

## The Role of Three Dimensional Echocardiography in the Detection of Cardiac Metastasis from Melanoma

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### Introduction

The growing collaboration between cardiologists and oncologists, combined with the use of new techniques such as three-dimensional transthoracic echocardiography (3D TTE), has allowed greater detection of cardiac abnormalities from neoplasm<sup>1</sup>.

Melanocarcinoma, considered the most malignant of skin tumors, with enormous potential for systemic metastasis mainly through the blood, usually occurs from 30 to 60 years of age. Its incidence increases progressively, affecting 4% to 8% of the white population<sup>2</sup>. Until recently, cardiac involvement was rarely diagnosed<sup>3</sup>. The limitations of imaging methods associated with nonspecific clinical symptoms made this diagnosis a challenge. Positron emission tomography (PET scan), together with the 3D TTE, plays an important role in palliative surgical planning, when recommended, as it provides detailed information of the tumor, such as size and invasion of adjacent structures. This case report describes the use of three-dimensional echocardiography for diagnosing cardiac neoplastic involvement due to melanoma, confirmed by PET-scan, in a female patient with nonspecific symptoms.

### Case Report

Female patient, 67 years old, diagnoses with cutaneous melanoma with liver metastasis three years before, underwent surgery, chemotherapy and radiotherapy. There was hepatic recurrence and the patient underwent partial hepatectomy in the same year.

The patient was pale, with significant weight loss, malnutrition, complaining of frequent palpitations and fatigue. Blood pressure of 100/60 mmHg, heart rate of 96 bpm, regular cardiac rhythm.

The patient underwent conventional echocardiography, which showed a mass measuring 2.6 x 2.3 cm in the interatrial

septum and an echogenic image without precise borders, related to the anterior cusp of the tricuspid valve, both suggestive of metastasis, viewed in apical 4-chamber view (Figure 1A). On subcostal view, liver metastases (Figure 1B) were observed. In order to better define the images viewed on two-dimensional echocardiography, 3D TTE revealed echogenic image in the tricuspid, cystic ring, not attached to the cusp, causing wall bulging (Figures 2 and 3).

PET scan revealed radiopharmaceutical uptake, indicating liver, retroperitoneal involvement, in addition to cardiac involvement in the pericardial and atrial septal areas, characterizing signs of disease progression (Figure 4).

### Discussion

Primary cardiac tumors are rare, with an estimated incidence of 0.02% observed in necropsies, while secondary neoplasms have an incidence 20 to 100 times higher<sup>4,5</sup>. Although no tumor preferably disseminates to the heart, some do it more often, like mesothelioma, lung adenocarcinoma, breast carcinoma and melanoma<sup>6</sup>.

We observed high rates of cardiac metastasis from malignant melanoma compared to any other tumor. Cardiac involvement was first described by William Norris in 1820 and may involve any cardiac structure and, as described in some cases, most commonly the myocardium<sup>3</sup>. It may lead to arrhythmias, atrioventricular blocks and structures compression; mimicking an atrial myxoma, causing valve obstruction from oscillating mass or heart failure. However, these findings were observed in more advanced stages of the disease, making intervention difficult. Melanoma is considered a tumor that is prone to early metastases and, consequently, its prognosis is quite reserved.

The most commonly used imaging methods to search for metastasis are Computed Tomography (CT), Magnetic Resonance Imaging (MRI), echocardiography and PET scan<sup>7,8</sup>. The latter is considered to be very important, especially when the evaluation reveals a suspected CT or MRI. Malignant tumors have a high rate of glucose utilization because they present higher metabolism compared to normal tissues. However, the PET scan plays a limited role in early-stage melanoma. It shows high sensitivity (94.2%) and specificity (83%) to identify metastasis from melanoma. False negatives occur around 4%<sup>7</sup>.

The use of echocardiography is essential to complement screening in tumors with cardiac involvement by melanoma. The emergence of 3D TTE in the 1990s made it possible

### Keywords

Three-dimensional Echocardiography; Neoplasm metastasis; Melanoma.

