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**CASE REPORT**
*Cardiac Imaging*

# Misdiagnosis for right atrial mass: a case report

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**Introduction** Patients with chronic kidney disease undergoing haemodialysis (HD) therapy have high morbidity and mortality, the main causes are cardiovascular events followed by infectious disease. Infectious problems originate from the vascular access, especially when such access is through a central venous catheter.

**Case presentation** We described a 72-year-old man with end-stage renal disease, requiring HD, with fever and purulent discharge at the catheter insertion site. Transthoracic echocardiography revealed a 39 × 27 mm mobile mass in the right atrium. Magnetic resonance imaging showed a 53 × 45 × 36 mm mass suggesting myxoma. The patient underwent surgery and a mass of approximately 5 × 6 cm was found attached to the floor of the right atrium, next to the inferior vena cava outlet, without affecting the tricuspid valve or the interatrial septum. Histopathology reported infected thrombus. This case confirms that sometimes it is difficult to perform a differential diagnosis between intracardiac masses. The patient showed full clinical recovery during this period and was discharged. Currently, he is in good clinical condition and attends follow-up clinic of nephrology, regularly.

**Discussion** In HD patients, a high index of suspicion is very important in the early recognition and management of infective endocarditis. Imaging studies are very useful for the diagnosis of intracardiac masses, but sometimes it is difficult to differentiate one mass from another. In our case, despite the multimodal approach, the histopathological study was the one that gave us the definitive diagnosis.

**Keywords** Intracardiac mass • Echocardiography • Infective endocarditis • Chronic kidney disease • Haemodialysis • Case report

## Learning points

- Patients with chronic kidney disease (CKD) have risk factors that predispose to thrombus and vegetation.
- The central venous catheter, besides being a septic focus, is considered a risk factor that predisposes to the formation of thrombi.
- Patients with CKD have an increased risk of thrombosis and/or atherothrombotic events, such as atrial fibrillation.
- Imaging studies are very useful for performing a differential diagnosis between intracardiac masses.

## Introduction

Patients with chronic kidney disease (CKD) undergoing haemodialysis (HD) therapy have high morbidity and mortality, the main causes are cardiovascular events followed by infectious disease. Infectious problems originate from the vascular access, especially when such access is through a central venous catheter (CVC). The increase in CVC use has led to an increase in the number of cases of infective endocarditis (IE)[1] (up to 9% incidence), being one of the most severe complications and with a worse prognosis, with a mortality of 25–45% during hospitalization and of 46–75% per year.[2] The CVC, besides being a septic focus, is considered a risk factor that predisposes to the formation of thrombi.[3] In addition to this, it has been shown that patients with CKD have an

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increased risk of thrombosis,[4,5] and/or atherothrombotic events, such as atrial fibrillation.[6]

Imaging studies are very useful for the diagnosis of intracardiac masses (tumours, thrombi, or vegetations). However, sometimes it is difficult to differentiate one mass from another, especially in patients with comorbidities and/or high risk factors, such as patients with CKD, which as mentioned above, have risk factors that predispose to both thrombus and vegetations.

