



Echocardiography in the Study of Cardiac tumors: Case Series and review

Échocardiographie dans l'étude des tumeurs cardiaques : série de cas et revue de la littérature

Messaoudi Yosra ; MD^{1,2}, Haggui Alaa ; MD^{1,2}

1. Université de Sousse, Faculté de médecine de Sousse, 4002, Sousse, Tunisie
2. Department of cardiology Ibn El jazzar hospital, 3100, Kairouan Tunisia

SUMMARY

Background: Cardiac masses include benign and malignant primary tumors, metastatic lesions, and pseudotumors. Early recognition is crucial due to risks such as obstruction, embolic events, tamponade, or heart failure.

Aim: To describe the experience of a tertiary cardiac in managing cardiac tumors with emphasis on the role of echocardiogram

Methods: Retrospective observational study conducted in the cardiology department of Ibn El Jazzar University Hospital of Kairouan (Tunisia) from January 2020 to December 2025. we analyzed a series of 10 cardiac tumors over a period of 6 years, with reference to clinical, radiological, morphological, and histopathological findings

Results: Ten cases (age 8 to 70 years) were reviewed, and images selected for presentation. Nine patients have histopathologic confirmation: one primary angiosarcoma, two fibroelastoma, four atrial myxomas, one interatrial septum lipoma and two cases of metastatic disease.

Echocardiography oriented the diagnosis in most cases.

Conclusion: Echocardiography is essential as a first-line modality for cardiac masses, effective for benign tumors but requiring complementary imaging for malignancies.

KEYWORDS

cardiac, neoplasia, Echocardiography, cardiac myxoma, angiosarcoma

RÉSUMÉ

Introduction : Les masses cardiaques comprennent les tumeurs primitives bénignes et malignes, les lésions métastatiques ainsi que les pseudotumeurs. Leur reconnaissance précoce est essentielle en raison du risque de complications graves telles que l'obstruction intracardiaque, les événements emboliques, la tamponnade cardiaque ou l'insuffisance cardiaque.

Objectif : Décrire l'expérience d'un centre tertiaire de cardiologie dans la prise en charge des tumeurs cardiaques, avec un accent particulier sur le rôle de l'échocardiographie dans leur diagnostic.

Méthodes : Nous avons réalisé une étude observationnelle rétrospective au service de cardiologie de l'Hôpital Universitaire Ibn El Jazzar de Kairouan (Tunisie) entre janvier 2020 et décembre 2025. Nous avons analysé une série de dix cas de tumeurs cardiaques identifiées sur une période de six ans, en nous référant aux données cliniques, radiologiques, morphologiques et histopathologiques.

Résultats : Dix cas (âge compris entre 8 et 70 ans) ont été analysés et des images représentatives ont été sélectionnées pour présentation. Une confirmation histopathologique a été obtenue chez neuf patients. Les tumeurs comprenaient un angiosarcome primitif, deux fibroélastomes papillaires, quatre myxomes de l'oreille, un lipome du septum interauriculaire et deux cas d'atteinte cardiaque métastatique. L'échocardiographie a orienté le diagnostic dans la majorité des cas.

Conclusion : L'échocardiographie demeure l'examen d'imagerie de première intention dans l'évaluation des masses cardiaques. Elle est particulièrement efficace pour l'identification des tumeurs bénignes, bien que des examens d'imagerie complémentaires soient souvent nécessaires pour la caractérisation des lésions malignes.

MOTS-CLÉS

Tumeurs cardiaques, néoplasies cardiaques, échocardiographie, myxome auriculaire, angiosarcome.

Correspondance

Dr Messaoudi Yosra
Email: messaoudiyosra@gmail.com

INTRODUCTION

Cardiac tumors are rare occurrences in cardiac clinical practice. Nevertheless, they form an important component of cardio-oncology practice in which diagnosis and management are vital (1). The classification of these lesions as benign or malignant is an important predictor of prognosis; however, any cardiac tumor, even if histologically benign, can have substantial arrhythmic or hemodynamic consequences depending on its size and location within the heart.

