World Journal of Cardiovascular Diseases, 2024, 14, 723-729
https://www.scirp.org/journal/wjcd
ISSN Online: 2164-5337
ISSN Print: 2164-5329

From Diagnosis to Recurrence: Primary Cardiac Myxofibrosarcoma, A Diagnostic and Therapeutic Challenge

Maria Jose Santa-Ana-Bayona[1], Camila Ponce-Acosta[1], Gilberto H. Gutierrez-Acosta[2], Pavel Martinez-Dominguez[3], Mauricio Garcia-Cardenas[4], Enrique Ruiz-Mori[4], Enrique C. Guerra[5], Ruben Alejandro Leon-Laredo[6], Nilda Espinola-Zavaleta[7,8]

[1]Mexican Faculty of Medicine, La Salle University, Mexico City, Mexico
[2]Institute of Biomedical Sciences, Autonomous University of Ciudad Juarez, Ciudad Juarez, Mexico
[3]Faculty of Medicine and Biomedical Sciences, Autonomous University of Chihuahua, Chihuahua City, Mexico
[4]Department of Cardiology, National Institute of Neoplastic Diseases, Lima, Peru
[5]MD-PhD (PECEM) Program, School of Medicine, National Autonomous University of Mexico, Mexico City, Mexico
[6]Department of Health Sciences, Anahuac University, Mexico City, Mexico
[7]Department of Nuclear Cardiology, National Institute of Cardiology Ignacio Chávez, Mexico City, Mexico
[8]Department of Echocardiography, ABC Medical Center, Mexico City, Mexico
Email: niesza2001@hotmail.com

How to cite this paper: Santa-Ana-Bayona, M.J., Ponce-Acosta, C., Gutierrez-Acosta, G.H., Martinez-Dominguez, P., Garcia-Cardenas, M., Ruiz-Mori, E., Guerra, E.C., Leon-Laredo, R.A. and Espinola-Zavaleta, N. (2024) From Diagnosis to Recurrence: Primary Cardiac Myxofibrosarcoma, A Diagnostic and Therapeutic Challenge. *World Journal of Cardiovascular Diseases*, **14**, 723-729.
https://doi.org/10.4236/wjcd.2024.1412064

Received: October 28, 2024
Accepted: December 2, 2024
Published: December 5, 2024

Abstract

Introduction: Primary cardiac myxofibrosarcoma (MFS) is a rare and aggressive malignancy, with limited treatment options and a high recurrence rate. Multimodal imaging is critical for diagnosis, and surgery remains the primary treatment, though recurrence is common. **Case Presentation:** We present the case of a 41-year-old male with history of intermittent chest pain and palpitations. Initial work-up revealed a left atrial mass, which after thorough evaluation with multimodal imaging and histopathological assessment, was diagnosed as a primary cardiac myxofibrosarcoma. Despite complete surgical resection and low-grade histology, recurrence ensued, prompting reintervention and adjuvant radiotherapy. **Discussion:** Cardiac MFS poses significant diagnostic challenges. Multimodal imaging and immunohistochemistry are key to diagnosis. While surgery is the mainstay of treatment, high recurrence rates necessitate consideration of adjuvant therapies and long-term monitoring. **Conclusion:** This case highlights the importance of differential diagnosis of intracardiac masses, as well as reaching a consensus regarding the approach for malignant cardiac tumors.

Keywords

Myxofibrosarcoma, Primary Cardiac Tumors, Left Atrial Mass, Multimodal Imaging

1. Introduction

Primary cardiac tumors are a rare entity, with most cardiac neoplasms being secondary, representing approximately 90% of cases. Among primary cardiac tumors, only about 10% are malignant in nature [1]. Myxofibrosarcomas (MFS) are rare malignant tumors originating from mesenchymal tissue, typically occurring in the extremities of elderly patients and infrequent within the cardiac chambers. These tumors are notorious for their infiltrative growth pattern, which contributes to their aggressive clinical behavior and high recurrence rates, posing significant challenges in both treatment and prognosis [2].

The clinical presentation of cardiac MFS is highly variable, and patients can remain asymptomatic for extended periods, delaying diagnosis. When symptoms do appear, they tend to be non-specific, including dyspnea, palpitations, chest pain, and syncope [3]. In advanced stages, MFS may lead to heart failure due to obstruction or infiltration of cardiac structures, along with systemic complications such as embolization or metastasis.