## Timeline

| | |
|---|---|
| 1987 | Diabetes mellitus Type 2 |
| 1989 | Systemic arterial hypertension |
| 2012 | Chronic renal disease secondary to diabetic nephropathy |
| 2013 | End-stage renal disease secondary to diabetic nephropathy |
| | Renal substitution therapy in 2013 (starting with peritoneal dialysis modality) |
| 2014 | Migrates from peritoneal dialysis to haemodialysis modality (with right jugular Mahurkar catheter) |
| 25 March 2016 | Intermittent high fever |
| 4 April 2016 | Purulent discharge at the Mahurkar jugular catheter insertion site |
| 7 April 2016 | Vancomycin intravenously was administered and out-patient management is recommended |
| 12 April 2016 | Patient was hospitalized and continued with antibiotic |
| | Right jugular Mahurkar catheter was removed |
| | Left jugular Mahurkar catheter and right femoral access for dialysis were placed |
| 14 April 2016 | Transthoracic echocardiography reported a mobile mass in the right atrium, suggestive of vegetation |
| | *Staphylococcus epidermidis* was identified so meropenem and gentamicin were given for infective endocarditis treatment |
| 2 May 2016 | The patient was referred to National Institute of Cardiology Ignacio Chavez in Mexico City |
| 6 May 2016 | Transthoracic echocardiogram |
| 11 May 2016 | Transoesophageal echocardiogram |
| | Both reported a mobile mass in the right atrium |
| 11 May 2016 | Cardiac magnetic resonance imaging: mobile oval mass attached to the floor of the right atrium suggestive of myxoma |
| 16 May 2016 | The case was discussed in a medical and surgical session, where patient was accepted for tumour surgical resection |
| 18 May 2016 | Surgical resection of the mass and treatment with antibiotic |
| 21 May 2016 | Subcutaneous administration of Enoxaparin 40 mg/24 h |
| 30 May 2016 | Histopathology reported an infected thrombus with Gram-positive bacterial colonies sensitive to cephalothin-prescribed for 2 weeks |
| 31 May 2016 | Repeat transthoracic echocardiogram without evidence of residual right atrial mass and without pericardial effusion |
| 3 June 2016 | Left brachiocephalic arteriovenous fistula |
| 4 June 2016 | Started with acenocoumarol orally |
| 7 June 2016 | Enoxaparin was suspended |
| 13 June 2016 | Last session of haemodialysis with ultrafiltration of 3000 mL |
| 14 June 2016 | Full recovery and discharge with indication of regularly follow-up in the clinic of nephrology in his city and cephalexin 500 mg every 8 h orally, for 4 weeks |
| 29 August 2017 | Last follow-up. Patient in good clinical condition |

*Continued*

## Case report

We present a 72-year-old man with history of systemic arterial hypertension, diabetes mellitus Type 2 and end-stage renal disease, secondary to diabetic nephropathy requiring renal substitution therapy since 2013, initially under peritoneal dialysis modality, migrating to HD with jugular Mahurkar catheter in 2015.

On the 25 March 2016, he started with intermittent high fever and purulent discharge at the Mahurkar catheter insertion site; he was treated with vancomycin without response, for which he was hospitalized in the Medical Centre ISSEMYM Arturo Montiel, Toluca City. During his stay, the right jugular catheter was removed and a left jugular catheter and right femoral vascular access for dialysis were placed. Transthoracic echocardiogram (TTE) reported a mobile mass in the right atrium, suggestive of vegetation that generated severe obstruction of the tricuspid valve. Treatment with meropenem and gentamicin were given for IE as soon the causative agent of infection was identified (Staphylococcus epidermidis) based on MC&S from catheter tip.

On the 29 April 2016, the patient was referred to the National Institute of Cardiology Ignacio Chavez to continue therapeutic and surgical management. At admission he was haemodynamically stable (heart rate (HR) 89/min, blood pressure (BP) 140/90 mmHg, respirtory frequency (RF) 18 r.p.m., and temperature 36.6°C). On ausculation no murmurs were heard and the electrocardiogram (ECG) reported atrial fibrillation with a mean heart rate of 89 b.p.m., without ST segment or T-wave alterations and right bundle brunch block (*Figure 1*). The inflammatory markers at his admission were: C-reactive protein, 161 mg/L (normal ranges 0.00–6.80); erythrocyte sedimentation rate, 86 mm/h (normal ranges 1.00–8.00); and white blood cell, $10 \times 10^3/\mu L$ (normal ranges 4.00–10.5).

Transthoracic echocardiogram revealed a mobile mass of $39 \times 27$ mm in the right atrium, which was corroborated on the transoesophageal echocardiography with dimensions of $40 \times 39$ mm; the mass was attached at the junction of the inferior vena cava outlet and the right atrium, (*Figure 2*). Cardiac magnetic resonance imaging (CMRI) using the sequences T1, T2, T2-short tau inversion recovery (STIR), early gadolinium, and late gadolinium, showed a $53 \times 45 \times 36$ mm mobile oval mass in the right atrium, attached to the floor of the atrium, adjacent to the inferior vena cava outlet, with suggestive characteristics of myxoma (*Figure 3*).

