



HISTOPATHOLOGICAL EVALUATION OF 13 CARDIAC MASS BIOPSY SPECIMENS AND CORRELATION BETWEEN CLINICAL PREDIAGNOSIS

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Article Info

Received 30/06/2015

Revised 17/07/2015

Accepted 22/07/2015

Key words:

Intracardiac masses,
Histopathological,
Thrombi, Vegetations
and Primary or
Metastatic Tumors.

ABSTRACT

Thrombi, vegetations and primary or metastatic tumors are the most frequent causes of intracardiac masses. Early clinical diagnosis of a cardiac mass and accurate pathological evaluation is crucial in terms of improving prognosis. However differential diagnosis may be challenging particularly in the absence of an evident malign process, infective endocarditis and a thrombotic state. We herein evaluated excisional and incisional biopsy specimens of 13 cardiac masses in the light of the literature and aimed to reveal the correlation between clinical pre-diagnosis and histopathological evaluation. A total of 13 cardiac excisional biopsy specimens were identified retrospectively and correlation with clinical pre-diagnosis was assessed. The number of cardiac mixomas was 10 (76.9%). Of all masses, 1 (7.7%) was reported to be thrombus formation. Angiosarcoma was present in a 1 (7.7%) patient and resected from the myocardium of the right ventricle. Finally the other 1 (7.7%) was diagnosed as endocardial fibrosis, proliferation of juvenile connective tissue, focal myxomatous degeneration and dystrophic calcification. Further developments are required in radiological evaluation of cardiac masses. Although high temporal resolution and excellent soft-tissue contrast are provided particularly in the MRI, differentiation of true neoplasms from tumor mimics still remains to be a clinical challenge.

INTRODUCTION

The most common causes of intracardiac masses are thrombi, vegetations and primary or metastatic tumors. Metastatic cardiac tumors are far more common than primary tumors [1]. Heart tumors were first defined under the term polyps of the heart in the XVIIth century. The first primary cardiac tumor was observed and reported in 1865 as a postmortem case by Bodenheimer. A primary cardiac

tumor was first diagnosed clinically by Popfit in 1932 [2, 3].

Cardiac tumors have become accessible by the use of the heart-lung pumps leading to possibility of surgical management. These developments enabled exploration of cardiac masses and made them go beyond part of an autopsy [3]. Indeed, the autopsy incidence of primary



cardiac neoplasms are extremely rare ranging from 0.0017% to 0.28% [4-9]. Among these, the prevalence of malignant tumors is reported to be 25% in adults and less than 10% in children [7-9].

Despite the developments in surgical procedures, malign cardiac tumors still have a poor prognosis even when complete resection is attempted [10]. Thus early clinical diagnosis of a cardiac mass and accurate pathological evaluation is crucial in terms of improving prognosis. However differential diagnosis may be challenging particularly in the absence of an evident malign process, infective endocarditis and a thrombotic state. Transthoracic echocardiography and especially transesophageal echocardiography (TEE) are the first-line imaging modalities. Computed tomography (CT) and magnetic resonance imaging (MRI) methods are also used for further evaluation. When a cardiac mass is clinically and radiologically diagnosed, precise histopathological evaluation is essential to manage the process and decide on the most favorable treatment modality.

We herein evaluated excisional and incisional biopsy specimens of 13 cardiac masses in the light of the literature and aimed to reveal the correlation between clinical prediagnosis and histopathological evaluation.

MATERIAL AND METHOD

A total of 13 cardiac excisional biopsy specimens were identified retrospectively, in Istanbul Special Ekin Pathology Laboratory, between January 2009 and April 2015.

All specimens were fixed in formalin, routinely processed for light microscopy and stained with hematoxylin-eosin (H&E). selected 1 case (angiosarcoma) was additionally stained with immunohistochemistry using

a panel of antibodies or markers through avidin-biotin peroxidase method (ABC) against CD34 (cell marker 1:100). The biopsies were evaluated according to the World Health Organization (WHO) classification (table 1). The clinical data of the patients were recorded and correlation of the histopathological diagnosis with these presurgical findings were evaluated.

RESULTS

A total of 13 cardiac specimens were examined. This patient population consisted of 5 (38.5%) women and 8 (61.5%) men. Seven of the cases were of unknown age; the average age of the remaining 6 cases was 63 (50-82). Detailed evaluation of biopsy samples is shown in table 2.

The number of cardiac mixomas was 10 (76.9%) (figure) 1 (7.7%) were reported to be thrombus formation angiosarcoma was present in a 1 (7.7%) patient and resected from the myocardium of the right ventricle, finally the other one (7.7%) was calcified and cystic endocardial mass extending from mitral leaflets towards apex and histopathologically diagnosed as endocardial fibrosis, proliferation of juvenile connective tissue, focal myxomatous degeneration, dystrophic calcification and acute as well as chronic minimal non-specific inflammatory infiltration.

