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Radio-Pathologic Correlation of Patient Presenting with Cardiac Masses in Tertiary Health Care Center

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ABSTRACT

In this study, we will investigate the imaging strategy for cardiac neoplasms, focusing on the most prevalent and clinically important tumours and the correlation between their pathology and imaging presentation. These uncommon diseases are at the crossroads of cancer and cardiac imaging, and their symptoms may be similar to those of more prevalent cardiac conditions. Various patients presenting to new civil hospital with cardiac mass are examined for clinical features, radiologic, biochemical and histopathologic examination. Cases of cardiac myxoma, rhabdomyoma, fibroma, haemangioma, angiosarcoma, lymphoma are examined. Patients are examined radiologically with computed tomography and magnetic resonance imaging. Important imaging factors to consider when dealing with a cardiac mass include tumour location, metastatic disease risk and clinical presentation. The most useful characteristic for identifying cardiac mass is often its location. The overall frequency of benign cardiac masses on the left side of the heart is higher than the frequency of myxomas, which are more common on the left side of the heart. The right side of the body is where the majority of cancers that spread to the heart, such as cardiac lymphoma and angiosarcoma, are found. Angiosarcoma is more likely to occur when there is necrosis, surface augmentation and valve involvement, lymphoma is more likely to occur when there is homogeneity and vascular encasement. All the cases are studied thoroughly for their clinical features, radiological findings and pathological appearance. Our results indicate that the pathophysiology at the root cause of the diverse imaging appearances of primary cardiac neoplasms is recognized. We come to the understanding that primary cardiac neoplasms are very uncommon and despite the fact that they could exhibit symptoms that are similar to those of other types of neoplasms, they are not considered to be cancerous. Their underlying pathophysiology provides an explanation for the varied imaging appearances that primary cardiac neoplasms can take. Location, tissue characteristics, age and related symptoms are the main clinical aspects to be considered while imaging a primary cardiac tumour.

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Key Words

Radio-pathologic correlation, cardiac masses, tumours

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INTRODUCTION

There are several degrees of difficulty in diagnosing cardiac neoplasms. Not only are they very unusual but they also lie at the unusual crossroads of cancer and cardiac imaging, and their clinical presentation may be similar to other, more frequent cardiac disorders. In spite of these difficulties, it is possible to acquire a favourable diagnosis by combining the most recent imaging tools with an understanding of the pathologic foundation of cardiac neoplasms. A thorough understanding of the pathophysiology of cardiac neoplasms provides an explanation for the wide range of imaging appearances, just as is the case with tumours in other parts of the thorax. In addition, the diagnostic strategy for these lesions and eventually, their treatment are influenced by information on cardiac tumours, which includes imaging appearances as well as epidemiology. This study will investigate the imaging strategy for cardiac neoplasms, focusing on the most prevalent and clinically important tumours and the correlation between the two.

A brief differential diagnostic or clinically meaningful diagnosis might be reached by first establishing an epidemiologic setting. Both autopsy research and clinical experience indicate that metastatic disease is forty to one hundred times more common than original cardiac neoplasms. Because cardiac imagers evaluate cardiac neoplasms often, there may be a discrepancy in their clinical experience between the frequency of primary tumours and metastatic sickness. The majority of epidemiologic data come from postmortem series or huge clinical databases that do not undergo additional diagnostic evaluation. This is the case despite the fact that cardiac spread may be discovered in the context of metastatic illness, which is a more generic term.

The reported annual incidence rate for primary cardiac neoplasms is 30 per 100,000 individuals.[1,2]. Of all cardiac tumours, around 80% are actually benign. Myxomas and other benign tumours, angiosarcomas and other malignant lesions and solitary fibrous tumours and other pericardial tumours are the three main categories into which cardiac neoplasms have been categorised by the World Health Organisation[3]. Primary cardiac neoplasms most often seen in people older than 16 years include myxomas, lipomatous tumours and papillary fibroelastomas. Among children under the age of 16, rhabdomyomas, teratomas, fibromas and myxomas are the types of tumours that are most often encountered.

A cardiac tumour is characterised by dyspnea, while additional symptoms could also manifest based on the tumor's location and size. Even benign cardiac tumours may cause fatal complications such diminished cardiac output, arrhythmia, restricted blood flow, or heart failure. Fatigue, anorexia, and fever are some of the systemic symptoms that may be seen.

MATERIALS AND METHODS

In this study various patient presenting to new civil hospital with cardiac mass is examined for clinical features, radiologic, biochemical and histopathologic examination. Cases of cardiac myxoma, rhabdomyoma, fibroma, haemangioma, angiosarcoma, lymphoma are examined. Radiological examinations including CT scans and MRIs are performed on patients. Clinical characteristics and symptoms are assessed during patient examinations.

RESULTS AND DISCUSSIONS

We will discuss individual case presenting to our tertiary health care center.