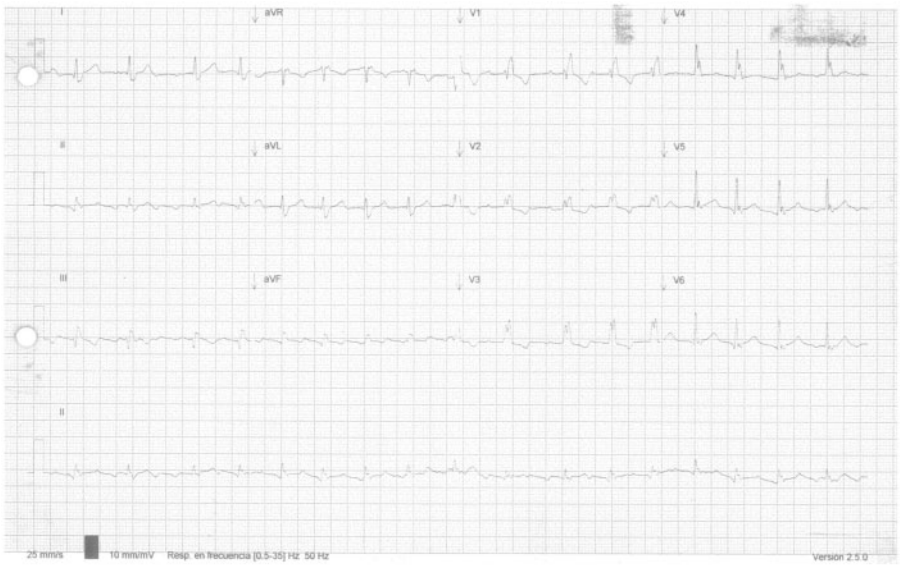


**Figure 1** Atrial fibrillation with a mean heart rate of 89 b.p.m. Right bundle brunch block.

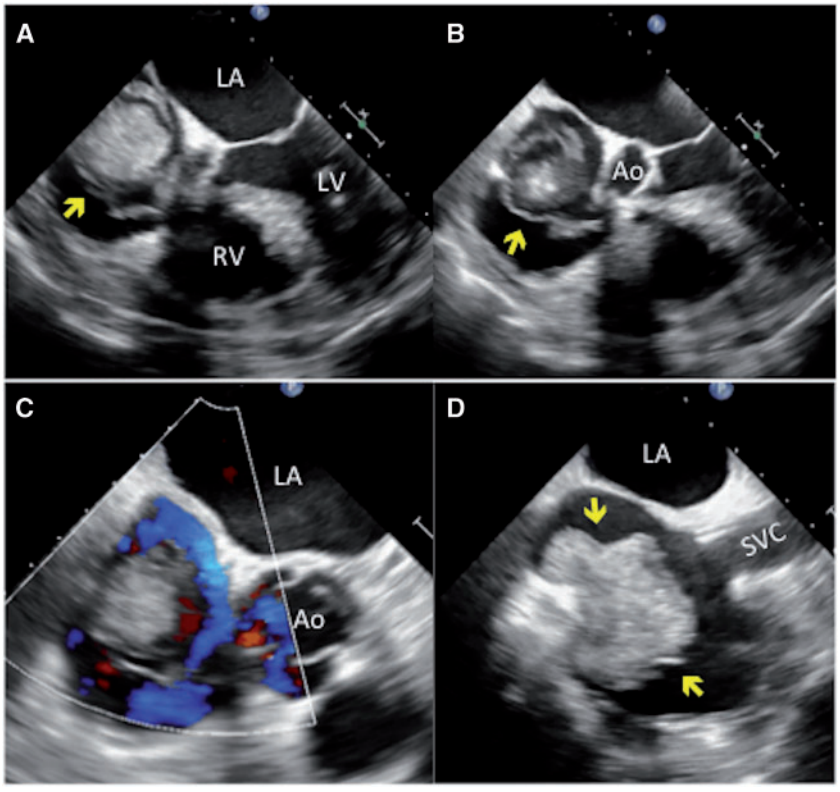


**Figure 2** Transoesophageal bidimensional echocardiography (*A*-0°, *B*-0°, and *D*-95°) showing a mass in the right atrium (yellow arrows) with irregular contour and heterogeneous echogenicity. The mass is avascular with colour flow (*C*-45°). LA, left atrium; LV, left ventricle; RV, right ventricle; Ao, aorta; SVC, superior vena cava.