Over the past decade, there has been a notable increase in the incidence of primary cardiac tumors. This may be attributed to the advances in imaging tools, with multimodality imaging being more widespread and accessible. In fact, Multimodality imaging is fundamental to help diagnosis, treatment and surgical planning (2). The prognosis and treatment of each tumor is different, although early diagnosis is usually associated with a better outcome.

Different flow charts of diagnostic work-up have been proposed to help physicians establishing a diagnosis before open biopsy (3). Echocardiography, which is non-invasive, widely accessible in clinical practice, and radiation-free, most often represents the first imaging modality used when an intracardiac mass is suspected.

AIM

To describe the experience of a tertiary cardiac center in managing cardiac tumors with emphasis on the role of echocardiogram.

MATERIALS AND METHODS

Retrospective observational study conducted in the cardiology department of Ibn El Jazzar University Hospital of Kairouan (Tunisia) from January 2020 to December 2025.

We included all patients with a confirmed intracardiac mass on Transthoracic (TTE) and/or Transesophageal (TEE) echocardiography, with exploitable clinical records and imaging.

Patients with poor quality window examinations, extracardiac masses without intracardiac involvement, or absence of diagnostic confirmation were excluded.

Collected data included age, gender, mode of presentation, echocardiographic characteristics (location, size, mobility, echogenicity, hemodynamic impact), management, and outcome.

RESULTS

Ten cases (age 8 to 70 years) were reviewed, and images selected for presentation. Nine patients have histopathologic confirmation: one primary angiosarcoma, two fibroelastoma, four atrial myxomas, one interatrial septum lipoma and two cases of metastatic disease.

Case 1: Left Atrial Myxoma in a 65-Year-Old Woman (Figure 1)

A 65-year-old woman presented with dyspnea on exertion and history of paroxysmal atrial fibrillation. On echocardiography, there was a mass in the left atrium measuring 6 cm x 5 cm having a wrecking ball effect on the mitral valve highly suggestive of atrial myxoma. Patient was referred to surgery without additional imaging. Surgical excision was performed without complications and histology confirmed the diagnosis.

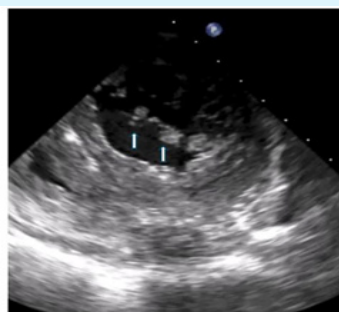


Figure 1. Atrial myxoma diagnosed in a 65-year-old female presenting with history of paroxysmal atrial fibrillation and dyspnea. Note the wrecking ball effect on the mitral valve

Case 2: Aortic Valve Fibroelastoma (Figure 2)

Incidental discovery in a 50-year-old patient. Surgical excision confirmed a papillary fibroelastoma.

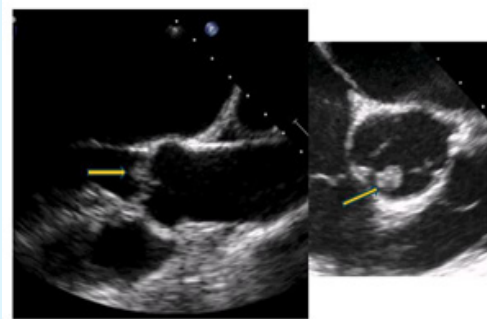


Figure 2. Fibroelastoma diagnosed in a 50-year-old man who underwent echocardiography because of history of arterial hypertension.

Case 3 : Mitral fibroelastoma (Figure 3)

A 38-year-old woman presenting with Transient ischemic attack (TIA). TTE/TEE revealed a mobile mitral fibroelastoma. Clinical and laboratory findings excluded infective endocarditis. Patient referred for curative surgery and the diagnosis of Fibroelastoma was confirmed by histopathology.