Given the diagnostic challenges, a multimodal imaging approach is critical for accurately characterizing cardiac MFS. Echocardiography, cardiac computed tomography (CCT), and cardiac magnetic resonance (CMR), help characterize the mass, evaluate its extent, and assess its impact on cardiac function. However, histopathological examination is essential for definitive diagnosis. Unfortunately, the prognosis for patients with cardiac MFS is generally poor, with high rates of recurrence and metastasis, underscoring the need for effective treatment strategies, as well as comprehensive follow-up protocols, to improve outcomes in this rare but extremely aggressive malignancy.

2. Case Presentation

A 41-year-old male presented to the outpatient clinic with episodic chest pain and palpitations over the past six months. He had no significant medical history, particularly no cardiovascular disease, or pertinent family history. Clinical examination revealed a pansystolic murmur II/VI over the apex, resembling mitral regurgitation.

Initial electrocardiogram, routine blood tests and cardiac biomarkers revealed no abnormalities. Nevertheless, a transthoracic echocardiogram (TTE) showed a 27.4 × 16.4 mm, immobile, oval-shaped mass with irregular borders in the posterolateral wall of the left atrium (LA). A slight increase in thickness of the mitral valve leaflets was observed, and pulmonary hypertension was deemed unlikely. Biventricular systolic function was normal (LVEF 59%, TAPSE 21 mm). Considering secondary cardiac tumors being more prevalent, a chest, abdominal, and pelvic CT was indicated to identify a primary malignancy. The patient denied dyspnea, cough, dizziness, syncope, headache, or leg swelling, as well as weight loss, fever or arthralgias that could suggest a paraneoplastic syndrome, making this diagnosis less likely. After ruling out a primary extracardiac tumor, the most common non-malignant primary cardiac tumors such as myxomas, papillary fibroelastomas

or lipomas were considered. Multimodal imaging was further conducted to detail the tumor's characteristics and determine its possible benign or malignant origin. CCT (Figure 1) revealed an oval mass in the LA (50 mm × 31 mm) invading the left inferior pulmonary vein and protruding into the left ventricle; arterial phase showed heterogeneous density suggesting hemorrhage or necrosis, late phase demonstrated central enhancement and partial involvement of the posterior mitral valve. CMR (Figure 2) identified an irregular fusiform mass (37.1 mm × 20.1 mm × 17 mm) in the lateral and posterior walls of the LA, involving the base of the LA appendage and the left inferior pulmonary vein. It appeared hypointense on CINE sequence, isointense on T1, and hyperintense on T2W (Figure 2(A)) and T2-STIR (Figure 2(B)), with no saturation on FAT-SAT pulse. Marked late enhancement of the tumor was observed, displaying a heterogeneous pattern with peripheral predominance and a hypointense core related to focal hemorrhage and necrosis (Figure 2(C)).

