6.1 Introduction

Primary cardiac tumors are a rare cause of heart disease, being found in autopsic series with a mean frequency of 0.02%, corresponding to 200 tumors in 1 million autopsies. Three quarters of primary cardiac tumors are benign and the rest are malignant. Atrial myxoma, a benign neoplasm, is by far the most common primary cardiac tumor, while the majority of primary cardiac malignancies are angiosarcomas or rhabdomyosarcomas (Table 6.1). Cardiac metastases are 10 to 40 times more frequent than primary cardiac tumors, melanoma being the most common, although clinically undetected in a large percentage of cases. The diagnosis of a tumor involving the cardiovascular system in alive patients was difficult in the past due to the elusive character of clinical signs and symptoms, their recognition being usually made at post-mortem examinations.

Cardiac tumors or masses are frequently an unsuspected finding in asymptomatic patients. Their clinical manifestations, when present, are related to their localization, size or behavior, causing pericardial effusion (metastases, mesotheliomas), compression of the cavities (cysts, thymomas, lymphomas), myocardial restriction (fibromas, hemangiomas, sarcomas), paroxistic pulmonary or central venous congestion (myxomas), or peripheral embolism (thrombi, papillary fibroelastoma).

Although a first line diagnostic tool, echocardiography does have limitations: poor image quality in those cases with a difficult acoustic window, and limited field of view, especially in paracardiac masses. In the latter, the differential diagnosis is frequently challenging as extrinsic cardiac compression may be due to many different causes, such as pleural effusion, hiatal hernia, or, simply, a chest wall malformation as in pectus excavatum. In all these situations, CMR is an excellent alternative imaging method (Figure 6.1). But also in the study of intracardiac masses CMR has become the preferred technique, due to its excellent image resolution and the possibility of obtaining angulated image planes, although in some aspects, as in the detection of calcifications, computed tomography is ahead. Provided the variety of techniques available, a knowledge of their relative merits in the diagnosis of cardiac masses is important (Table 6.2).
6.2 Technical Aspects in the Evaluation of Masses with CMR

The excellent soft tissue definition that CMR provides allows the clear delineation of the myocardium, pericardium, paracardiac fat, vascular structures, and the lungs, and thus facilitates the identification and study of abnormal masses. The wide field of view permits unlimited observation of the extension and the anatomical relationships of cardiac and paracardiac masses with the great vessels and the bronchial tree, information that is especially useful to guide surgeons in the design of an appropriate therapeutical strategy.6,7

To some extent, CMR allows some degree of tumor tissue characterization8 by a comparative analysis of signal intensity characteristics on the images from the different sequences available (Table 6.3). Easy to characterize are those tumors with a high fat content, such as lipomas, which stand out for their bright signal intensity in T1w spin-echo (SE) sequences (Figure 6.2). Comparing the characteristics of the same image in T1w and T2w SE sequences, the composition of an

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Table 6.1 Classification of the most frequent masses and cardiac tumors

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign</td>
<td>Malignant</td>
</tr>
<tr>
<td>Myxoma</td>
<td>Sarcoma</td>
</tr>
<tr>
<td>Pericardial cyst</td>
<td>Mesothelioma</td>
</tr>
<tr>
<td>Lipoma</td>
<td>Breast carcinoma</td>
</tr>
<tr>
<td>Fibroelastoma</td>
<td>Esophageal carcinoma</td>
</tr>
<tr>
<td>Rhabdomyoma</td>
<td>Mediastinal tumors</td>
</tr>
<tr>
<td>Fibroma</td>
<td></td>
</tr>
<tr>
<td>Hemangioma</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Direct extension</th>
<th>Venous extension</th>
<th>Metastatic extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung carcinoma</td>
<td>Renal cell carcinoma</td>
<td>Melanoma</td>
</tr>
<tr>
<td>Breast carcinoma</td>
<td>Adrenal carcinoma</td>
<td>Leukemia</td>
</tr>
<tr>
<td>Esophageal carcinoma</td>
<td>Hepatocellular carcinoma</td>
<td>Lymphoma</td>
</tr>
<tr>
<td>Mediastinal tumors</td>
<td>Thyroid carcinoma</td>
<td>Genitourinary tract</td>
</tr>
<tr>
<td></td>
<td>Carcinoma of the lung</td>
<td>Gastrointestinal tract</td>
</tr>
<tr>
<td></td>
<td>Sarcoma of the uterus</td>
<td></td>
</tr>
</tbody>
</table>

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FIGURE 6.1

F. 6.1. Axial (left) and sagittal (right) images showing a large hiatal hernia (asterisks) compressing the posterior aspect of the heart. LA: left atrium; RA: right atrium.