Supplementary

Appendix 1 CMR and PET/CT explanation

1. Cardiac magnetic resonance imaging (MRI)

Cardiac MRI was utilized to evaluate the morphological characteristics of the cardiac tumors, including tumor size, location, and tissue composition. The imaging techniques used in this study include T1/T2 mapping with a fat-saturation technique, as well as portion first-pass perfusion and late gadolinium enhancement (LGE), as shown in Figure S1. These advanced modalities help to identify both the enhancement patterns and histological characteristics of the tumors, which are crucial for differentiating malignant from benign lesions.

T1/T2 mapping provides quantitative measures of tissue composition, and when combined with fat-saturation techniques, it helps distinguish between different tissue types, such as fat or fibrosis, within the tumor.

First-pass perfusion with Gadolinium administration is used to assess myocardial blood flow, while LGE highlights areas of necrosis or fibrosis, which are often indicative of some malignancy.

These imaging techniques offer high spatial resolution and excellent tissue contrast, which are essential for accurate tumor characterization and have been shown to be highly effective in evaluating the presence of malignancy.

2. Computed tomography (CT)/positron emission tomography (PET)

PET scans with radiotracers, often combined with CT (PET/CT), were used to assess the metabolic activity of cardiac tumors. Malignant tumors typically show increased metabolic activity, which can be quantified by measuring the standardized uptake value (SUV), 9 of subjects accepted this valuable technology along with other clinical evidence to give the identification. This functional imaging provides important information that is not available through structural imaging alone, making it a valuable tool in identifying tumors with higher malignancy potential.

CT scans provide detailed structural information, offering high-resolution images of the tumor's anatomic location, size, and surrounding tissues.

PET/CT fusion enables the correlation of metabolic data with anatomical information, allowing for comparing the uptake intensity of metastasis and primary lesions, further improving the accuracy of tumor detection and classification, as a routine modality in practical already.

Together, these modalities allow for a more comprehensive assessment of tumor characteristics, as they combine both functional and structural information.

3. Data analysis

Both cardiac MRI and PET data were carefully analyzed to extract relevant multiparameter features that aid in tumor classification. Quantitative measures, such as the T1 values, LGE area, and SUV, were extracted from the imaging data and incorporated into a model designed to distinguish between benign and malignant tumors.

T1 values can reflect tissue composition, with lower values often indicating fibrosis or malignancy. The LGE area provides insight into areas of myocardial injury or fibrosis, which are more commonly seen in malignant tumors. The SUV measured by PET scans is a key marker of metabolic activity, where higher values suggest malignant lesions with increased metabolic activity.

This quantitative data from multimodal approach was processed and integrated to improve diagnostic accuracy, with the final diagnosis confirmed by a combination of imaging and clinical evidence.

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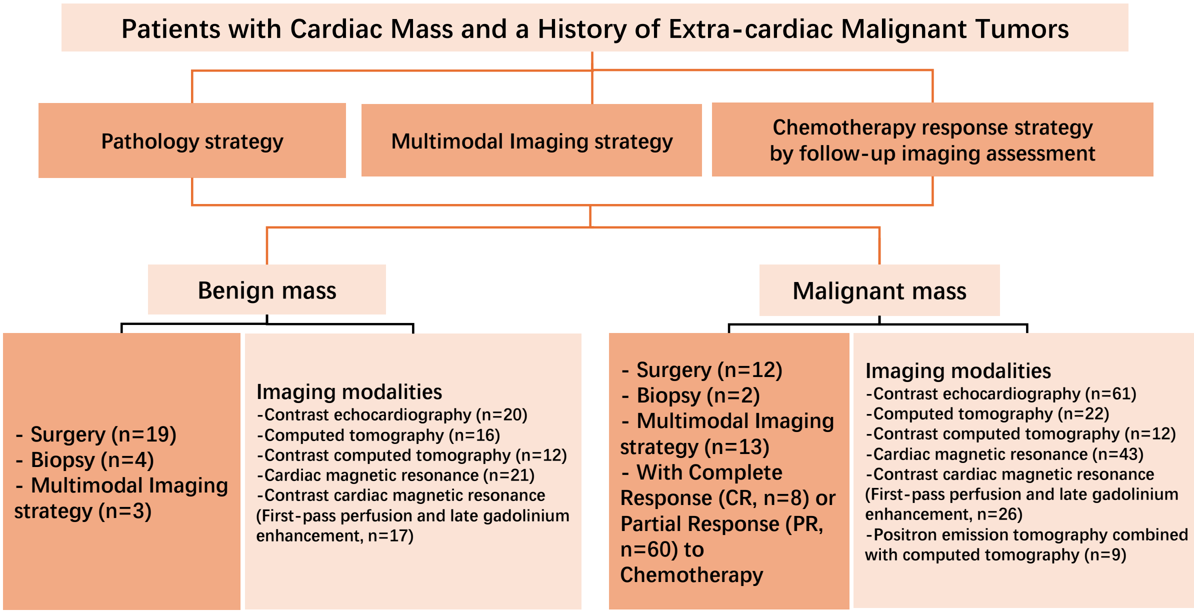

Figure S1 Flowchart depicting the diagnostic strategies for patients with cardiac masses and a history of extra-cardiac malignant tumors. The workflow is divided into three approaches: pathology strategy, multimodal imaging strategy, and chemotherapy response strategy using follow-up imaging. Data are categorized into benign and malignant masses, with details on surgical interventions, biopsy procedures, imaging modalities (contrast echocardiography, computed tomography, cardiac magnetic resonance, positron emission tomography), and chemotherapy outcomes, including CR and PR. CR, complete response; PR, partial response.

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