Case Report

Primary Cardiac Lymphoma: Role of Imaging Multimodality in Diagnosis

Linfoma Cardíaco Primário: o Papel da Multimodalidade de Imagem na Abordagem Diagnóstica

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Abstract

Intracardiac masses are a diagnostic challenge since their symptoms can be common to cardiovascular pathologies. Some methods, whether invasive or not, enable differential diagnosis, histological confirmation, and adequate treatment. To better understand the importance of imaging multimodality and the approach to managing cardiac tumors, we investigated a case of a primary cardiac lymphoma in which the multidisciplinary approach allowed rapid diagnosis and treatment, including of intercurrences, with a promising initial response despite fatal progression due to severe acute respiratory syndrome coronavirus 2 infection.

Introduction

Intracardiac masses are a diagnostic challenge as their symptoms can be common to cardiovascular pathologies. Diagnostic methods, whether invasive or not, enable differential diagnosis, histological confirmation, and adequate treatment. To better understand the importance of imaging multimodality and the approach to managing cardiac tumors (CTs), here we report the clinical case of a patient with a mass in the right atrium (RA).

Case report

An 82-year-old woman with nonspecific symptoms was admitted for investigation on March 10, 2020. She denied any oncological history. The patient was emaciated, pale, eupneic, and hemodynamically stable. Laboratory tests showed mildly increased lactic dehydrogenase (LDH) and C-reactive protein (CRP) levels. It also demonstrated negative HIV and negative tumor marker serology. An electrocardiogram (ECG) revealed sinus rhythm with ventricular extrasystole. Computed tomography of the chest showed a dilated suprahepatic vena cava/right atrium (RA). The assessment was limited by the absence of contrast, with an axial diameter of 5.9 cm and no lymphadenopathy identified. Cardiac magnetic resonance imaging (MRI) revealed RA enlargement and the presence of a mass measuring 3.7 × 1.5 cm in the proximal region of the superior vena cava (SVC). Heterogeneous perfusion and delayed enhancement were noted in addition to tissue characterization suggestive of a neoplastic origin (Figure 1A). Fluorodeoxyglucose (^{18}FDG) positron emission tomography CT (PET/CT) showed increased uptake in the para-caval and lateral RA region (maximum standardized uptake value, 18.8) (Figure 1B). Transesophageal echocardiography (TEE) showed a sessile echo-dense image with no cleavage plane on the RA wall close to the SVC outflow measuring 4.1 × 1.7 cm with subsequent endocardial biopsy (Figures 1C–E). A pathological examination identified high-grade B-cell non-Hodgkin's lymphoma and positive immunohistochemistry for BCL-2, Bcl-6, CD10, CD20 (Pan B), LCA (CD45), and Ki 67 (MIBI-1, positive in 95% of neoplastic cells) (Figure 2). The proposed treatment was cytoreduction with dexamethasone 20 mg for 4 days, followed by six cycles of R-mini-CHOP (rituximab 375 mg/m^2, doxorubicin 25 mg/m^2, vincristine 1 mg, cyclophosphamide 400 mg/m^2, and prednisone 60 mg from D1 to D5) with a 21-day interval and the first cycle divided into two stages. The patient presented with complete atrioventricular block (CAVB) on D4 for which a definitive pacemaker was indicated. She was discharged from the hospital after completing the first treatment cycle. Control TEE performed after two cycles of chemotherapy showed mass reduction (1.4 × 0.7 cm) with increased echo density (Figure 1F). She was readmitted on June 16, 2020 with respiratory failure due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Transthoracic echocardiography (TTE) showed no evidence of the mass in the RA, and she died on June 27, 2020.