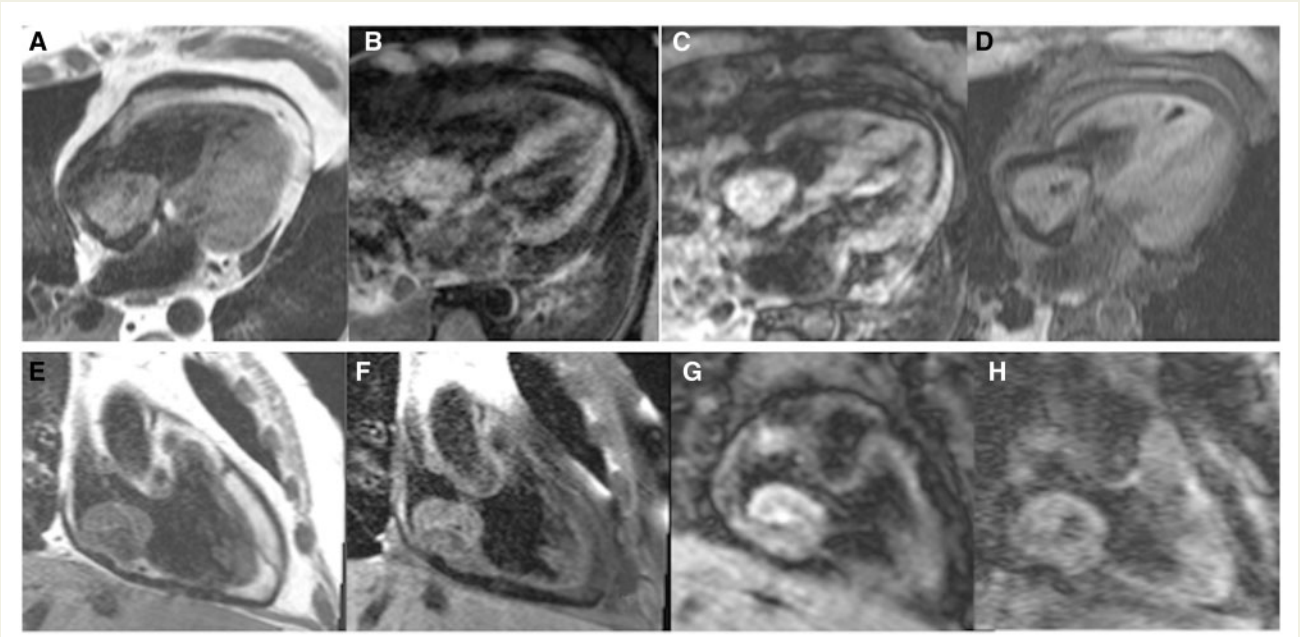


**Figure 3** Magnetic resonance imaging in four chambers (*A–D*) and two chambers of the right cavities (*E–H*). The magnetic resonance imaging showed an oval mobile mass adhered to the floor of the right atrium, adjacent to the inferior vena cava, that measures 53 × 45 × 36 mm. In all the magnetic resonance imaging sequences the mass showed heterogeneous signal intensity. It was predominantly isointense in T1 (*A*, *E*) and T1 fat-sat (*B*, *F*) with hypointense centre. In T2-weighted (*C*, *G*), it was predominantly isointense, with some hyperintense zones and with hypointense centre. In T2* hypointense focus was also identified in the centre of the lesion. Fat content was not identified.

The patient underwent surgery to remove the mass of approximately 5 × 6 cm attached to the floor of the right atrium, next to the inferior vena cava outlet, without affecting the tricuspid valve, or the interatrial septum. The histopathological report gave the diagnosis of infected thrombus with Gram-positive bacterial colonies (*Figure 4*) sensitive to cefalotin, antibiotic was given for 2 weeks and also enoxaparin 40 mg/24 h our, and before discharge acenocoumarol was added guided by International normalised ratio (INR) in order to suspend enoxaparin. The repeat TTE performed on 31 May 2016, showed no evidence of residual mass in the right atrium. The patient showed full clinical recovery during this period and was discharged on 14 June 2016. No adverse and unanticipated events were detected in the regular follow-up at the nephrology clinic and cephalexin 500 mg was continued every 8 hrs orally, for 4 weeks. The most recent follow-up was on 29 August 2017 and the patient is in good clinical condition.

