Role of different imaging modalities in assessment of Pericadial and Cardiac masses

Assay
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Abstract

Primary cardiac and pericardiac neoplasm are rare lesions and are less common than the secondary ones. They include both benign and malignant histologic types. Myxoma is the most frequent primary cardiac neoplasm in adult, while rhabdomyoma is the most common neoplasm in children. The pericardial tumors include benign teratom and malignant mesothlioma. However they can be early diagnosed with echocardiography, computed tomography (CT), and magnetic resonance imaging (MRI). Chest X-Ray may reflecting the location of the tumor., while Echocardiography is the preferred initial imaging modality, but CT and MRI add a very specific information in the evaluation of primary cardiac and pericardiac neoplasm as they detect the tumor location, morphologic features and tissue characterization, include the presence of calcification, fat, fibrous tissue, hemorrhage or cyctic changes. This help refine the differential diagnosis.

Key wards:

Cardiac masses/neoplasm, pericardiac masses/neoplasm, echocardiography, MRI heart, multislice CT heart.

Table of contents

List Of Figures

page

Introduction

Primary cardiac neoplasm are rare lesions that affect patients of all ages. It is estimated that primary cardiac neoplasm are ١٠٠-١٠٠٠ times less prevalent than secondary neoplasm of the heart. The benign primary neoplasm are more common than the malignant ones although benign neoplasm don not metastasize may lead to significant morbidity and mortality by affecting blood flow and causing arrhythmias and emboli before the advent of cross sectional image. *(Sawage et. al., ٢٠٠٠)*

The most common primary cardiac neoplasm is myxoma that account for half of all the cases other primary cardiac tumors include papillary fibroelastoma which is the most common valvular tumor,rhabdomyoma, fibroma, lipoma, hemangioma& paragnglioma. While the malignant cardiac tumors include sarcoma which represent the second most common primary cardiac neoplasm and lymphoma which is rarely manifest as primary cardiac tumor.*(Shapiro et.al. ,٢٠٠١)*

The pericardial tumors also affect the heart mimic cardiac neoplasms the most common pericardial tumors are teratoma and malignant mesothelioma. *(Schvartzman et.al., ٢٠٠٠)*

Benign neoplasms are classified according to their histological features and cellular differentiation into that arising from fibrous tissue as (fibroma), vascular as (hemangioma), fat as (lipoma)& nervous as (pheochromocytoma) or ectopic as (teratoma).

While the malignant neoplasms are histological classified by tissue type into as mesenchymal (sarcoma), lymphoid (lymphoma) and mesothelial as (mesothelioma). *(Zissin et.al.,١٩٩٩)*

Patients with primary cardiac neoplasms present with wide range of symptoms that are commonly cardiovascular in nature that may mimic cardiopulmonary diseases as coronary artery diseases, cardiomyopathy, pericarditis or valvular dysfunction.

The most common clinical presentation is heart failure as dyspnea, orthopnea, peripheral edema, followed by symptoms of peripheral emboli to the cerebral or the coronary arterial circulation. The clinical presentation is determined by the tumor location, size, rate of growth, friability with the its tendency for emmobilization and the degree of invasivness. *(Perchinsky et.al.,١٩٩٧)*

The intra cavitary tumors tend to obstruct the cardiac valves or the major vascular structures or produce emboli, while the myocardial lesions may affect the conduction system of the heart resulting in arrhythmia, the pericardial neoplasms lead to pericardial tamponad. *(Roberts et.al.,١٩٩٧)*

Radiological evaluation usually begin with chest X-Ray which reveals abnormal findings including cardiomegaly, abnormal contour, sign of heart failure and plural effusion. Specific chamber enlargement may result from various intracavitary tumors, whereas the mural lesions produce abnormal contour or cardiac enlargement. Pericardial neoplasm usually produce a rapid developing pericardial effusion.*(Rachmani et.al.,١٩٩٩)*

Echocardiography is the primary modality of imaging intracardiac disease as it provide high resolusion and real time images through trasesophageal echocardiography, it is the initial

evaluation of suspected cardiac tumors and it is frequently required for more accurate assessment.