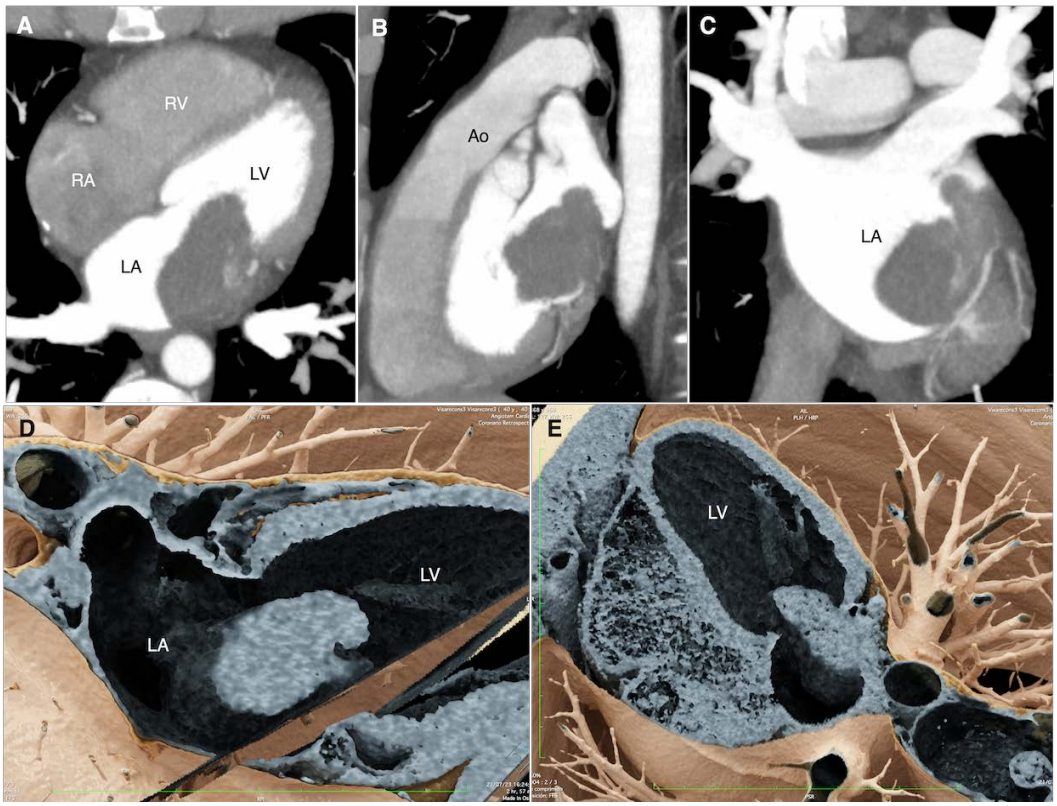

Figure 1. Cardiac computed tomography. (A) Four-chamber view, (B) Sagittal view, and (C) Coronal view showing LA mass protruding into LV. (D and E) 3D-Reconstruction, Volume Rendering. (D) Two-chamber view, and (E) Four-chamber view. revealing LA mass adhered to the posterolateral wall. Ao: aorta; LA: left atrium; LV: left ventricle; RA: right atrium; RV: right ventricle.

Given its malignant features, surgical intervention was scheduled for complete tumor resection. Subsequent histopathological examination of the excised tumor revealed the presence of spindle-shaped cells in a fascicular pattern with a myxoid background. Immunohistochemistry was positive for smooth-muscle actin (SMA)

(Figure 3(A)), CD34 (Figure 3(B)) and negative for calretinin (Figure 3(C)) and epithelial membrane antigen (EMA) (Figure 3(D)). Ki-67 was <10%, diagnosing a cardiac low-grade MFS.

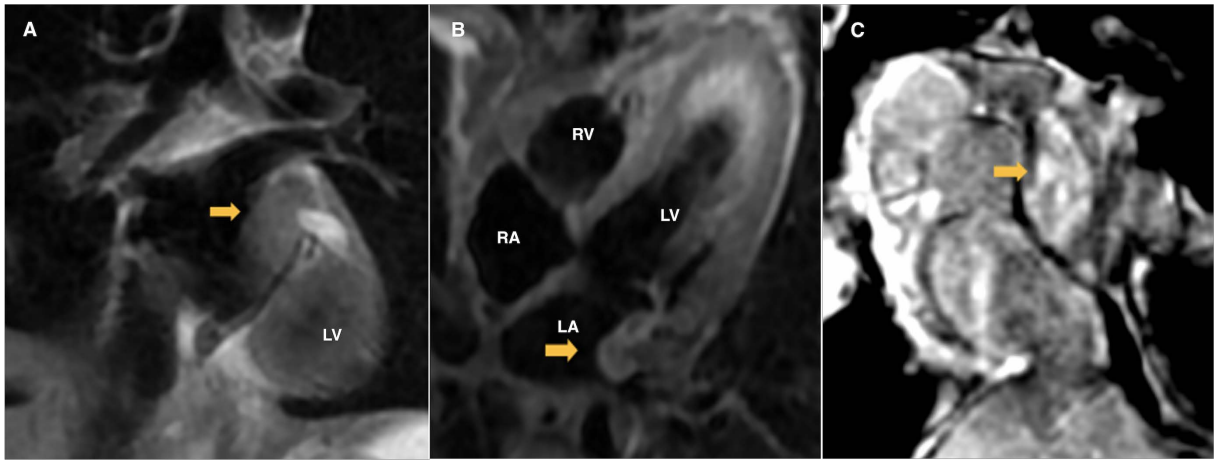

Figure 2. Cardiac Magnetic Resonance. (A) T2W, and (B) T2 STIR, showing a hyperintense mass (arrow). (C) Late gadolinium enhancement revealing a heterogeneous pattern with peripheral predominance and hypointense core suggesting hemorrhage or necrosis (arrow). LA: left atrium; LV: left ventricle; RA: right atrium; RV: right ventricle.