## Discussion

In our case, because of the history of IE and purulent discharge at the catheter insertion site, it was initially suspected that the mass was vegetation, however, on heart auscultation, no murmurs were heard and the TTE reported a structurally normal tricuspid valve, without lesions or presence of vegetations. Even though, on *Figure 2D* the mass looks pedunculated and may suggested a myxoma, in most cases, myxomas usually arise from fossa ovalis of the interatrial septum and protrude into the atrium; also our patient was in atrial fibrillation and had dilatation of both atrial cavities, findings that give us a strong suspicion of thrombus.[7]

Imaging studies are very useful for the diagnosis of intracardiac masses (myxoma, thrombus, and infected thrombus), but sometimes it is difficult to differentiate one mass from another.[8–14]

Cardiac magnetic resonance imaging showed a 53 × 45 × 36 mm mobile oval mass in the right atrium, attached to its floor, adjacent to the inferior vena cava outlet, with suggestive features of myxoma. The superior tissue characterization capability of CMRI is able to determine the nature of some tumours pre-operatively and performs well in differentiating myxomas from thrombus. The different composition of myxoid tissue, fibrous tissue, blood, and haemorrhagic breakdown products contained within myxomas result in significant variability of signal characteristics exhibited by these lesions on CMRI (*Table 1*).[13–15]

Thrombus represents the principle differential diagnosis for myxomas. The age of the thrombus determines its CMRI signal characteristics. Acute thrombus, predominantly containing oxyhaemoglobin return intermediate signal on T1- and T2-weighted sequences. As the thrombus becomes more organized, the water content diminishes and the methaemoglobin rich cellular fragments are replaced by fibrous tissue. Chronic thrombi return low signal on T1- and T2-weighted sequences. Contrast enhanced sequences: first pass perfusion and late gadolinium enhancement is important in distinguishing myxomas from thrombus. Thrombi are avascular masses and therefore, do not typically enhance on first pass perfusion. Early gadolinium at inversion times of 550–650 typically shows the thrombus to appear dark.[9,16]