However the image acquisition with computed tomography adequately demonstrate the morphology, location and extent of cardiac neoplasms, and its main advantages over the echocardiography is its depiction of the pericardium, great vessels and surrounding structures to look for the associated metastasis *(Shaparo et.al.,١٩٩٩)*

The soft tissue contrast by CT imaging is superior to that of echocardiography and is capable of detection of calcification which is important variable in the differential diagnosis of cardiac neoplasm.

Magnetic resonance imaging has a higher soft tissue contrast than CT images and allows much greater flexibility in selection of imaging planes. MRI is utilized in preoperative evaluation of cardiac neoplasm. The main advantage of MRI is high contrast and spatial resolution, wide field of view, multiplaner imaging and capabilities of precise demonstration of the masses include its anatomical relation to the pericardium, myocardium or any contiguous structures. In some cases the use of gadolinium increase the conspicuity of the tumor by showing the differential enhancement with respect the surrounding normal myocardium. *(Smith et.al., ١٩٩٨)*

Aim of study

To compare the capability of different imaging modalities in diagnosis of cardiac tumors.

Anatomy of the heart

The heart base is facing upward with its apex is pointing downward forward and to the left . Two third of the heart lies to the left ,and one third lies to the right of the median plain .

The heart has two surfaces: the anterior surface , that is anterior superior ,and the posterior surface that is posterior inferior it also has two borders: A blunted left border and a sharp right border.

The anterior surface of the heart is made mainly of the anterior surface of the right ventricle with a small strip of the left ventricle to the left and the anterior aspect of the right atrium to the right.

The posterior surface of the heart is divided into the diaphragmatic, and the vertebral surfaces.

The diaphragmatic surface is formed of the ventricles separated by the posterior inter ventricular sulcus. The left ventricle forms the left two third of this surface. The vertebral surface that form the base of the heart is formed by the atria, mainly the left . The base is separated from the diaphragmatic surface by the posterior part of the coronary sulcus. .*(Abaza et al.,١٩٩٥)*

Right atrium :

The right atrium consists of smooth walled posterior part which receive the superior and inferior vena cava and the coronary sinus and an anterior part which is ridged by muscle bundles (muscle pectinati). The two parts are separated on the right by an external groove(sulcus terminalis) and a corresponding internal vertical ridge (crista terminalis) . The fossa ovalis lies on the posteromedial wall of the right atrium . the left border of the right atrium is largely formed by the tricuspid valve.

Left atrium:

The left atrium is an ovoid shaped camber. The four pulmonary veins enter through its posterior wall. The mitral valve occupies the left anterorinferior aspect of the chamber, while the atrial septum forms its right anteroinferior wall. *(Abaza et al.,١٩٩٥)*

Right ventricle:

The right ventricle lies anterior and to the right of the left ventricle, its cavity is approximately triangular in shape when seen from the anterior surface and crescent in shape in transverse section . The normal chamber can be divided into two identifiable segments :an outflow portion or infundibulum leading to the pulmonary valve. The remainder of the ventricle has irregular muscular ridge (trabeculae carneae) projecting from its internal surface.

There are usually ٣ papillary muscles . Large posterior and anterior papillary muscles and several small septal papillary muscles. Each of these papillary muscles is inserted into the

margins and ventricular surface of the two adjacent cups of the tricuspid vale by tendinous strands (chordae tendinae).

The crista supra ventricularis is a muscular sheet that extend between the tricuspid and the pulmonary valves and forms the right posterior wall of the infundibulum.

Septomarginal trabecula or moderator band is one of the trabeculae crossing the cavity of the ventricle from the septum to the anterior papillary muscle .