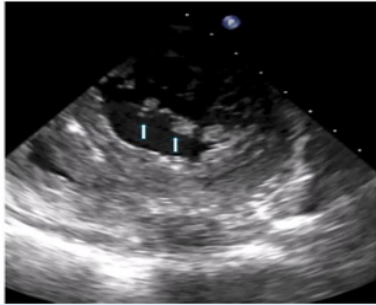


Figure 3. Fibroelastoma on the mitral leaflets free edge and chordae.

Case 4 : Right Atrial Angiosarcoma (Figure 4)

A 34-year-old woman presenting with tamponade. Echocardiography revealed a heterogeneous intra-atrial right mass with tricuspid obstruction suggesting a malignant tumor. Urgent CT scan was assessed to study the extension of the tumor. Patient was rapidly referred for surgery. She underwent Surgical pericardial drainage and excision of the mass. Histopathology revealed angiosarcoma and the patient had adjuvant chemotherapy.



Figure 4. Angiosarcoma of the right side of the heart . Malignancy was highly suspected by TTE (a) and extension of the tumor was assessed by CT Scan (b).

Case 5: Cardiac Metastasis from Pulmonary Carcinoma (Figure 5)

A 60-year-old male smoker presenting with abundant pericardial effusion and an infiltrating mass. CT scan and bronchoscopy confirmed squamous cell carcinoma metastatic to the heart.

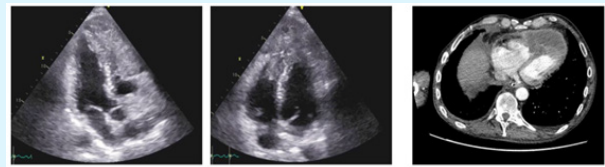


Figure 5. Cardiac metastasis of a squamous cell carcinoma of the lung. Note the Bulky Tissue and the invasion of the myocardi

Case 6: Lipomatous Hypertrophy of the Interatrial Septum (Figure 6)

An obese 55-year-old woman presenting with typical «hourglass» lipomatous hypertrophy, confirmed by MRI.

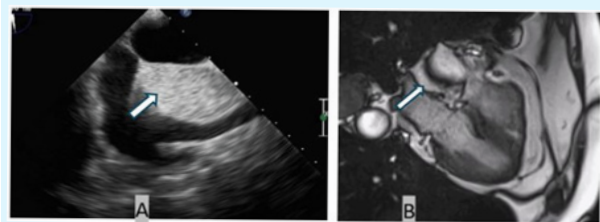


Figure 6. Lipomatous hypertrophy of the atrial septum / Lipoma

Case 7: Myxoma in a Child revealed by ST Elevation Myocardial Infarction (STEMI)

An 8-year-old boy hospitalized for anterior STEMI. Myocardial infarction was complicated by ventricular tachycardia. Emergency management included electrical cardioversion, heparin therapy and clopidogrel medication. Echocardiography showed a left atrial myxoma and the supposed mechanism of the STEMI was embolization of the tumor into the coronaries. Diagnosis was confirmed by CT scan. Successful resection of the tumor was done with uneventful follow up.

Case 8: Hepatic Metastasis with Extension into the inferior vena cava (IVC) and the right atrium (RA)

A 70-year-old man presenting with a heterogeneous mass invading the IVC and RA. Thoracoabdominal CT scan confirmed a metastatic hepatic tumor.

Case 9: atrial myxoma in a 45-year-old man revealed by Acute limb ischemi

Acute management included Fogarty embolectomy. Then tumor resection with histopathological study confirmed the diagnosis.

Case 10 : atrial myxoma of 40*50mm attached to the atrial septum in an asymptomatic 60 year old woman.

