Considering these factors, we concluded that myxoma was the likely preoperative diagnosis.

Seven case reports have documented the growth rates of right atrial myxomas, estimated through multiple imaging examinations, including those conducted before tumor development, similar to the present case (see Table 1) [4–10]. The growth rate is calculated by dividing the long and short diameters of the largest section by the corresponding time (in months) or by dividing the area by the corresponding time (in months). In the literature, the reported growth rates based on the diameters range from 0.01 cm to 1.36 cm per month and the rates based on the area range from 0.034 cm^2 to 2.5 cm^2 per month; in our case, the growth rates were 0.41 cm × 0.31 cm per month and 1.15 cm^2/month, respectively. Notably, to our knowledge, this case represents an instance of rapid growth of right atrial myxoma in the oldest known patient with this tumor. Despite the advanced age of the patient, the growth rate was comparable to that documented in previous reports. However, left atrial myxoma was reported in an 89-year-old patient that grew to a size of 140.6 mm over a period of 79 months [11].

The present case of right atrial myxoma was characterized by chronic renal failure and advanced age. An analysis of 108 cardiac myxomas, including 12 right atrial myxomas, identified chronic renal failure as an independent predictor of 5-year survival [12]. In this study, the mean age of patients with left atrial myxomas was 57.69 [standard deviation (SD) 0.25] years and that of those with right atrial myxomas was 61.08 (SD 8.63) years. In another study, the ages of patients with left and right atrial myxomas were 50.52 (SD 13.30) and 47.77 (13.20) years, respectively [13]. Furthermore, the mean age of patients with sporadic forms was reported to be over 50 years [14], indicating that the sporadic form of right atrial myxoma is more prevalent than the familial form in elderly patients.

These studies had certain limitations. Previous studies, including ours, commonly assumed that tumor growth commences at the time of the initial examination and progresses linearly between two examination points. However, several studies state that the growth pattern is not linear [10, 15]. Moreover, variations in the accuracy of each examination method have been observed. For instance, computed tomography scans tend to be coarser

Table 1 Published reports with documented right myxoma growth

Study	Year	Age	Sex	Size at diagnosis (cm)	Interval between examination (months)	Reported growth rate	Image modality
Suzuki et al. [2]	1994	13	Male	2.5×0.5	37	0.07 cm cm×0.01 cm per month 0.034 cm^2 per month	US
Goldberg et al. [3]	1997	Early infancy	Female	4.7×2.3	6	0.78 cm×0.38 cm per month 1.8 cm^2 per month	US
Karlof et al. [4]	2006	58	Male	15×3	11	1.36 cm×0.3 cm per month 4.09 cm^2 per month	US
Kelly et al. [5]	2014	71	Male	5.8×5.3	12	0.48 cm×0.44 cm per month 2.5 cm^2 per month	US
Heidari et al. [6]	2018	41	Female	9×6	24	0.375 cm×0.25 cm per month 2.25 cm^2 per month	US
Hsi, et al. [7]	2021	38	Female	3.7×4.8	54	0.069 cm × 0.089 cm per month 0.329 cm^2 per month	CT
Gewehr et al. [8]	2022	69	Female	3.28×3.18	6	0.546 cm×0.530 cm per month 1.74 cm^2 per month	US
Present case		80	Male	3.7×2.8	9	0.41 cm×0.31 cm per month 1.15 cm^2 per month	US

CT, computed tomography; US, ultrasonography

than ultrasonography scans and can be influenced by the slice thickness. The accuracy of ultrasonography examinations also depends on the examiner's skill level. As mentioned earlier, the growth rate was calculated under the assumption that the lesion developed immediately after the presence was confirmed on the initial imaging findings. However, it is possible that the lesion occurred later than the time indicated by the previous examination, potentially leading to an underestimation of the growth rate. Conversely, a microscopic lesion could have been missed during the initial examination, resulting in an overestimation of the growth rate. Despite these assumptions, the methodology employed in this study was the most suitable approach based on real-world clinical observations.

In this case, the tumor that was not visible 9 months earlier had grown to a resectable size within a relatively brief time frame, underscoring the importance of considering the presence of myxomas on echocardiograms for unrelated purposes. Additionally, this case provides valuable insights into the natural progression of right atrial myxoma, a subject for which limited data exists.

Abbreviations

AVF Arteriovenous fistula
CKD Chronic kidney disease

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Author contributions

N.T. and H.N. were contributors in writing the manuscript. M.A., T.K., H.K., R.T., F.S., H.T., and F.K. supervised the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets generated during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. Informed consent for publication was obtained from the patient included in the study.

Consent for publication

Informed consent for publication was obtained from the patient included in the study.

Competing interests

The authors declare that they have no competing interests.

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