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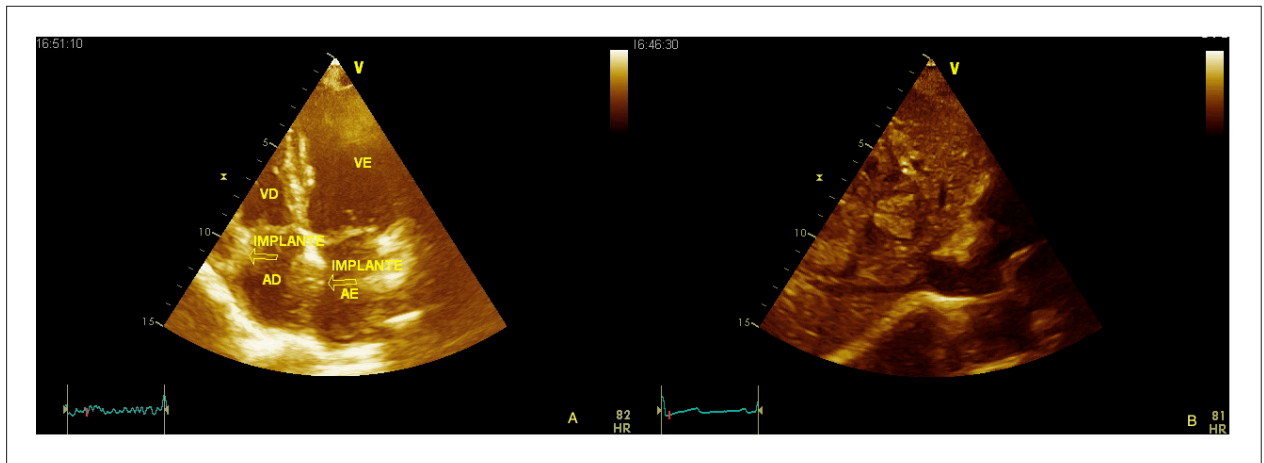
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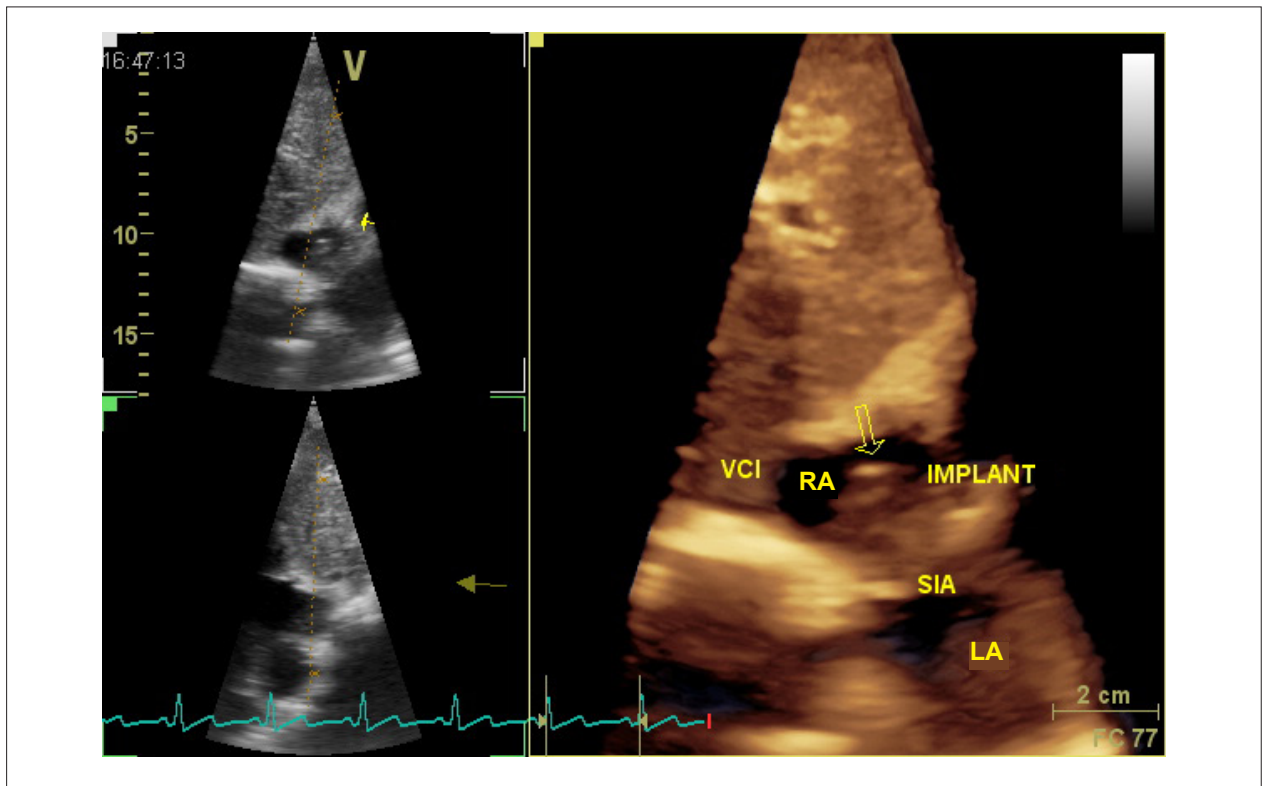
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**Figure 1A** – The figure shows apical 4-chamber transthoracic echogenic image in interatrial septum and another related to the anterior cusp of the tricuspid valve without precise borders. **Figure 1B** – Subcostal view showing hepatic metastasis of the melanoma.



