CT Scan in Evaluation of Cardiac Masses

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Objective. To evaluate the usefulness of CT scan in Cardiac tumor **Design.** A descriptive study with convenient sampling **Results**. We studied seven cases referred to us for work up of cardiac masses, the contrast enhanced CT scan was able to identify and give the extent in five of these patients. Two patients were negative on CT scan but were confirmed to have a mass in the cardiac chamber by echocardiography. While CT was able to identify the thrombotic mass extending into the heart in two of the patients which remained inconclusive on echocardiography. **Conclusion.** CT is better modality for the extent of the lesion and echocardiography is better as an initial modality to screen the cardiac chambers.
Key words. CT scan, Cardiac Tumors, Echocardiography

Primary cardiac neoplasms are rare, occurring in only 0.001%–0.03% of patients in autopsy series[1]. In all age groups, benign primary cardiac neoplasms are more common than malignant ones[1]. Although histologically benign in the sense that they do not metastasize, benign cardiac neoplasms may lead to significant morbidity and mortality by affecting blood flow and causing arrhythmias and emboli. Before the advent of cross-sectional imaging, these neoplasms were frequently diagnosed only at autopsy. Nowadays, they can be detected in living patients and are usually treated successfully[2].

Echocardiography is the primary modality for imaging intracardiac disease. It provides high-resolution, real-time images, whose quality has further improved with the introduction of new ultrasonographic (US) imaging techniques such as tissue harmonics[3]. However, as image acquisition with computed tomography (CT) and magnetic resonance (MR) imaging has steadily become faster, these modalities have played an increasingly important role in the evaluation of cardiac neoplasms. Although spatial and temporal resolution are far lower with these modalities than with echocardiography, the soft-tissue contrast of both CT and MR imaging is superior to that of echocardiography, and both modalities allow imaging of the entire mediastinum and evaluation of the extracardiac extent of disease. Unlike MR imaging, CT is capable of helping detect calcification, which is an important variable in the differential diagnosis of cardiac neoplasms. In addition, CT is faster, easier to perform, and generally has more reliable image quality. MR imaging has better soft-tissue contrast than CT and allows much greater flexibility in the selection of imaging planes.

Study with patient and methods:
This was a descriptive study which was conducted with convenient sampling, non interventional .The study started from January 2001 and dated till January 2005. It was conducted in the Departments of Radiology of Jinnah Hospital and Mayo Hospital, Lahore. The CT scan machines used were Spiral CT of Toshiba, first without IV contrast slices and then contrast enhanced CT of whole of the Chest was done. IV contrast was given in bolus of 100 ml, through an arm vein.Whole of the Chest was scanned from thoracic inlet till atleast the adrenals, though in one case scan had to be extended till kidneys.

All the patients were indoor patients and echocardiography was also performed before the procedure. All the patients had a lesion in the cardiac chambers on echocardiography and were referred for further evaluation to the CT scan machine.

Results:
The CT scan diagnosed that out of seven patients five had an intracardiac mass and was inconclusive in the other two patients. All seven showed a mass on echocardiography. CT scan diagnosed two masses as the extension of the thrombus thorough the IVC and SVC. One had a thrombus in SVC, extending from the Jugular vein which was surrounded by nodal mass and the IVC thrombus was a tumor thrombus from renal cell carcinoma.

Out of other three diagnosed by CT scan, two had atrial myxoma and one had a malignant mass of the left ventricle.

The extra cardiac extent was better shown on CT scan.In three patients which had an extra cardiac extension, showed that the echocardiography could not diagnose the extent correctly.

Table 1: Number of patients

Nature of lesion	n=
Benign Intracardiac tumor	4
Malignant Intracardiac tumor	1
Thrombus extending into Heart	2

Table 2. Percentage diagnosis on CT of Cardiac masses

Lesion	CT +ve	CT-ve	n=	%age
Benign Lesion	2	2	4	50
Malignant Lesion	1	-	1	100
Thrombus extending into heart	2	-	2	100

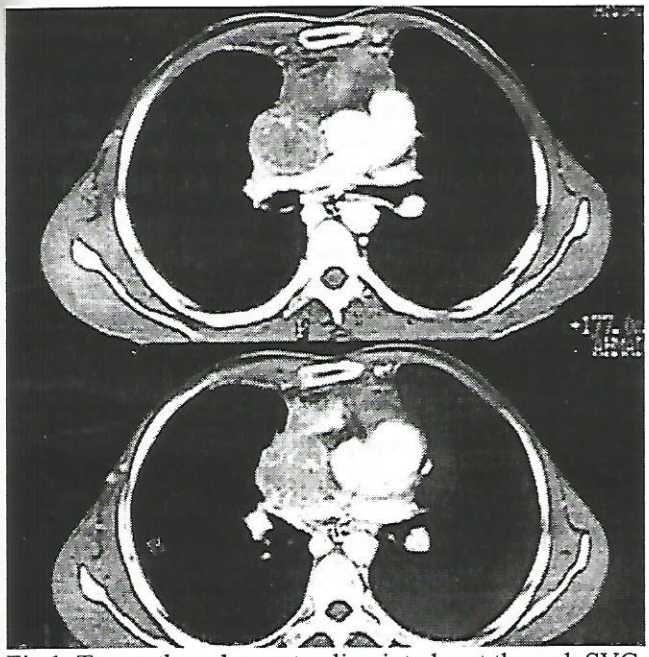
Fig 1. Tumor thrombus extending into heart through SVC.