Table 1. Clinical and echographic characteristics of cardiac tumors cases

Case	Age/Sex	Circumstance of discovery	Location	Size (mm)	Mobility	Echo appearance	Final diagnosis	Confirmation	Outcome
1	34/F	Dyspnea + tamponade	RA	60×42mm	Mobile	Heterogeneous, sessile	Angiosarcoma	Histology	Resection + chemo, 2 years without recurrence
2	60/M	Dyspnea + RHF	Pericardium + myocardium	Large	Fixed	Infiltrative	Metastasis (squamous cell carcinoma of lung)	CT + biopsies	Palliative chemotherapy
3	65/F	Exertional dyspnea	Left atrium (fossa ovalis)		Highly mobile	Homogeneous, pedunculated	Myxoma	Histology	Resection, discharged day 5
4	8/M	Chest pain + anterior STEMI	Left atrium	25×20	Mobile	Homogeneous	Myxoma	Histology	Resection, favorable outcome
5	50/M	Atypical chest pain	Aortic valve	12	Highly mobile	"Sea anemone"	Papillary fibroelastoma	Histology	Resection
6	38/F	TIA	Mitral valve	10	Highly mobile	Typical	Papillary fibroelastoma	Histology	Resection, no recurrence
7	70/M	Hepatomegaly + weight loss	Right atrium+ inferior vena cava invasion	Large	Fixed	Heterogeneous	Metastasis (hepatocellular carcinoma)	CT	Palliative chemotherapy
8	55/F	Palpitations	Interatrial septum	Thickening	Fixed	Dumbbell-shaped, hyperechogenic	Lipomatous hypertrophy of IAS	MRI	Follow up
9	45/M	Acute Limb ischemia	Left atrium	large	Mobile	Homogeneous, well demarked	Myxoma	Histology	Resection, favorable outcome
10	60/F	Incidentalome	Interatrial septum, left atrium	40*50mm	Mobile	Homogeneous, well demarked	Myxoma	Histology	Resection, favorable outcome

DISCUSSION

The differential diagnosis of cardiac masses ranges from anatomical variants such as Chiari networks, Eustachian valves, to true lesions, divided into neoplastic and non-neoplastic lesions.

Primary cardiac tumors are rare, accounting for less than 0.03% of the cases identified in autopsy-based studies (4). Approximately 80% of these tumors are benign, with myxomas being the most common type (50%–70%) (5). Others include, fibromas, lipomas fibroelastomas, and rhabdomyomas. Primary malignant tumors of the heart are sarcomas in 95% of cases and lymphomas in the remaining 5% (6). Secondary tumors of the heart generally represent a very advanced stage of the malignant disease (7).

Studies have shown that certain tumors prefer specific areas of the heart. Papillary fibroelastomas are often present at valve sites, particularly the aortic valve (8).

The left atrium was the most common location of myxomas. This is because the structure and function of the LA may

help tumors to grow. In our 4 cases, the tumor was large in all patients which confirm the slow evolution of the tumor.

The diagnosis of cardiac tumors relies on a combination of clinical evaluation, imaging techniques, and, when necessary, histological confirmation through biopsy.

Strengths and weaknesses of Echocardiogram

As rapid advances have been made in cardiovascular imaging, the diagnosis of cardiac tumors dramatically improved, the type of cardiac tumors could be accurately predicted. Echocardiogram is often the first-line cardiac imaging modality because of its widespread availability, excellent temporal-spatial resolution, and assessment of hemodynamic impacts.

It allows precise localization, analysis of mobility, study of relationships with valves and cardiac chambers and assessment of hemodynamic impact (obstruction, valvular insufficiency, effusion, embolism) (9).

In 8/10 patients in our series, the suggestive diagnosis was established at TTE.

When using echocardiography to assess cardiac masses, there are several key features that can help differentiate between benign and malignant masses.