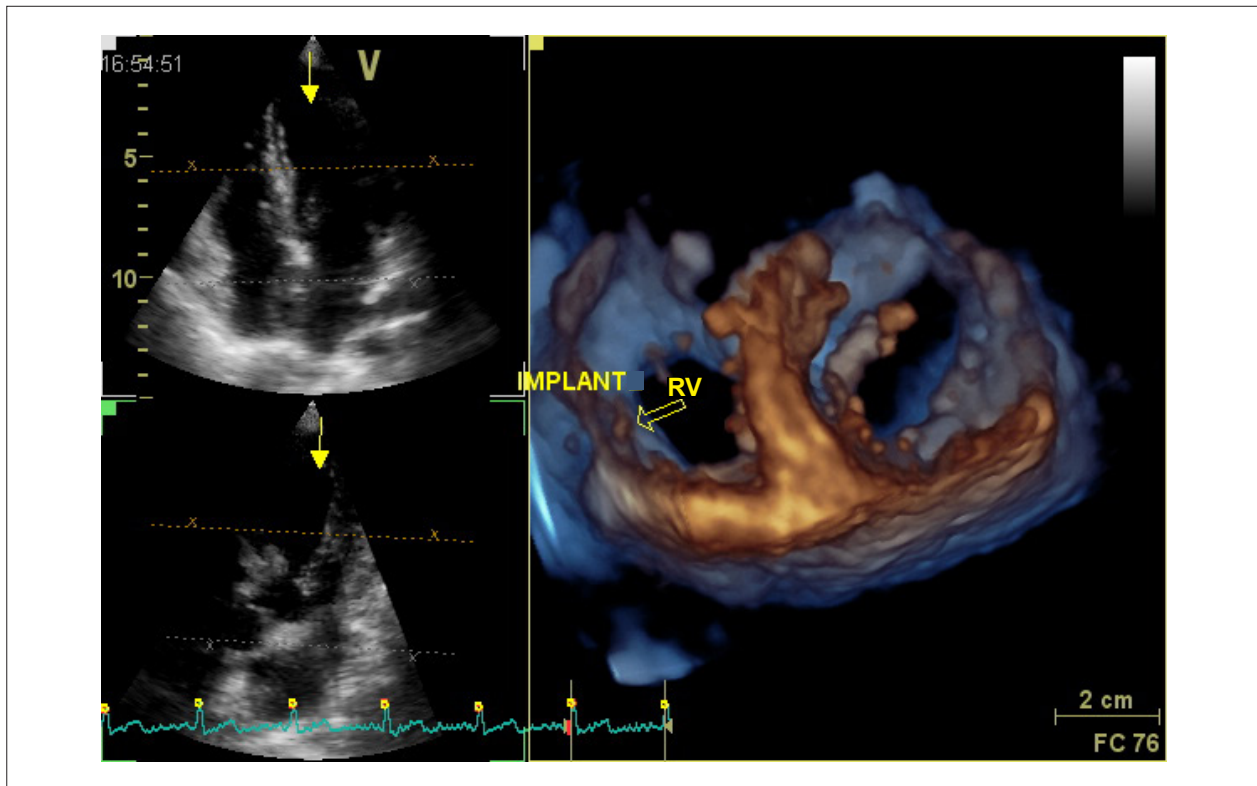
**Figure 2** – The image on the right shows atrial septal implant using 3D echocardiography (arrow).

to view precise anatomical details, as well as the functional characteristics of the adjacent cardiovascular structures involved in real time, providing the ability to get multiple views that allow the evaluation of cardiac masses, being of fundamental importance for surgical planning or follow-up, through a non-invasive, radiation-free and risk-free test<sup>9</sup>. Among other advantages, 3D TTE allows viewing the structure to be studied through various projections only with image