MYXOMA:

Clinical Considerations: In adults, cardiac myxoma accounts for as many as 80% of benign primary cardiac neoplasms[5], however, in children, it only accounts for 10% of these tumours. There are several neoplasms (both endocrine and nonendocrine), pigmented skin and mucosal lesions, cutaneous tumours and an autosomal dominant syndrome called Carney complex that affects 3-10 percent of cardiac myxomas. Acromegaly and Cushing syndrome are symptoms of this condition, which is caused by pituitary neoplasms and adrenocortical tumours, respectively. “Half of the deaths caused by this condition are attributable to cardiac myxomas, which are more likely to occur in younger individuals, be diagnosed in more than one site, and have a greater chance of returning. There are many different symptoms, ranging from general ones like fever and weight loss to more specialised ones like breathing difficulties and chest pain. In as many as thirty percent of cases, embolism is the first sign of a myxoma. Studies have shown that myxomas of the left heart present with more severe dyspnea and earlier onset of symptoms than those of the right heart. Although myxomas may develop in any part of the heart, they often begin in the interatrial septum and start in the left atrium. Myxomas are most commonly seen in the left atrium. In addition to being mobile, these lesions may have a pedunculated appearance and an uneven border. The chance that the lesion may obstruct the atrioventricular valve and the tumor's mobility are influenced by the size of the tumour.

Pathologic Features: Upon physical inspection, myxomas are soft, gelatinous, or friable lesions that typically vary in size from 2-11 cm. Thromboembolism is assumed to be connected with tumours that have a villiform appearance, while most tumours have lobular

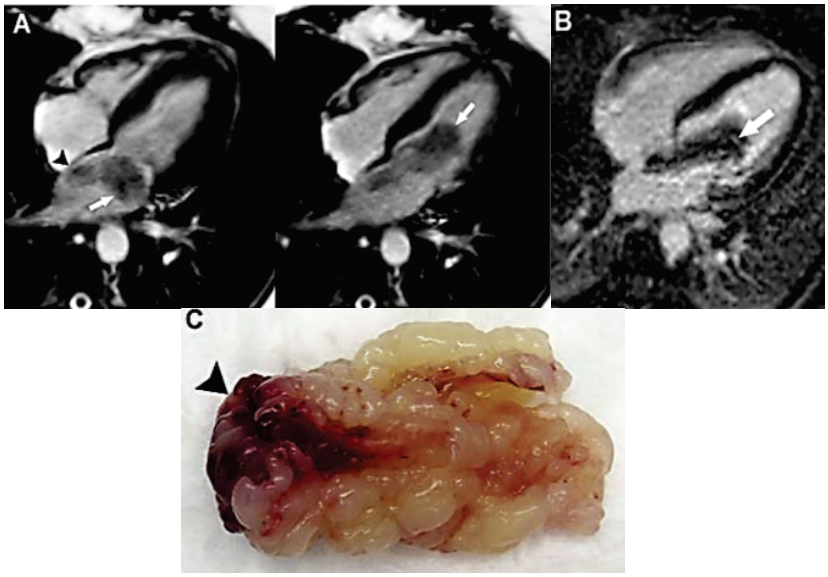

Fig. 1: A 35-year-old man with cardiac myxoma. (A) Axial SSEP MR composite image show a mass (arrow) in the left artrium with stalk like attachment (arrowhead) to the interatrial septum. Note the prolapse of the mass across the mitral valve plane between systole (left) and diastole (right), characteristic of myxoma. (B) Axial late gadolinium enhancement MR image show small foci of internal enhancement, a useful differentiating feature from thrombus. © Gross sepcimen show the cut stalk (arrowhead) and a smoth polyploid mass. SSEP, steady-state free precession