Discussion

CTs are infrequent, while primary CTs (PCTs) are even rarer, with an incidence of 0.05% on autopsies, while metastatic tumors are 20–40 times more frequent. About 90% of PCTs are benign (myxomas, lipomas, fibroelastomas, etc.), while the other 10% are malignant, of which 95% are sarcomas and 5% are lymphomas and mesotheliomas. Primary cardiac lymphoma (PCL) represents 1.3% of PCTs, while a CT secondary to disseminated lymphoma occurs in 9–24% of cases.[1-3] PCL is more frequent in women, especially in those after the fifth decade of life and those with immunocompromised status (acquired immunodeficiency syndrome or post-transplant immunosuppression).[4]

Clinical presentations are nonspecific, including chest pain, arrhythmia, congestion, pericardial effusion, SVC syndrome,

Keywords

Cardiovascular Diseases, Echocardiography, Lymphoma.

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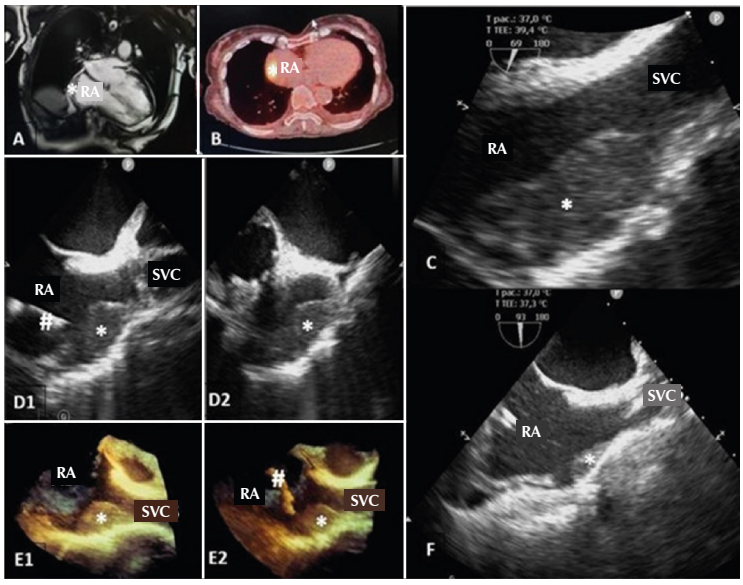

** mass; # biotome; RA right atrium, SVC superior vena cava.*

Figure 1 – *A- Cardiac MRI 4 Chambers. B- PET/CT with 18FDG. C e D - TEE 2D bicaval. E- TEE 3D bicaval. F- TEE 2D bicaval.*

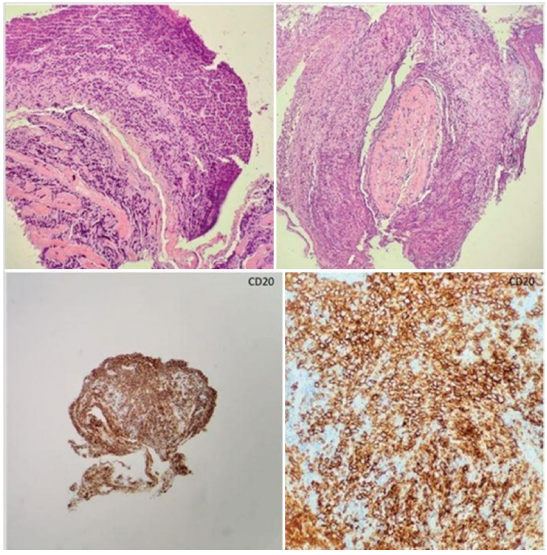

Figure 2 – *Upper images Hematoxylin and eosin stain: Large lymphocytes with prominent cytoplasm and nucleoli. Lower images High-grade non-Hodgkin's B-cell lymphoma, immunohistochemistry CD20 (+) which may indicate suitability for treatment with rituximab.*

and sudden death.[2] Laboratory findings include leukocytosis, neutrophilia, increased erythrocyte sedimentation rate, CRP, LDH, ß2-microglobulin, and carcinoembryonic antigen. No single ECG finding is considered diagnostic, with ventricular or supraventricular arrhythmias and atrioventricular block being the most common. Chest radiography may show an increased cardiac area (mainly in the RA), pleural effusion, and pulmonary congestion.[3]