Several authors have proposed echocardiographic criteria to guide the distinction between benign and malignant cardiac tumors. The following features are particularly useful:

- Regularity of contours, generally regular in benign lesions and often irregular in malignant tumors.
- Homogeneity of the echostructure, in favor of a benign tumor, as opposed to the heterogeneity frequently observed in malignant masses.
- Mobility of the mass, usually marked in benign tumors such as myxoma or fibroelastoma.
- Thus, benign masses are often mobile, pedunculated, with regular margins (>50% of the border clearly demarcated), and tend to adhere to the interatrial septum or heart valves. Conversely, malignant masses are generally larger

with inhomogeneous appearance, irregular margins, sessile implantation, and a polylobate shape.

- Extra-cardiac extension, strongly suggestive of a malignant origin.
- Presence of pericardial effusion; Malignant masses are more frequently associated with significant (moderate to severe) pericardial effusion.
- Another relevant aspect in differentiating between benign and malignant masses is their localization. Benign masses are typically located in the left heart chambers, whereas malignancies are more often found on the right side, in the pericardium, or in the pulmonary arteries.

At echocardiographic assessments, 6 red flags—*infiltration, polylobate mass, significant pericardial effusion, sessile attachment, inhomogeneity, and non-left-sided localization*—are key indicators of malignancy (Figure 7). Integrating these red flags into scoring systems, such as the diagnostic echocardiographic mass score, can significantly improve the diagnostic accuracy for identifying malignant cardiac masses.




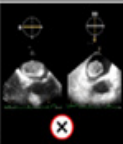
















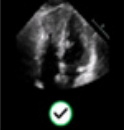



	Non-left localization	Pericardial Effusion (≥ moderate)	Infiltration	Polylobate shape	Inhomogeneity	Sessile
Primary benign tumor (e.g. myxoma)						
Pseudotumor (e.g. thrombus)						
Primary malignant tumor (e.g. angiosarcoma)						
Metastasis (e.g. melanoma, chondrosarcoma)						

Figure 7. examples of echocardiographic features shown to be independent markers of malignancy in patients with cardiac masses (10)

In their study, Pasquale Paolisso et al showed that three or more “malignant” echocardiographic parameters were associated with progressively higher risk for death (10).

In addition, TEE is considered the diagnostic gold standard

for detecting small (<1 cm) and highly mobile lesions, such as vegetations, papillary fibroelastomas, or masses involving the valves, because of its superior temporal resolution compared with cardiac magnetic resonance (CMR).

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Moreover, with the latest advances, Echocardiography can now be enhanced with real-time 3-dimensional techniques, a volumetric approach that captures the entire cardiac mass, providing an accurate evaluation of its volume, attachments, and relationships with surrounding structures. Besides diagnosis, 3D echocardiography may also be useful for intraprocedural guidance during surgical treatment of cardiac masses.

Echocardiography constitutes the first-line examination for the diagnosis of cardiac tumors. It is sufficient in the majority of benign tumors, particularly for:

- Left atrial myxomas: typical location in the left atrium, characteristic size and morphology allowing reliable diagnosis by TTE.
- Valvular fibroelastomas: small mobile masses attached to the cardiac valves, detectable by their mobility and precise location.
- Interatrial septal hypertrophies: typical fatty infiltration, often easily differentiable from true tumoral masses.

It may become insufficient when a malignant cardiac tumor is suspected. In this context, complementary evaluation is indispensable, relying on:

- Thoracic CT scan, enabling analysis of local and distant extension;
- Cardiac MRI, providing precise tissue characterization;
- Histological examination, the only guarantor of a definitive diagnosis.

When we suspect malignant tumors, the extent of tumor invasion must be examined attentively to decide the patient’s operative status. Furthermore, surgeons need information regarding how much of the tumor can be removed. The extent of resection is an important factor contributing to the prognosis.

Echocardiographic characteristics of Cardiac Tumors

Myxoma: Its location is in the left atrium in eight out of ten cases, and in 60% of cases its insertion is found on the left side of the fossa ovalis. From a macroscopic standpoint, myxomas may have a pedunculated or sessile base (11). The mean size at the time of diagnosis is 5 cm (12). Their

consistency is most often gelatinous and very friable. In one third of cases, they are of firm consistency (13)

In our series of cases, 4 patients were diagnosed with myxoma, confirming its frequency as the most common benign tumor, with different circumstances of discovery.