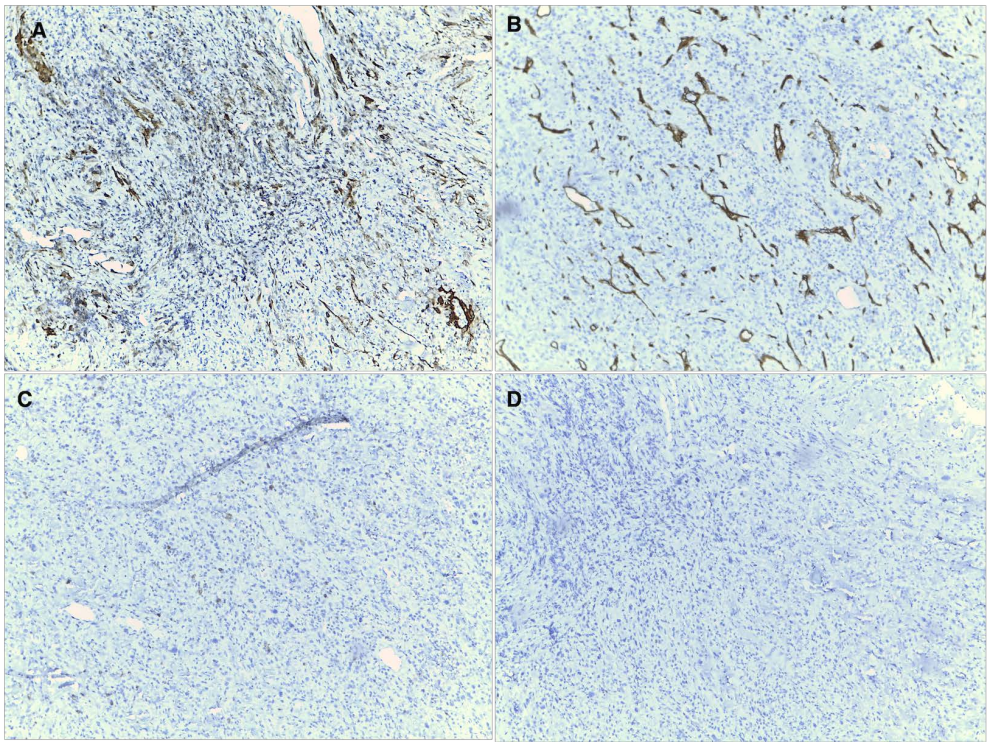

Figure 3. Histopathology of tumor. (A and B) Immunohistochemical tests with positive tumor cells for alpha-SMA and CD-34. (C and D) Immunohistochemical tests showing negative tumor cells for calretinin and EMA.

Decision-making process regarding adjuvant therapy involved careful consideration of the tumor's characteristics and the patient's overall condition. Given

the tumor's low-grade histology, and the absence of supporting evidence for chemo- or radiotherapy in this context, adjuvant therapy was not given to the patient; however, close follow-up was strictly recommended.

The patient underwent close surveillance to monitor recurrence and metastasis. Follow-up echocardiography was planned to be performed every six months. During the initial follow-up consultation, physical examination showed no recurrence signs, however the patient reported being able to carry out light work activities, but unable to engage in any strenuous activities. Six months after surgical intervention, a transthoracic echocardiogram showed the recurrence of the cardiac tumor, presenting similar characteristics as the first one. Subsequently, the patient underwent surgery and received adjuvant therapy with stereotactic body radiation therapy with 3500 cGy in five sessions, which was well tolerated. The patient was evaluated one month later with a new echocardiogram with findings corresponding to surgical interventions. However, regarding the patient's clinical state, a close monitoring was recommended.

3. Discussion

Primary cardiac MFSs are exceedingly rare tumors, documented predominantly through isolated case reports. These tumors rarely arise within cardiac chambers; however, when they do, the LA is most frequently involved [4], as observed in this case. Noteworthy, reported cases have documented cardiac MFS arising from right chambers, pulmonary artery, and left ventricle [3].

Due to the rarity and aggressive nature of cardiac MFS, early and accurate diagnosis is critical, yet challenging, as clinical presentation is widely variable, depending on the tumor's size, location and metastasis. The most reported presentation is dyspnea and syncope, with other cases showing pleural effusion and heart failure [3] [5].