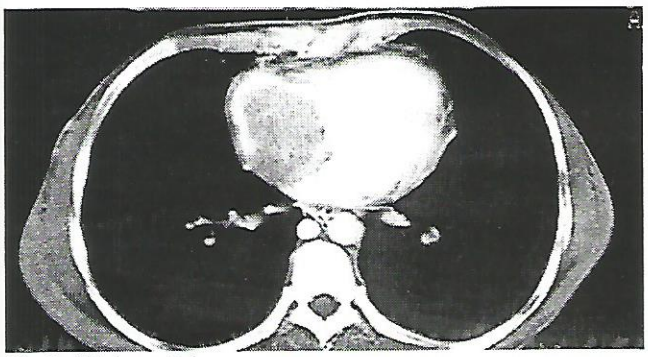
Fig 2. Right atrial tumor

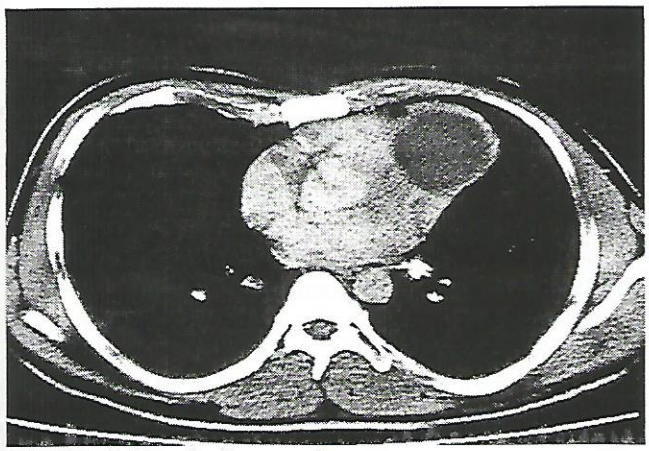
Fig 3. Left Ventricular mass/tumor

Discussion:

Cardiac masses are rare. Metastases to the heart are 20–40 times more common than primary **tumors**, only 25% of which are malignant[4]. In one autopsy series, the prevalence of primary cardiac malignancies was only 0.001%–0.28%. Before the advent of cross-sectional imaging, primary cardiac malignancies were rarely diagnosed before death. Today, they are being discovered in living patients, sometimes incidentally, and their proper characterization has become important in guiding management.

To date, echocardiography has been the modality of choice for diagnosis of intracardiac disease. Transthoracic echocardiography is inexpensive, noninvasive, and clearly depicts heart morphology in a variety of imaging planes. It also provides a large amount of functional information. Echocardiography allows real-time imaging and can show tumor mobility and distensibility, features that are typically seen in atrial myxomas and less often in sarcomas[6]. Doppler ultrasound can provide velocity measurements that can be used to estimate chamber pressures. The effectiveness of transthoracic echocardiography is mainly limited by the available imaging window, which can vary with patient body habitus and operator experience.

Transesophageal echocardiography is invasive but circumvents the problem of acoustic window often found with transthoracic echocardiography. Some extracardiac structures such as the descending aorta and pulmonary veins can be imaged. Because it is not necessary for reflected sound to penetrate the chest wall with transesophageal echocardiography, higher-frequency transducers may be used and better resolution is achieved. However, soft-tissue characterization remains limited compared with that achieved with computed tomography (CT) and magnetic resonance (MR) imaging, and myocardial disease such as tumor infiltration is not clearly depicted. Most important, both transesophageal and transthoracic echocardiography provide only limited views of the mediastinum and cannot be used to evaluate extracardiac manifestations of disease.

CT can be used to accurately image the heart and surrounding mediastinum. CT provides better soft-tissue contrast than echocardiography, can depict calcification and fat, and may allow tissue diagnosis of some masses such as lipomas[4]. Although spatial resolution of CT has improved with the development of faster imaging techniques, particularly electron beam CT, this modality is still far inferior to echocardiography in the depiction of small moving structures such as the cardiac valves. Unlike echocardiography, CT does not allow true real-time imaging, and imaging planes are limited to those allowed by angulation of the gantry.

Like CT, MR imaging can depict the extracardiac extent of disease. Although MR imaging cannot show calcification, it allows better overall soft-tissue characterization than CT and is the modality of choice for evaluating abnormalities intrinsic to the myocardium. In addition, MR imaging is more versatile than CT in that it allows imaging in multiple planes and can provide some functional information such as flow direction and flow velocity in large vessels. The main disadvantage of MR

imaging is its susceptibility to motion artifact. High-quality cardiac MR imaging is highly dependent on regular electrocardiographic rhythms and cardiac gating.

Conclusion:

CT scan is better in cases of extent of the lesion and should be done in every case proven on echo as a cardiac mass to define whether it is primarily of cardiac origin or is an extension of the thrombotic mass. Echo should be done as first investigation for diagnosis.

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