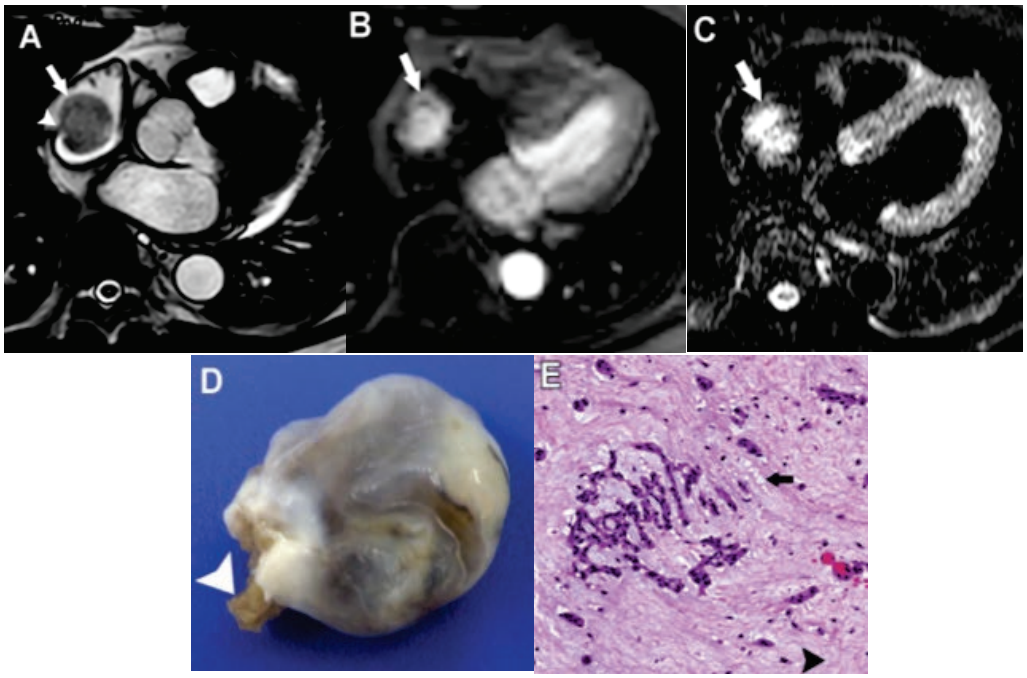

Fig.2: A 62-year-old man with cardiac myxoma (A) Axial staedy-state free precession MR image shows a mass (arrow) in the right atrium with stalk like attachment (arrowhead) to the wall of the atrium. (B) Axial T2 wighted MR image shows significant hyperintenstiy of the mass (arrow). Attributed to the myoxid component of these tumers (C) Axial perfusion MR image im the early arterial face shows deffuse enhancement of the mass (arrow). Excluding thormbus as a diagnostic consideration.(D) Gross specimen shows the cutt stalk of the mass (arrowhead) and a variegated white and gray tan external surface.(E) photomicrograph (orignalmagnification 40x; hematoxyline-eosine stain) shows spindal cells without atypia (arrowhead) and pauci cellular meterial (arrow)

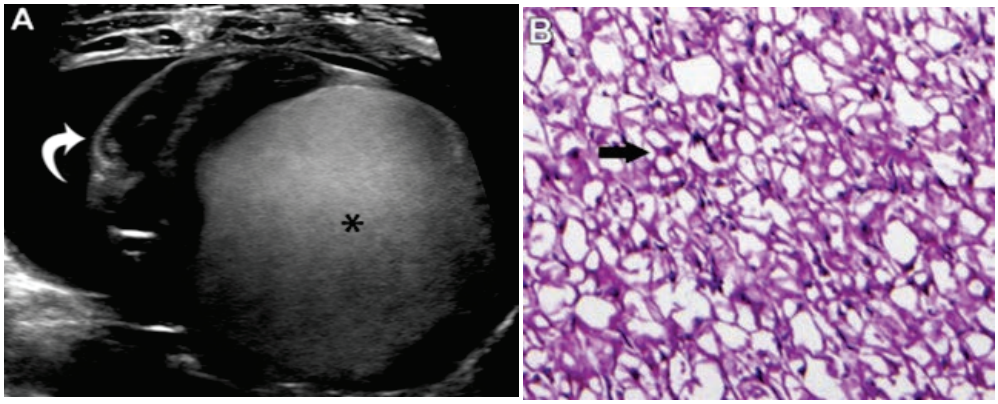

Fig. 3: Neonate with cardiac rhadomyoma. (A) Transthoracic echocardiographic image shows a homegenously hyperechoic mass (asterisk) displacing the heart to the right (curved arow). (B) Photomicrograph (original magnification 40x, hematoxy line-esoin stain) show large vacuolated cells with centrally placed nucleus and myofibrils radiating to the cell memberan, “spider cell” (arrow)