Cardiac echocardiography is in the majority of cases sufficient to establish the diagnosis of myxoma by demonstrating a typical appearance of a mobile, pedunculated LA mass with insertion on the left side of the fossa ovalis.

Fibroelastoma

Fibroelastoma is a benign cardiac tumor with a frequency of 0.001 to 0.33% in autopsy series. It is the second most common benign tumor in adults (14). From a morphological standpoint, it is a small tumor averaging 5 to 15 mm, whose shape has been compared to that of a sea anemone (15)

They most often arise on the valves, primarily the aortic valve, followed by the mitral valve, principally on the downstream side (16). The echocardiographic characteristics of a papillary fibroelastoma (PFE) are its small size, independent mobility, and attachment to an endocardial surface (17).

TEE detects more PFEs than TTE due to their typically small size, reinforcing the role of TEE in the evaluation of an embolic event (18). There is a significant association between a clinically diagnosed PFE and a thromboembolic event (19)

The differential diagnosis of PFE includes infectious and non infectious vegetations. Patients with infected vegetations tend to have valve destruction and usually have risk factors for infective endocarditis, fever, night sweats, and positive blood cultures.

In our series, 2 patients were diagnosed with PFE, one discovered incidentally and one following a TIA ; both valves were affected. Diagnosis was established exclusively based on TTE/TEE appearance, with postoperative histological confirmation.

Lipomatous Hypertrophy of the Interatrial Septum:

Lipomatous hypertrophy of the interatrial septum, a relatively rare condition, corresponds to a non-tumoral fatty infiltration of the septum, preferentially affecting the superior and inferior regions while sparing the fossa ovalis, giving it the typical «hourglass» or «dumbbell» appearance on echocardiography (20)

It appears as a homogeneous septal thickening, often hypochoic to echogenic, generally measuring ≥ 2 cm.

Transthoracic echocardiography is most often sufficient for diagnosis, but TEE can better define the septal limits and confirm preservation of the fossa ovalis. The absence of mobility, internal vascularity, and pedunculated mass

allows it to be distinguished from true cardiac tumors such as lipomas or myxomas.

This entity is benign and requires no treatment, except in rare symptomatic cases.

Malignant Tumors

Primary cardiac tumors are rare. Approximately 25% are represented by sarcomas or primary cardiac lymphomas (21). Angiosarcoma is the most frequent primary malignant tumor of the heart (37–40%) (22). On echocardiography, angiosarcoma appears as a sessile, heterogeneous, and hyperechoic mass, with a striking predilection for the right atrium (23).

Cardiac and pericardial metastases are far more common than primary cardiac tumors, found at autopsy in 10 to 12% of all cancer patients, and are generally associated with a poor prognosis (24).

Tumoral involvement of the heart and pericardium can occur via four pathways: retrograde lymphatic extension, hematogenous dissemination, direct contiguous extension, or transvenous extension. Tumors with the highest metastatic potential to the heart are pulmonary carcinoma, breast carcinoma, esophageal carcinoma, malignant lymphoma, leukemia, and malignant melanoma (25).

CT scan or, ideally, MRI are indispensable for visualizing the atrial tumor, performing tissue characterization, and investigating pericardial and extracardiac extension (26).

CONCLUSION

Echocardiography is the first-line examination in the assessment of cardiac masses. It allows in the majority of cases the differentiation between benign tumors and suspicious lesions. The use of MRI or CT scan is indispensable in cases of suspected malignancy or to clarify the extent of disease. Some echocardiographic parameters can serve as markers to accurately predict malignancy, thereby informing the need for second-level investigations and minimizing the diagnostic delay in complex clinical scenario.

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