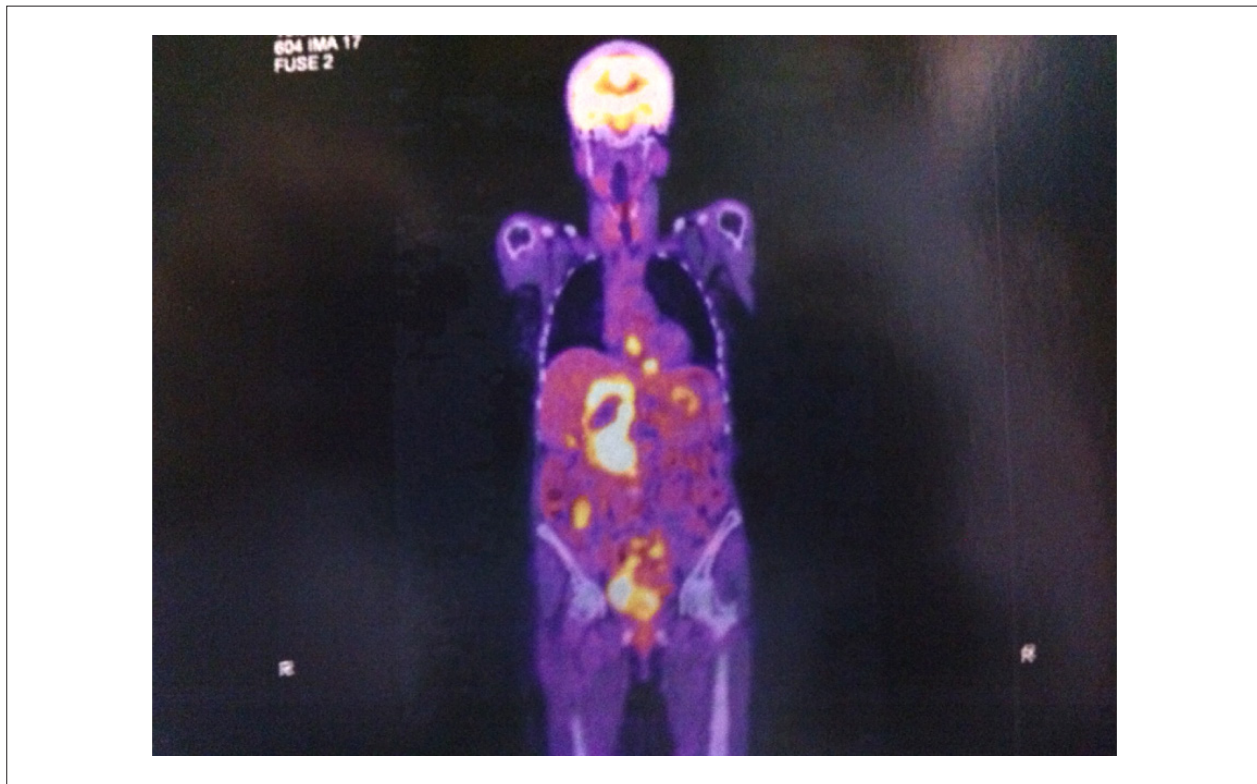
rotation<sup>10</sup>. In this particular case, there was a more precise definition of the tricuspid valve injury that generated doubts about the two-dimensional diagnosis.

There are numerous literature reports of the use of 3D TTE in the identification of metastatic breast and lung tumor, carcinoid heart disease, confirming its importance in defining the borders of the affected structures and its extension in a noninvasive manner, which is fundamental where the surgical option was chosen<sup>11-15</sup>.

## Case Report



**Figure 3** – The image on the right shows the ventricle towards the atrium, showing tricuspid ring implant.



**Figure 4** – Tomographic image of the entire body acquired after administration of the radiopharmaceutical drug in hybrid PET scanning machine with multislice CT. Increase in the number and uptake of multiple lesions in the retroperitoneum, increased glycolytic metabolism in the hepatic hilum, and two heart uptakes.

Cardiac metastasis from melanoma should always be considered when the patient with this disease presents a cardiovascular symptom, and 3D TTE is a new tool that supports a better spatial resolution of the images on two-dimensional testing, with limitations in its definition.