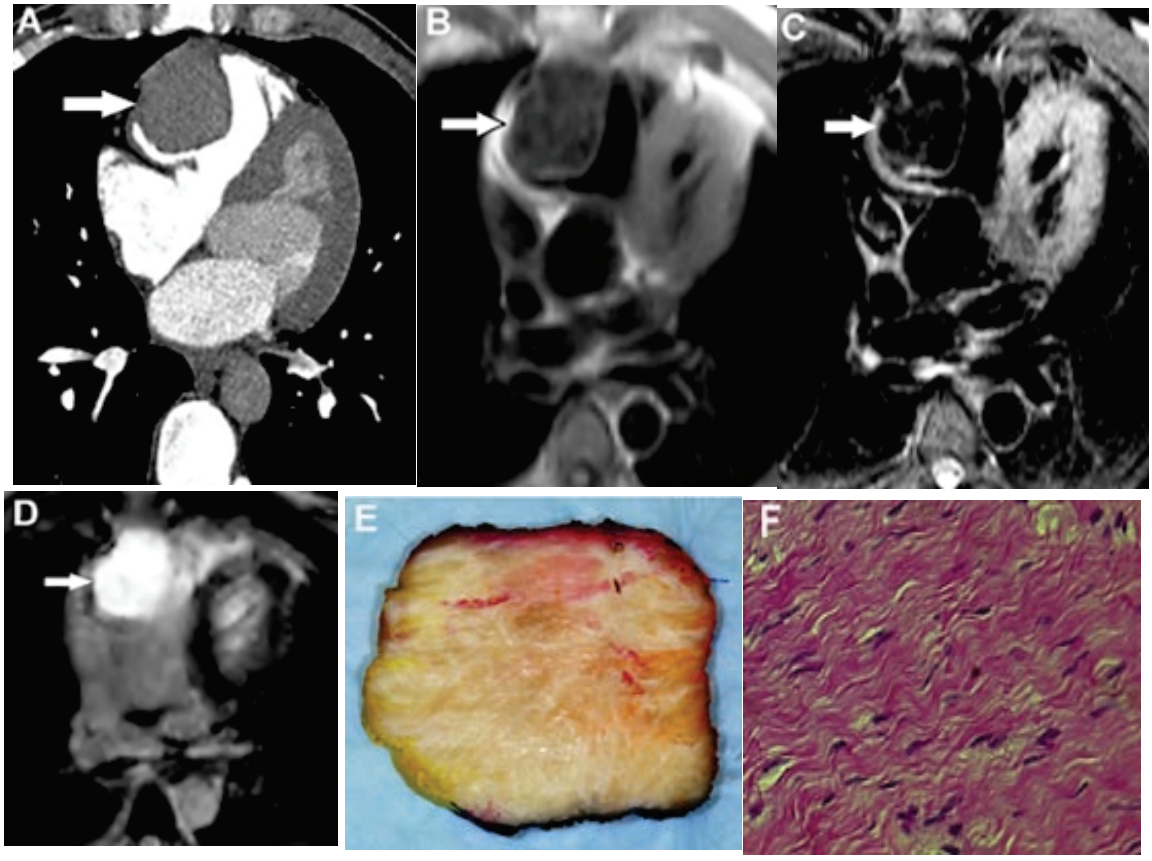

Fig. 4: A 45-year-old man with cardiac fibroma. (A) Contrast-enhanced axial CT image shows a smooth, well cirumscribed right ventricular mas (arrow) without pericardial effusion or evidence of local invasion. (B) Axial TI-weighted T2 image shows the mass (arrow) to be unifrom and slightly hypointense relative to skeletal components. (D) Axial late galdolinium enchancement MR image show intense, diffuse (arrow) of the mass suggesting fibrotic tissue. (E) Sectioned gross specimen shows a homogeneous, whirled, solid cut surface. (F) photomicrograph (original magnification, 40x; hematoxyline-eosin stain) shows multiple bland fibrobalste with normal appearing nuclei and no evidence of mitosis

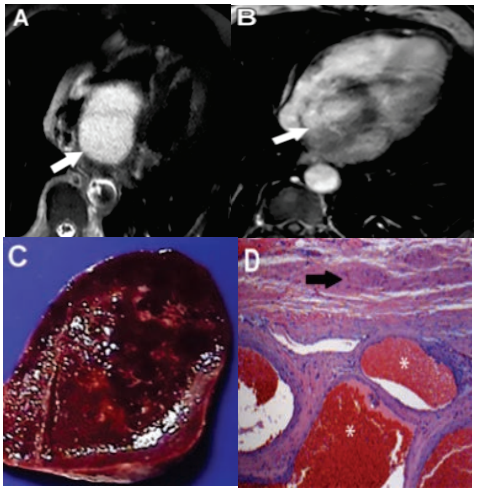

Fig. 5: A 71-year-old man with cardiac hemangioma.(A) axial T2-wighted MR image show a homogeneously hyperintense intracardiac mass(arrow) displacing the adjacent cardiac chambers.(B) Axial postcontrast T1-hyperintense intracardiac mass (arrow) displacing the the adjacent. (C) sectioned gross specimen shows an encapsuleated mass with with red with red-tan. Sponngy fibourse tissu and maroon-red flued.(D) photomicrograph (orignalmagnification 40x; hematoxyline-eosine stain) shows dilated vascular channels(asterisk) and overlying myocardiuam (arrow)

