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Research Article

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The Usefulness of 3D Transesophageal Echocardiography in the Diagnosis of Cardiac Tumors

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Abstract

Cardiac masses represent a heterogeneous group of tumor and pseudotumor conditions characterized by a diversity of clinical symptomatology and morphologic aspects on medical imaging. Echocardiography is the basic examination that allows the detection of these lesions in order to specify the type of mass and propose a rough characterization.

Three-dimensional echocardiography (TEE) is a new modality that allows for the better identification and localization of anatomical structures, which significantly improves our understanding of this pathology. The result of the 3D evaluation allowed unlimited slicing and cropping, facilitating the recognition of anatomical details as to the assessment of the size, composition, and location of the cardiac mass and its relationship with adjacent structures, in conjunction with an accurate assessment of left ventricle volumes and ejection fraction.

Our primary objective in this prospective study, including 15 cases of cardiac tumors, is to prove the additional contribution of 3D transesophageal echocardiography in the diagnosis of cardiac tumors outside the proliferative images of endocarditis and thrombi.

Keywords: Cardiac Mass, Echocardiography, Diagnosis, Anatomical Details, 3D Transesophageal Echocardiography.

Introduction

Cardiac masses represent a heterogeneous group of tumoral and pseudotumoral diseases characterised by a diversity of clinical symptoms and morphological aspects on medical imaging. Echocardiography is the basic examination used to detect these lesions in order to determine the type of mass and propose a preliminary characterisation. Three-dimensional echocardiography is emerging as a new modality that allows better identification and localisation of anatomical structures, which significantly improves our understanding of this pathology.

Objective

Through our series, to demonstrate the additional contribution of 3D transoesophageal echocardiography (3D TEE) in the diagnosis of cardiac tumors, excluding proliferative images of endocarditis and thrombi.

Method and Results

We report a retrospective study of a series of 15 patients followed at the cardiology department CHU Beni messous between the year 2017-2021, the sex ration was 0.6 (9 F /6 H), the median age was 50 years (32-83ans). Most patients had no specific medical history. In order of frequency, the mode of revelation was dyspnea (in the context of right heart failure), fever (09 patients had a positive inflammatory test), systemic emboli (stroke, no cases of embolisation of the limbs or coronary arteries were reported), Atrial fibrillation/Flutter's disease, The discovery was fortuitous in 2 patients (during a general check-up). 2D echocardiography was the initial diagnostic approach, as it already allowed the localisation of the mass : 08 masses in the left atrium (LA), 04 in the right (RA) atrium and 03 in the right ventricule (RV). The description according to the clinical context, especially with 2D and then 3D transoesophageal echocardiography which was used to direct the diagnosis towards a myxoma (40%) (Figure 1 ,2), a lipoma (20%) (Figure 3), a fibroelastoma (20%) (Figure 4, 5) and a secondary location of a breast cancer and lymphoma (13%.) (Figure 6, 7) and a primary cardiac tumour (Figure 8).

The assessment by 3D transesophageal echocardiography was marked by better analysis of the cardiac mass, a more accurate study of the size (underestimated in 2D, and of the shape of the mass as well as, in some cases, the composition of the mass). As in the case of myxoma, an echogenic, voluminous mass with irregular contours, pedicled and inserted into the free wall of the LA occupying the whole of the LA (Figure 1).

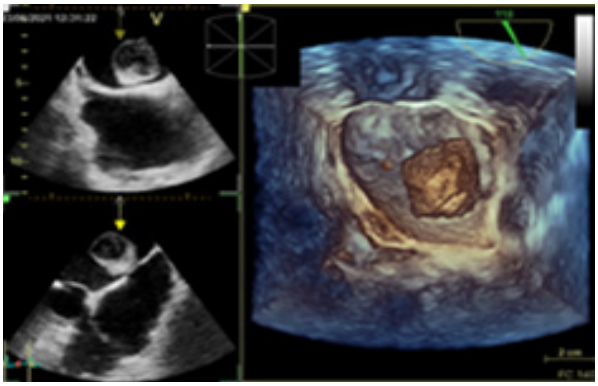

Figure 1: LA myxoma in an 81-year-old woman on 3D TEE.