Multimodal imaging plays a pivotal role in the initial assessment, aiding in the differential diagnosis between benign and malignant cardiac masses [5]. TTE and transesophageal echocardiography, provide characterization of tumor morphology, extent, and assessment of hemodynamic repercussions [1] [6]. Furthermore, CCT is useful in evaluating the tumor relationship with adjacent structures and CMR may provide valuable information regarding histopathology and features indicative of malignancy such as necrosis, calcification, fat infiltration, fibrosis, or hemorrhage, as seen in our patient [3] [6].

Given the absence of specific clinical features and multimodal imaging profiles, immunohistochemistry assumes paramount importance in the diagnosis of primary cardiac MFS. In our case, SMA, vimentin and CD34, emerged as positive markers, consistent with prior studies on cardiac MFS, whereas calretinin, EMA, cytokeratin, desmin, CD31 and S-100 protein yielded negative results [3].

Surgical resection remains the cornerstone of treatment for cardiac MFS management, as highlighted in a study by Sun *et al.*, although the efficacy and role of adjuvant chemo and radiotherapy is uncertain. However, the documented recurrence and distant metastasis rate stand at 42.9% and 19.0%, respectively, underscoring

the aggressive nature of this tumor [3]. In the presented case, the decision to forego adjuvant therapies initially reflected current evidence questioning their benefit, especially in low-grade MFS. Despite advancements, a consensus regarding the optimal approach to cardiac MFS remains elusive, prompting the need for further investigation, especially given the high propensity for recurrence and metastasis.

4. Conclusion

A cardiac MFS is an extremely rare condition that might resemble non-malignant and more common primary cardiac tumors. Multimodal imaging is crucial to determine further evaluation, potential treatment, and differential diagnosis. Despite having limited evidence and surgery being the mainstay of treatment for these tumors, adjuvant therapies should be considered due to the aggressive nature of the tumor, and high rate of recurrence or metastasis, as occurred in our patient. Additionally, close follow-up with imaging evaluation is imperative to detect potential tumor regrowth.

Consent

Written consent was obtained from the patient for elaboration and publication of this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Tyebally, S., Chen, D., Bhattacharyya, S., Mughrabi, A., Hussain, Z., Manisty, C., *et al.* (2020) Cardiac Tumors. *JACC*: *CardioOncology*, **2**, 293-311. https://doi.org/10.1016/j.jaccao.2020.05.009

[2] Widemann, B.C. and Italiano, A. (2018) Biology and Management of Undifferentiated Pleomorphic Sarcoma, Myxofibrosarcoma, and Malignant Peripheral Nerve Sheath Tumors: State of the Art and Perspectives. *Journal of Clinical Oncology*, **36**, 160-167. https://doi.org/10.1200/jco.2017.75.3467

[3] Sun, D., Wu, Y., Liu, Y. and Yang, J. (2018) Primary Cardiac Myxofibrosarcoma: Case Report, Literature Review and Pooled Analysis. *BMC Cancer*, **18**, Article No. 512. https://doi.org/10.1186/s12885-018-4434-2

[4] Azuma, R., Sato, K., Sunadoi, H., Ishii, Y., Tomaru, U. and Motohashi, M. (2023) Primary Cardiac Myxofibrosarcoma of the Left Atrium and Pericardium: A Case Report. *Journal of Cardiothoracic Surgery*, **18**, Article No. 334. https://doi.org/10.1186/s13019-023-02441-9

[5] Ujihira, K., Yamada, A., Nishioka, N., Iba, Y., Maruyama, R., Nakanishi, K., *et al.* (2016) A Case Report of Primary Cardiac Myxofibrosarcoma Presenting with Severe Congestive Heart Failure. *Journal of Cardiothoracic Surgery*, **11**, Article No. 95. https://doi.org/10.1186/s13019-016-0490-3

[6] Șerban, A., Dădârlat-Pop, A., Tomoaia, R., Trifan, C., Molnar, A., Manole, S., *et al.* (2023) The Role of Multimodality Imaging in the Diagnosis and Follow-Up of Malignant Primary Cardiac Tumors: Myxofibrosarcoma—A Case Report and Literature Review. *Diagnostics*, **13**, 1811. https://doi.org/10.3390/diagnostics13101811

Abbreviations

Cardiac computed tomography (CCT); Cardiac magnetic resonance (CMR); Epithelial Membrane Antigen (EMA); Left atrium (LA); Myxofibrosarcomas (MFS); Transthoracic echocardiogram (TTE); Smooth muscle actin (SMA).