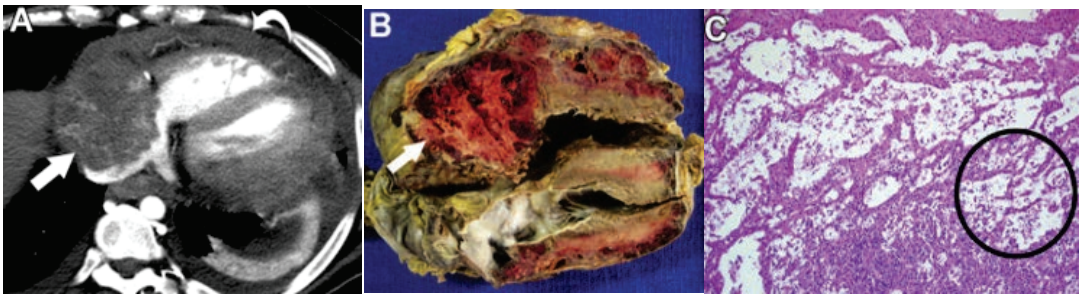

Fig. 6: A 26-year-old man with cardiac angioscaroma. (A) Contrast-enhanced axial CT image show an aggressive mass (arrow) centered int the right artrium with internal vascular enhancement. A pericardial effussion is present (curved arrow). (B) selctoined gross specimen shows a the mass (arrow) with internal dilated vessels. © Photomicrograph (original magnification, 40x; hematoxyline eosin stain) shows a proliferation of vascular interonnected space (circle) and malignant spindle And epithlioid cells

and smooth contours. For the aim of histologically identifying myxomas, it is feasible to make use of the presence of myxoma cells inside a myxoid stroma, in addition to the possibility of calcification and inflammation. There is a possibility that these lesions include heterotopic components, such as large cells, glands and bone. For the purpose of further determining whether or not the Carney complex is present in myxoma cases, an immunohistochemistry test of PRKAR1A, which is a regulatory subunit of cAMP-dependent protein kinase type 1a, may be used.

Imaging Features: For the first assessment of cardiac myxomas, transthoracic echocardiography is the preferred imaging modality even if its findings are not specific. Echocardiography may show whether or not a myxoma is calcified and whether or not it is homogeneous. While contrast-enhanced CT often reveals an oval or spherical mass with lower attenuation than the surrounding myocardium, using CT to characterise the tumour is not advised. Characteristics of magnetic resonance imaging (MR) that can be used to detect myxomas include T2-weighted hyperintensity, hypoperfusion on first-pass perfusion following intravenous gadolinium injection, and a heterogeneous appearance on delayed enhancement compared to the myocardium

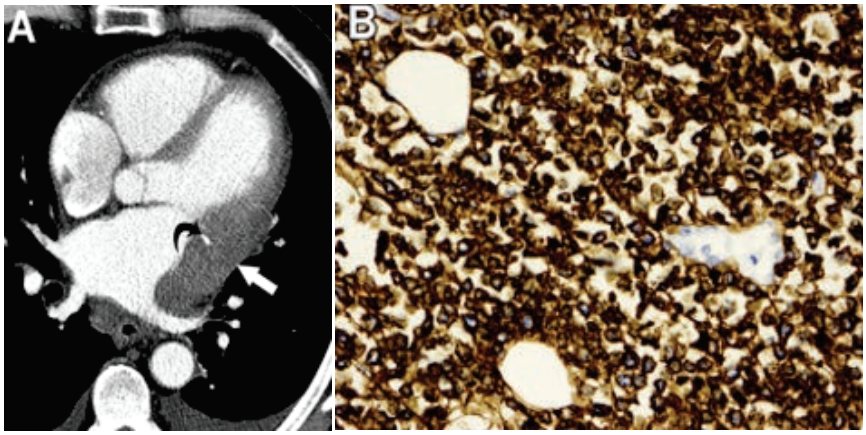

Fig. 7: A69-year-old man with cardiac large B-cell lymphoma.(A) contrast-enhanced axial CT image shows a mass(arrow)centered on the left atrioventricular groov. surrounding the but not occluding the left circumlex coronry artery (curved arow). (B) Photomicrograph (orginal magififcation, 40x, CD20 stain) shows diffuse positive strining for B-cell marker CD20

(Figs. 1-7). A susceptibility artefact caused by hemostirin may be shown using gradient echo imaging. In addition, parametric approaches can be used to characterise the mass. T1 mapping shows T1 timings from 1285-1356 msec, whereas T2 mapping shows T2 durations from 76-270 msec at 1.5 T.

RHABDOMYOMA

Clinical Considerations: Over 60% of paediatric primary cardiac neoplasms are rhabdomyomas, making them the most prevalent primary cardiac tumour in children and newborns[12]. Lesions like these are typically found throughout the first year of a child's life, or even sooner[13]. Heart rhabdomyomas are most commonly found in people with tuberous sclerosis (30-50%), although they can also arise on their own and very rarely in conjunction with congenital heart defects[13,14]. Periungual fibromas, multiple retinal hamartomas, adenoma sebaceum on the skin, cortical tubers and subependymal nodules in the brain are the characteristics of tuberous sclerosis[14]. Months or even years before other symptoms of tuberous sclerosis, like changes in the skin or anomalies in neuroimaging, rhabdomyomas may manifest[12]. The size and location of the tumour determine the symptoms of heart rhabdomyoma, which might vary. They may cause obstruction-related congestive heart failure or cause no symptoms at all. There have been reports of arrhythmias as well[15]. Rhabdomyomas are less prevalent in the atrioventricular groove and more prevalent inside the ventricles that are connected to the myocardium[9,12]. In 60% of instances, they occur in multiples, most often in the context of tuberous sclerosis.