Left ventricle:

The left ventricle is an elliptic shaped chamber with a flattened base formed by the aortic valve . It is round in cross section , having thick wall and fine trabeculations . The aortic and metal valves insert in a common on the fibrous skeleton of the heart . The mitral valve is situated along the most posterior and superior aspect of the left ventricle , just below the posterior margin of the aortic valve . The mitral valve is tethered by two finger like papillary muscles , one arising from the anterior lateral aspect of the left ventricle wall near the cardiac apex and the other from the posterior medial portion of the ventricle. .*(Abaza et al.,١٩٩٥)*

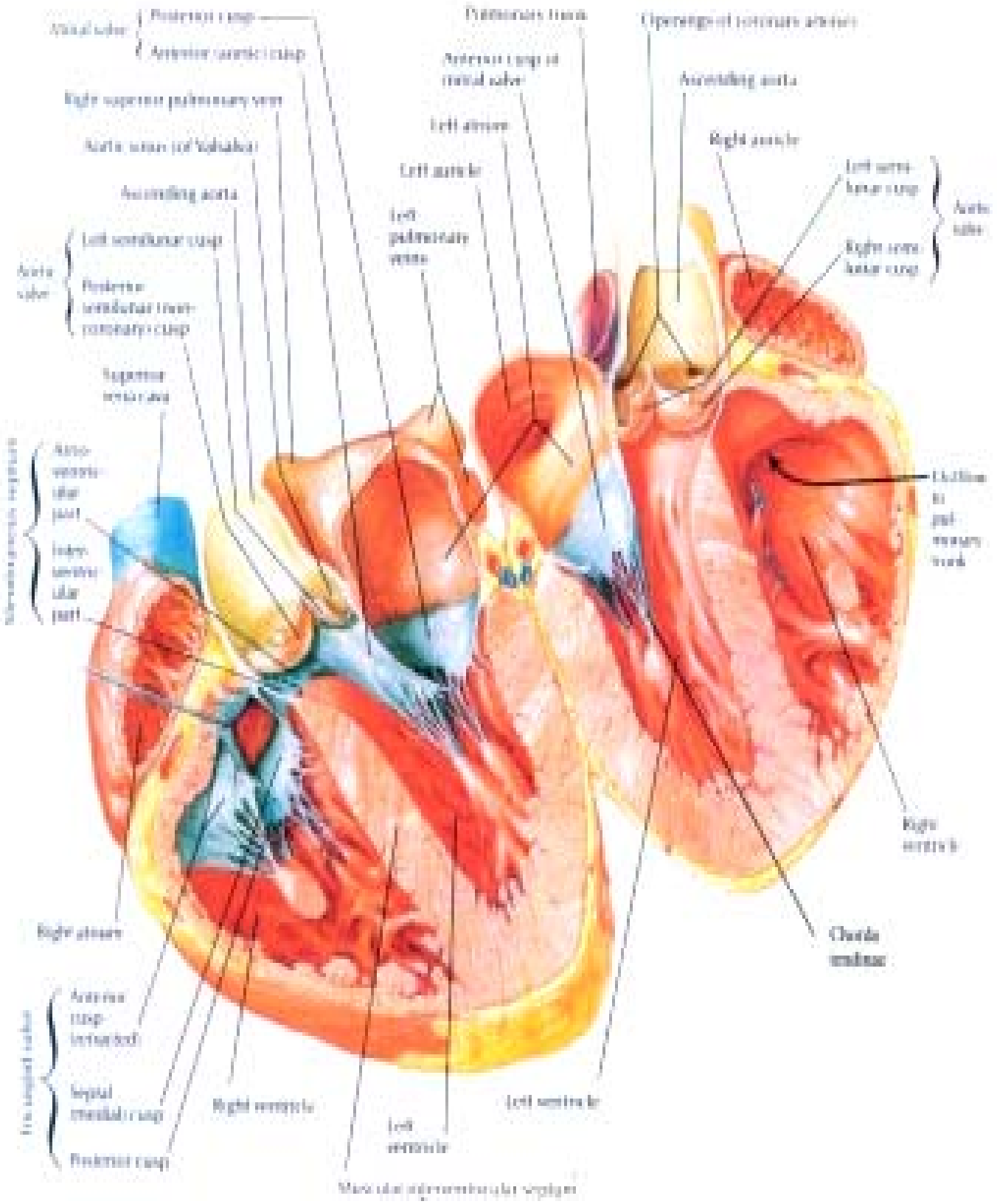

Fig (١) anatomy of the heart (Netter ١٩٩٥)