## Authors' Contribution

Research design: Gripp EA, Rabischoffsky A; Data sourcing: Gripp EA, Barreto JLW, Barbosa FCP, Rabischoffsky R, Mesquita ET, Rabischoffsky A; Analysis and interpretation of data: Gripp EA, Barreto JLW, Barbosa FCP, Rabischoffsky R, Mesquita ET, Rabischoffsky A; Drafting: Gripp EA, Barreto JLW, Barbosa

FCP, Rabischoffsky R, Mesquita ET; Critical revision of the manuscript as for important intellectual content: Mesquita ET, Rabischoffsky A.

## Potential Conflicts of Interest

No relevant potential conflicts of interest.

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## Academic Association

This study is not associated with any graduate programs.

## References

1. Kalil FR, Hajjar LA, Bacal F, Hoff PM, Diz MP, Galas FRBC, et al. I Diretriz Brasileira de Cardio-Oncologia da Sociedade Brasileira de Cardiologia. *Arq Bras Cardiol.* 2011; 96(2 supl.1):1-52.
2. Savoia P, Fierro MT, Zaccagna A, Bernengo MG. Metastatic melanoma of the heart. *Surg Oncol.* 2000; 75(3):203-7.
3. Cebon JSG, Calafiore P, Robinson WA. Cardiac metastases from melanoma maligno. *Cancer.* 1999; 85(1):78-84.
4. Thomas-de-Montpréville V, Nottin R, Dulmet E, Serraf A. Heart tumors in children and adults: clinicopathological study of 59 patients from a surgical center. *Cardiovasc Pathol.* 2007;16(1):22-8.
5. Reynen K. Frequency of primary tumors of the heart. *Am J Cardiol.* 1996; 77(1):107.
6. Bussani R, De-Giorgio F, Abbate A, Silvestri F. Cardiac metastasis. *J Clin Pathol.* 2007; 60(1):27-34.
7. Strodel K, Durmmer R, Husarik DB, Lago MP, Hanry TF, Steinnert HC. High-Risk Melanoma: Accuracy of FDG PET/CT with Added CT Morphologic Information for detection of Metastases. *Radiology.* 2007; 244(2):566-74.
8. Restrepo CS, Largoza A, Lemos DF, Diethelm L, Koshy P, Castillo P, et al. CT and MR imaging findings of malignant cardiac tumors. *Curr Probl Diagn Radiol.* 2005; 34(1):1-11.
9. Chong JJH, Richards DA, Chard R, McKay T, Thomas L. Two-dimensional and three-dimensional transthoracic echocardiography in surgical planning for right atrial metastatic melanoma. *Eur J Echocardiogr.* 2008; 2(9):286-8.
10. Xie MX, Wang XF, Cheng TO, Lu Q, Yuan L, Liu X. Real time 3-dimensional echocardiography: a review of the development of the technology and its clinical application. *Prog Cardiovasc Dis.* 2005; 48(3):209-25.
11. Katalinic D, Stern-Padovan R, Ivanac I, Aleric I, Tentor D, Nikolac N, et al. Symptomatic cardiac metastases of breast cancer 27 years after mastectomy: a case report with literature review - pathophysiology of molecular mechanisms and metastatic pathways, clinical aspects, diagnostic procedures and treatment modalities. *World J of Surg Oncol.* 2013; 11:14.
12. Ovejero-Gomez VJ, Martin-Cuesta L, Alija V, Villalba J, Rodríguez-Cabello J, Perez J, et al. Malignant cardiac metastasis from breast cancer: Imaging contribution to surgical attitude. *Case Reports in Clinical Medicine.* 2013; 2(8):450-3.
13. Sobczyk D, Nosal M, Trybowski M, Gorkiewicz-Kot I, Olejniczak P, Sadowski J. Cardiac metastasis due to pulmonary metastasis from a transitional cell carcinoma. *Eur J Echocardiogr.* 2008; 9(1):113-5.
14. Fazlinezhad A, Moravvej Z, Azari A, Bigdelu L. Carcinoid heart disease and the utility of 3D trans-thoracic and trans-esophageal echocardiography: Two clinical cases. *J Saudi Heart Assoc.* 2014; 26(1):51-5.
15. Stefano L, Sergio B, Hector S, Ines M. Direct left ventricular metastasis reduction: 3D-echo monitoring for management of clinical case. *J Cardiovasc Echography.* 2013; 23(3):84-7.