Pathologic Features: Under a microscope, lobulated lumps with a glossy cut surface are the appearance of rhabdomyomas. Larger tumours are more common in sporadic tumours compared to those in tuberous sclerosis[13]. These tumours reveal themselves histologically as big cells in comparison to the heart, brimming with glycogen. Any tumour characterised by a core mass of granular cytoplasm and the presence of lengthy projections of myofibrils that extend peripherally from the nucleus to the cell membrane is considered to have "'spider cells"[13,16]. Positive desmin, actin, and myoglobin immunohistochemistry staining results are shown for these lesions.

Imaging Features: Fig. 3 shows that rhabdomyomas look uniformly hyperechoic on transthoracic echocardiography[12]. Their appearance on contrast-enhanced CT images is often as hypodense masses with minimal contrast enhancement. Seventy According to the MR imaging results, these tumours appear uniformly as follows. T1-weighted images show isointense to slightly hyperintense signal to cardiomyocytes, T2-weighted images show slightly hyperintense signal to cardiac tissue, first pass perfusion shows hypo-enhancing signal and myocardial delayed enhancement shows isointense signal to cardiac tissue[9,1].

FIBROMA

Clinical Considerations: The second most frequent primary heart tumour in infants and children, after rhabdomyoma, is cardiac fibroma[13].More than 80% of cardiac fibromas occur in children, while the disorder can also strike adults[19]. Odontogenic cysts, nevoid basal cell carcinoma (Gorlin) syndrome,

microphthalmia, coloboma of the iris, congenital cataracts and medulloblastoma are all conditions that increase the likelihood of these tumours occurring in patients. It develops in 2% of people with basal cell carcinomas who are younger than 45 years old[20]. Arrhythmias, congestive heart failure and sudden death are symptoms that patients with cardiac fibromas may have. However, it is thought that these complications are not caused by invasion but by irregularities in the heart's transmission system. The year 19 Left ventricle free walls, interventricular septum and right ventricle are the most typical sites of cardiac fibromas.

Pathologic Features: On the surface, cardiac fibromas seem as small, white tumours with clear borders, around 3-8 cm in diameter. Some examples of cut surfaces include brown, grey, or white (Fig. 4). The tumor's histology reveals a collagen matrix including conspicuous spindle-shaped fibroblasts[19]. Age induces a reduction in cellularity and an increase in collagen matrix[22]. Although cells lack desmin, CD34 and S100 protein expression, they do show alpha smooth muscle actin[19]. Although calcification is seen, it is more likely to occur in people who are older.

Imaging Features: Cardiac fibromas may exhibit calcification on chest radiography[21]. The tumour was successfully identified and shows mixed echogenicity on transthoracic echocardiography. In contrast-enhanced computed tomography (CT), fibromas may show homogeneous or heterogeneous enhancement[21]. When examining at T1-and T2-weighted magnetic resonance imaging, it is possible to see a thin border of the myocardium in the lesion, which has varying signal strength. When intravenous gadolinium is used, delayed imaging often shows significant hyperenhancement across the region, with or without decreased enhancement in the middle.

HEMANGIOMA

Clinical Considerations: Any age group is susceptible to hemonagemas, which make about 5% to 10% of benign cardiac neoplasms[24]. Dyspnea with exercise is the most prevalent symptom, while patients are often asymptomatic[25]. Recurrent thrombocytopenia and consumptive coagulopathy are symptoms of Kasabach-Merritt syndrome, which occurs in very rare cases[24]. Although they may develop in any heart chamber, the ventricles are where these tumours most often arise.[4].

Pathologic Features: Red and hemorrhagic hemangiomas are visually noticeable at first glance[26]. Capillary, cavernous and arteriovenous variations are seen on histology. Lesion components include a variety of mature vessels held together by fibrous connective tissue and surrounded by a dilated mixture.

Imaging Features: A solid vascular mass is shown by transthoracic echocardiography in cases of hemangiomas[12]. Hemangiomas are heterogeneous masses that actively augment on contrast enhanced CT and may include calcifications[17]. Hemangiomas are diverse and hyperintense to the heart on T2-weighted imaging[4] and they are isointense to hypointense to the myocardium on T1-weighted imaging (Fig. 5)[25]. [4] Hemangiomas are also hyperintense to the brain. The degree of improvement that may be noticed with myocardial delayed imaging may vary, despite the fact that they exhibit improvement with first pass perfusion[9]. On MR imaging, hemangiomas may be hard to tell apart from other types of vascular tumours, including malignant neoplasms such angiosarcoma[1].