Echocardiography allows the rapid noninvasive assessment of the PCL and is usually the initial approach. TTE has a sensitivity of 55–60%, while TEE reaches 97–100%. The PCL presents as a homogeneous infiltrative mass with a broad base located in the right cavities, predominantly in the RA, and can invade nearby structures. It usually presents with

pericardial effusion. The use of ultrasound contrast allows a differential diagnosis with non-vascularized masses (thrombi), as the presence of perfusion suggests malignant tumors (hypervascularity).[5] CT assesses the extent of the mass and its relationship with cardiac and extracardiac structures, such as a low- or normal-density epicardial or myocardial infiltrative mass.[3, 5, 6] On cardiac MRI, the lesions are poorly defined with delayed enhancement (unlike sarcomas that present with necrosis). Tissue characterization, a vascularization study, and the definition of myocardial and pericardial infiltration show the possibility of a cardiac tumor. PCL presents iso- or high-intensity signals on T2 and iso- or low-intensity signals on T1 images. Pericardial inversion-recovery images may show a high-intensity signal in the pericardial fluid suggestive of malignancy. Being located in the RA, having a diameter greater than 5 cm, the presence of a hemorrhagic pericardial effusion, and late enhancement are also suggestive of malignancy. Comparatively, MRI has higher sensitivity than CT (90–92% vs. 71–73%, respectively).[3] Hypermetabolism on ^{18}FDG PET/CT is suggestive of a malignant tumor.[3,7]

A definitive diagnosis comes from the histological study of the mass or a cytological analysis of the pericardial fluid (positive in 2/3 of cases); a biopsy of the mass can be collected and analyzed by interventional (endovascular) or surgical cardiology.[2,3] Diffuse B-cell lymphoma is the most common histological type (80% of cases), followed by follicular, Burkitt, and T-cell lymphoma.[2,3] Surgical biopsy is chosen in cases of hemodynamic instability (cardiac tamponade, superior or inferior vena cava syndrome, and blood flow obstruction) and left-chamber tumors (to minimize embolic risk). In other situations, the endovascular biopsy can be guided by intracardiac or transesophageal echocardiography as in the case presented here.[6,8]

Complete surgical resection is usually very difficult, being restricted to cases with great hemodynamic repercussions.[9] The R-CHOP regimen, the most commonly used clinical treatment protocol, significantly impacts survival. Increased complications such as arrhythmias, atrioventricular block, myocardial wall rupture, and death soon after the start of chemotherapy have been described. Of the proposed approaches to minimizing such risks, pre-treatment with corticosteroids and vincristine, a 50% reduction in the initial dose of cyclophosphamide and doxorubicin, and, more commonly, fractionation of the first cycle into two steps with a 15-day interval similar to we what we did here, is required.[4,10] The response is favorable in 79% of cases, with complete remission achieved in 59%.[9,10] Treatment responses can be assessed as reduced tumor burden on echocardiography or MRI and by reduced metabolic activity on PET/CT.[3,5,10]

PCL behaves aggressively, resulting in death in a few months when not properly treated. On the other hand, compared to other malignant tumors, it responds favorably to treatment with improved long-term survival.[4] Immunodeficiency, extracardiac involvement, left ventricular involvement, and presence of arrhythmia are markers of a worse prognosis.[4] Disease-free survival increased from 12 to 24 months after rituximab was included in the chemotherapy treatment.[4,10]

Conclusion

Here we reported a case of PCL in which the multidisciplinary approach allowed rapid diagnosis and treatment, including intercurrence, with a promising initial response despite fatal progression due to SARS-CoV-2 infection.

Authors' contribution

Manuscript design, data collection, writing, and critical review: Souza JWPS, Alvares LTA, Gonçalves MPR, Paiva ABAG, Ferreira RL, Paiva MG

Conflict of interest

The authors have declared that they have no conflict of interest.

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