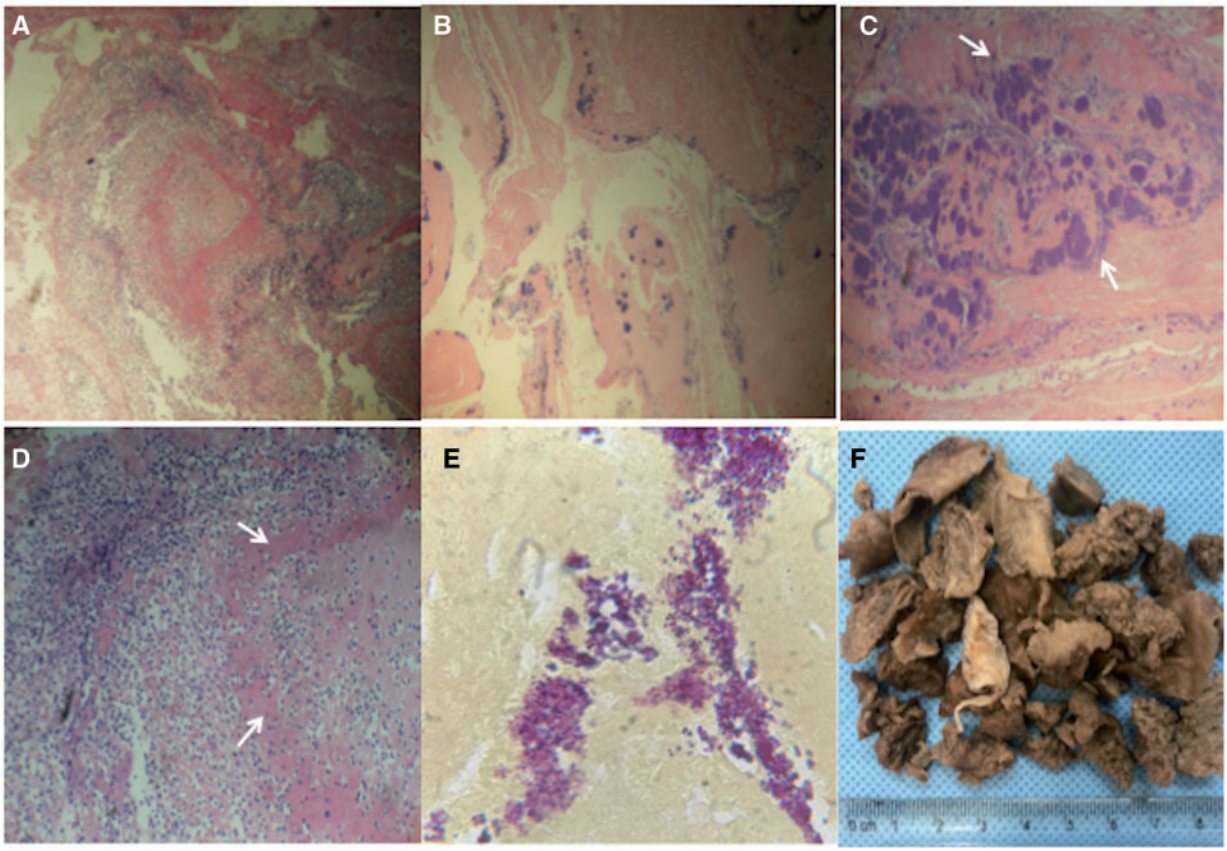


**Figure 4** (*A* and *B*) Laminated thrombus with fibrin (HE 10×). (*C*) Some areas of thrombus with purple bacterial colonies (arrows) (HE 10×). (*D*) Necrotic areas (arrows) with leucocyte infiltrate (HE 40×). (*E*) Gram-positive cocci that form grapelike clusters (Gram HE 100×). (*F*) Fragmenting thrombus with a total weight of approximately 20 g. They are blackish brown with whitish areas and friable consistency. HE: hematoxylin eosin staining.

**Table 1 Cardiac magnetic resonance imaging sequences for differential diagnosis of myxoma, thrombus, and infected thrombus**

| MRI weighted sequences | Myxoma | Thrombus | Infected thrombus |
|---|---|---|---|
| T1 | Isointensity signal | Low to intermediate signal<br>Acute thrombus-Intermediate signal<br>Chronic thrombus-Low signal | Low to high signal |
| T2 | High signal | Low to intermediate signal<br>Acute thrombus-intermediate signal<br>Chronic thrombus-low signal | Low to high signal |
| T2* | Isointensity signal | Hypointensity signal (if acute) | Isointensity signal |
| T2-STIR | High signal intensity indicates a high water content caused by active inflammation and/or oedema | Low (if acute-high) | Low signal |
| T2 fat-Sat | High signal | Isointensity signal | Isointensity signal |
| Early perfusion | Lower vascularity | Avascularity | Avascularity |
| Early gadolinium | Minimal early contrast enhancement of the mass | No uptake | No uptake |
| Late gadolinium | No late enhancement (important discriminator from a thrombus) | No uptake | No uptake |

MRI: magnetic resonance imaging; STIR: short tau inversion recovery.

Infected thrombus returns isointensity signal on T1, T2, and T2*. For this reason, we wanted to summarize some of the CMRI characteristics that can help us reach the aetiological diagnosis (*Table 1*).[10–12]

In our case, the behaviour of the CMRI sequences were similar for both myxoma and thrombus and no contrast media was administered, that could have helped us in establishing the differential diagnosis between myxomas and thrombus, because our patient has CKD and this would have represented a risk of nefrogenic systemic fibrosis.

# Conclusion

In HD patients a high index of suspicion is very important in the early recognition and management of IE. Imaging studies are very useful for the diagnosis of intracardiac masses, but sometimes it is difficult to differentiate one mass from another. In our case despite the multimodal approach, the histopathological study was the one that gave us the definitive diagnosis.

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**Consent:** The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

**Conflict of interest**: none declared.

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