ANGIOSARCOMA

Clinical Considerations: When it comes to individuals with considerable differentiation, cardiac angiosarcomas account for around forty percent of all cardiac sarcomas. Furthermore, they are the most prevalent form of primary heart cancer. Patients are typically less than 65 years old, with a slight male predominance of 1.3:1.27 with a peak occurring in the fourth or fifth decade of life. It is estimated that between 80-90 percent of cardiac angiosarcomas are located in the right atrium, close to the atrioventricular sulcus. The most common causes of symptoms are obstruction, tumour emboli, or local invasion into the myocardium and atrial free wall. Blockage is often a source of symptoms. There are a number of symptoms that are often experienced, including vertigo, dyspnea, chest tightness and indicators of congestive right heart failure.

Weight loss, malaise, anaemia, and exhaustion are examples of nonspecific symptoms that may coexist. Due to the increased likelihood of pericardial involvement, cardiac angiosarcomas account for a disproportionately high number of cases of pericardial effusion (56% of patients), which might present as cardiac tamponade. A sneaky start to arrhythmia is common in younger patients and is usually a sign of myocardial invasion[28]. Metastases from these tumours may occur both locally and far the lung is the most prevalent location for distant metastases. Additional places mentioned in studies include the liver, bone, spleen, adrenal glands and mediastinal lymph nodes. The elevated risk of brain metastases in individuals after surgical resection is thought to be caused by intravascular dissemination during tumour excision and manipulation[29].

Pathologic Features: Right atrium is the site of origin for cardiac angiosarcomas in 80-90% of cases. The tumour often grows permeatively into the myocardium as a result of surgical excision and it also invades the coronary arteries the vena cava the tricuspid valve and the pericardium. Gross pathology reveals the

enormous lobulated mass, which manifests as a dark red and brown coloration due to the presence of hemorrhagic and necrotic components at the same time. An indistinguishable, thicker rim of gray-black tissue around the tumour indicates the presence of pericardial invasion[30]. Numerous arterial channels lined with endothelial cells and connected by branching anastomoses and sinusoids are the most prominent histological features. Anaplastic spindle cells, which mimic those of Kaposi sarcoma, are tightly packed among the other cells. Circular cells with an abundance of cytoplasm and numerous mitoses characterise the epithelioid variety, which is prevalent in the heart. As an additional tool, immunohistochemistry may be used to assess these tumours. The predominant histologic pattern determines the variability and heterogeneity of staining. Although CD30 staining is nonspecific for cardiac angiosarcomas, it is positive in over 90% of patients. The gold standard is the specificity of the monoclonal antibody BNH9, which is directed against H and Y antigens that are associated with blood groups.

Imaging Features: Echocardiography or coronary angiography is usually ordered when dyspnea and congestive heart failure are symptoms. When it comes to detecting cardiac masses, transesophageal echocardiography has a sensitivity of 75-97%[30,32]. This modality provides information on the position, size, form, attachment, and mobility of tumours. The majority of the time, technologies such as computed tomography (CT), magnetic resonance imaging (MRI), and fluorodeoxyglucose (FDG) PET/CT are able to give further mass characterisation and metastatic evaluation. Imaging has shown two distinct morphologic categories. One typical presentation is a small, irregularly shaped mass that attaches to the myocardium and typically originates from the right atrial free wall; it averages 6 cm in size and has a wide border (Fig. 6). This mass has been described in previous studies[33,34]. Cavitations have the potential to decompress, allowing tumour materials to pour into the systemic circulation and facilitating unrestricted communication with the heart chambers. Additionally, calcifications might be seen. Important results also include the degree to which the great vessel is involved, the mass impact on the heart chambers, and the amount to which myocardial invasion has occurred. An indivisible, diffusely infiltrative mass around the heart is the second morphologic kind. The presence of hemorrhagic and necrotic tumour debris is common in complicated pericardial effusions. A bloody aspirate, which may include cancerous cells, is the result of a pericardiocentesis[35]. Cardiac magnetic resonance imaging (CMR) typically shows an aggressive hyper vascular mass with intense heterogeneous enhancement, it also shows tumour location, tissue composition, and local invasion more clearly than other modalities and it can distinguish between neoplasms and tumour mimics (like thrombus). Spin echo sequences clearly show intralesional flow voids associated with big tumoral arteries. Additionally, the two morphologic subgroups may have distinct CMR patterns because of their differences. On T1- and T2-weighted imaging, the first pattern reveals a hyperintense mass in the form of a cauliflower, which contains both hemorrhagic and necrotic material. A "'sunray" look on postcontrast sequences is the second morphology indicating substantial pericardial infiltration. This appearance is caused by pericardial thickening and effusion, with linear contrast material filling vascular channels[33]. Within a single patient, both imaging patterns are possible.