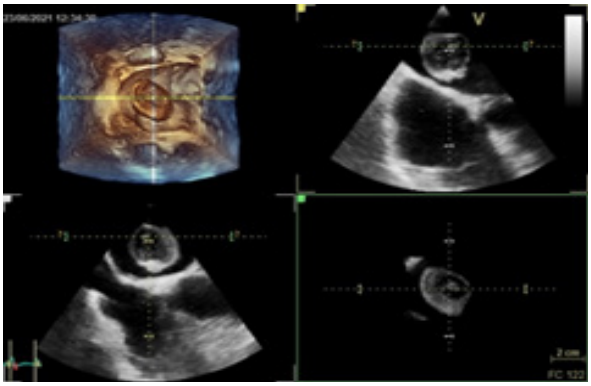

Figure 2: Left atrium myxoma in a 70-year-old man on 3D TEE.

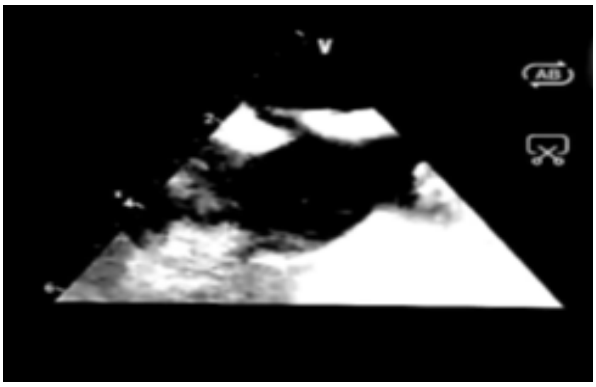

Figure 3: Inter-atrial septal lipoma in a 24-year-old woman.

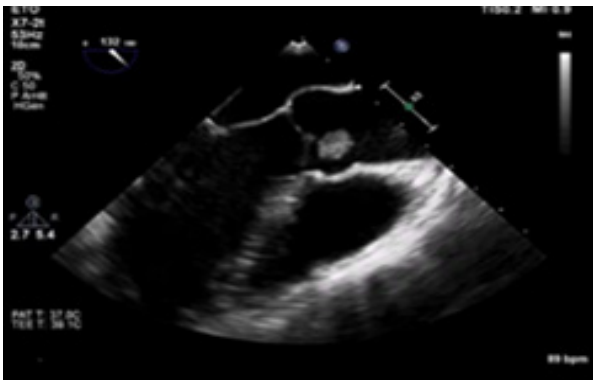

Figure 4: aortic fibroelastoma on TEE.

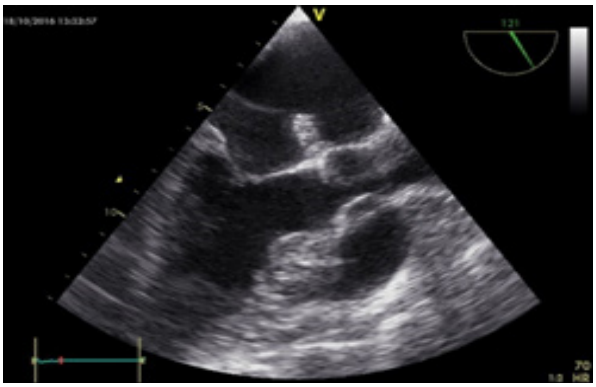

Figure 5: Mitral fibroelatoma on TEE.

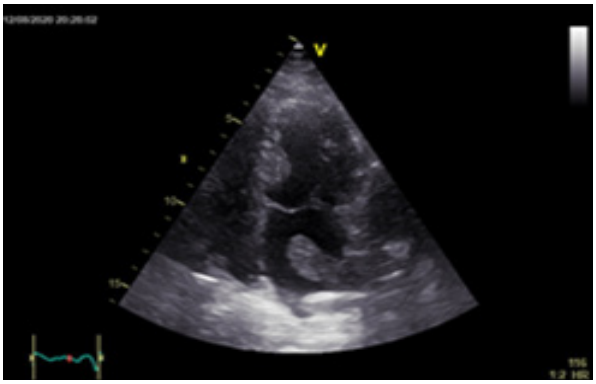

Figure 6: Secondary location of breast cancer in the LA.