CARDIAC LYMPHOMA

Clinical Considerations: Primary cardiac lymphoma, also known as PCL, is a kind of extranodal lymphoma that is very uncommon. It is located on the right side of the heart and accounts for between one percent and one and a half percent of all primary cardiac tumours. PCLs are often hostile and come from a non-Hodgkin kind of infection. Within the sixth or seventh decade of his life, the average patient is an immunocompetent adult man with a ratio of two males to one female. The range of ages is twelve to eighty-six, with the average age being sixty[44]. Immunocompromised individuals are more vulnerable to several subtypes. The majority of occurrences of posttransplant lymphoproliferative illness, a syndrome linked to Epstein-Barr virus-induced B-cell proliferation, are seen in patients who have had lung or heart transplants. Individuals who have HIV are more likely to develop primary effusion lymphoma (PEL), a herpesvirus linked to Kaposi sarcoma (KASP), in their patients. The clinical symptoms might vary, but the most prevalent ones are dyspnea, chest discomfort, constitutional problems and congestive heart failure. Clinical symptoms are characterised by their distinct anatomical locations. Five to eight percent of patients with right atrial lymphoma will develop superior vena cava syndrome due to the tumor's ability to block venous inflow[44]. The invasion of tumours may also lead to arrhythmia or even coronary artery blockage, which can cause angina". Pericardial effusion and tumour embolism, with or without tamponade, are also common. Despite the prevalence of direct endomyocardial biopsy, pericardial fluid analysis may still provide a diagnosis.

Pathologic Features: PCLs are usually seen in the right heart and have a consistency similar to that of fish flesh. They are gray-white masses that coalesce and are visible during a gross assessment[44]. The majority

of PCLs originate from B-cells, and in 80% of instances, they are DLBCLs[45]. Histopathological analysis of large B-cell lymphoma (DLBCL) indicates the presence of a homogeneous population of lymphoid cells that exhibit B-cell lineage-associated markers including CD19, CD20, CD22, CD79a, or PAX-5. The typical type of DLBCL is seen in most patients. It is detailed how immunocompromised patients might develop chronic inflammation-related DLBCL and PEL variations the former is more common after valve replacements, while the latter is connected with HHV-8 infection. Follicular lymphoma and Burkitt lymphoma are the two surviving subtypes of B-cell lymphomas[46]. In Burkitt lymphoma the presence of follicular subtype CD5, CD23 and BcL-2 antigens, in addition to c-myc gene translocations, provides further evidence that these antigens may be responsible for the differentiation of the cells[44].

Imaging Features: PCL affects the right atrium or ventricle in 92% of cases and on contrast-enhanced CT scans, it often manifests as a homogenously lowattenuating, hypoenhancing mass[47]. Angiosarcoma or any unusual diagnosis should be considered in the presence of heart valve involvement and necrosis. Classical anatomy includes the major vessels, aortic root, coronary arteries, and their encasement along the epicardial surface (Fig. 7)[33]. In some cases, especially with the PEL subtype, the only imaging sign is pericardial thickening and significant effusion[48]. Next, the stigma associated with high right heart pressures is evaluated. The metabolic rate of PCL is quite high, much as that of other lymphomas. The primary utility of FDG PET/CT imaging is to track the patient's reaction to therapy, while it is also useful for preliminary staging. Physiologic myocardial activity may sometimes obscure interpretation. Radiotracer nodules with a high standardised uptake value (>10) and a corresponding large quantities on CT scans increase the precision of diagnosis and staging[49,50]. Cine steady-state free precession (SSFP) imaging gives additional information that may be used for the purpose of quantifying the attachment location of the tumour as well as the mobility of the tumour itself. An further benefit of SSFP is the excellent contrast resolution it offers when imaging the heart, tumour, blood pool, and surrounding soft tissues. The standard practice for tissue characterisation employs T1-and T2-weighted sequences. T1-weighted imaging shows hypointensity in PCLs and modest hyperintensity on T2-weighted imaging, both of which are hallmarks of hypercellular tumours. This tumour might have a homogenous or heterogeneous pattern of enhancement. Postcontrast imaging is useful for distinguishing tumours from thrombuses the latter of which has no central contrast uptake.

CONCLUSIONS

When imaging a cardiac mass, the three most significant factors to consider are the tumor's location, the likelihood of disease metastasis and the patient's clinical presentation. Location is frequently the most useful factor to consider when making a differential diagnosis for primary malignant cardiac tumours. As a whole, the fact that myxomas are more common on the left side of the heart suggests that tumours on the left side of the heart are typically benign. The majority of primary cardiac malignancies, including lymphoma and angiosarcoma, often impact the right side of the body. In contrast to lymphomas, which tend to be uniform and encased in blood arteries, angiosarcomas are more prone to exhibit features such as valve involvement, surface enhancement (a "'sun-ray'" appearance), including necrosis. Other cardiac sarcomas often arise from the left atrium's posterior wall and are mostly left-sided. The pathogenesis of primary cardiac tumours accounts for a number of imaging features, such as T2 hyperintensity in myxoma and calcification in OS. The combination of imaging data with the pathologic features of cardiac tumours improves the clinical imager's ability to diagnose patients with accuracy and expands our understanding of the variety of ways these tumours may manifest.

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