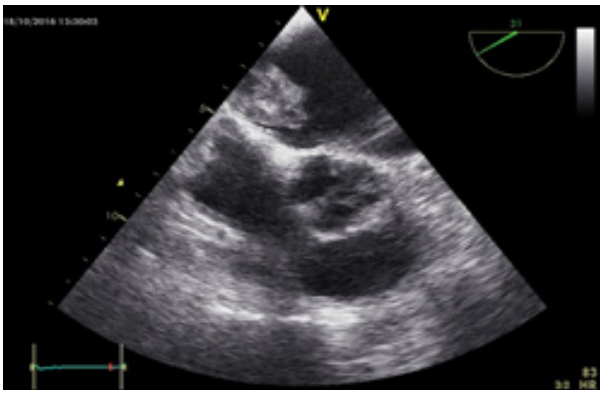

Figure 7: TEE objectives a cardiac tumour in Hodgkin's disease.

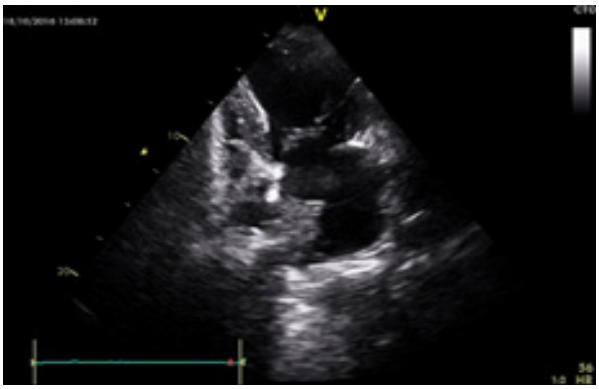

Figure 8: Primitive cardiac malignant tumour located in the LA.

Discussion

Cardiac masses represent a heterogeneous group of tumoral and non-tumoral conditions, while cardiac tumors are rare. Their prevalence varies from 0.001 to 0.02%. Cardiac metastases are 40 to 100 times more frequent than primary tumors. Neoplasia that frequently metastasize to the heart include cancers of the lung, breast and kidney, melanoma and lymphoma [1]. The primitive tumors are mostly benign (80%), of which 70% are myxomas. The others are rhabdomyomas, fibromas, fibroelastomas and lipomas. Primary malignant tumors of the heart are sarcomas in 95% of cases and lymphomas in the remaining 5%. The most common are undifferentiated sarcomas, followed by angiosarcomas, leiomyosarcomas and rhabdomyosarcomas [1].

Pseudotumor can be infectious or thrombotic lesions, anatomical variants or congenital cystic malformations. The clinical context and imaging characteristics of these masses can differentiate them, particularly on 3D imaging. Signs and symptoms are non-specific and highly variable depending on the location, size and composition of the cardiac mass. For example, if a mass is attached to an area of abnormal wall movement, generally akinesia or dyskinesia, the diagnosis of a thrombus is more likely than that of a tumor. Similarly, a valvular mass should raise more concern in the presence of thrombotic (sterile) or infectious vegetation than a benign or malignant mass.

Transesophageal echocardiography (TEE) is commonly used to better characterize a cardiac mass in terms of size, morphology, site of attachment, extension and hemodynamic effects. The use of three-dimensional (3D) echocardiography is the most recent approach to assessing intracardiac masses. It allows a full volumetric assessment of a mass with measurements in several planes, giving a more accurate assessment of volume and a more precise estimate of size. This is particularly the case with irregularly shaped masses, where it is difficult to measure accurately or to select the largest diameter in the 2 D mode. With the cropping techniques available with 3D, various aspects of the mass can be visualized more clearly, including the point of attachment, homogeneity, vascularity and calcifications. Thus, a benign tumor is suggested by the mobility and distensibility of the tumor, an aspect that is typically seen in atrial myxomas, where 3D echocardiography is particularly useful for analyzing the base of implantation and the heterogeneity of the mass using the cropping function. Measurement of left atrial myxoma using 3D echocardiography has shown an excellent correlation with the size excised during surgery.

The 2D and 3D echocardiography modalities, with the recent contribution of 3D transesophageal echocardiography, allow a complete analysis of the anatomy and nature of cardiac masses. (This limits the misuse of other imaging tests such as MRI and CT scans) [2-5].

Conclusion

3D transesophageal echocardiography can provide considerable additional value in the echocardiographic assessment of cardiac masses. The 3D assessment allows unlimited slicing and reframing, making it easier to recognize anatomical details. It allows visualization of 3D structures in motion: assessment of the size, composition and location of the cardiac mass and its relationship with adjacent structures, in conjunction with accurate assessment of LV volumes and EF. It enables the cardiologist to draw the right conclusions for diagnosis, follow-up and surgical planning.

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