When localization of the tumors were evaluated, the left atrium was ranked at the first as 11 (84.6%) of all masses were excised from there. The number of masses excised from right ventricle and mitral valve was 1 (7.7%) for each. As expected 9 of the 10 cardiac masses excised from left atrium were myxoma. The remaining one was thrombus formation. Atrial myxomas were the most common cardiac tumors in our series.

Table 1. World Health Organization 2010 Cardiac Tumor Classification

Benign tumors and tumor-like lesions	Malign tumors
Rhabdomyoma	Angiosarcoma
Histiocytoid cardiomyopathy	Epithelioid hemangioendothelioma
Hamartoma of mature cardiac myocytes	Malignant pleomorphic fibrous histiocytoma (mfh) / undifferentiated pleomorphic sarcoma
Adult cellular rhabdomyoma	Fibrosarcoma and myxoid fibrosarcoma
Cardiac myxoma	Rhabdomyosarcoma
Papillary fibroelastoma	Leiomyosarcoma
Hemangioma	Synovial sarcoma
Cardiac fibroma	Liposarcoma
Inflammatory myofibroblastic tumor	Cardiac lymphoma
Lipoma	Metastatic tumors
Cystic tumor of the atrioventricular node	

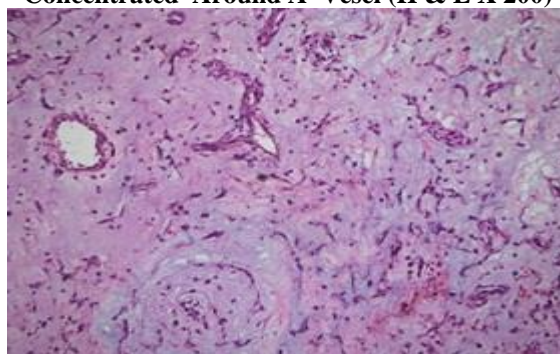
Table 2. Evaluation of cardiac biopsy specimens

S.No	Age	Gender	Pathologic diagnosis	Clinical data
1	50	Male	Angiosarcoma	Intracardiac mass, left atrium
2	57	Male	Cardiac myxoma	Intracardiac mass, left atrium
3	60	Male	Cardiac myxoma	Intracardiac mass, left atrium
4	62	Male	Cardiac myxoma	Intracardiac mass, left atrium



5	65	Female	Cardiac myxoma	Intracardiac mass, left atrium
6	82	Female	Organized blood and fibrine mass, with the thrombus formation	Intracardiac mass, left atrium
7		Female	Endocardial fibrosis, proliferation of juvenile connective tissue, focal myxomatous degeneration, dystrophic calcification and acute as well as chronic minimal non-specific inflammatory infiltration	Mass on the mitral valve
8		Male	Cardiac myxoma	Right ventricle mass
9		Male	Cardiac myxoma	Intracardiac mass, left atrium
10		Male	Cardiac myxoma	Intracardiac mass, left atrium
11		Female	Cardiac myxoma	Intracardiac mass, left atrium
12		Male	Cardiac myxoma	Intracardiac mass, left atrium
13		Female	Cardiac myxoma	Intracardiac mass, left atrium

Fig 1. Cardiac Myxoma: Myxoid Ground, Hyperchromatic Nuclei, Spindle And Stellate Cells ; A Portion Of Concentrated Around A Vesel (H & E X 200)



DISCUSSION

We herein presented our experience regarding histopathological evaluation of cardiac mass. Thrombus formation was detected in one case. The other case was calcified and cystic endocardial mass extending from mitral leaflets towards apex and histopathologically diagnosed as endocardial fibrosis, proliferation of juvenile connective tissue, focal myxomatous degeneration, dystrophic calcification and acute as well as chronic minimal non-specific inflammatory infiltration. These masses had been resected and sent to pathology laboratory with pre-diagnosis of a cardiac tumor.

This is meaningful by the means of pointing the inadequacy in pre-surgical evaluation of cardiac masses despite the developments in radiological methods and other non-invasive procedures.

We aimed to establish the correlation between prediagnosis of the clinicians and the final histopathological evaluation. Indeed, the majority of the prediagnosis were consistent with the pathological definitions as the one mass clinically reported to be invasive was angiosarcoma.

Atrial mixomas had been sent from the clinics with the accurate prediagnosis. In general, the confounder deteriorating this correlation between prediagnosis of the clinicians and histopathological evaluation was as mentioned excision of a thrombus formation instead of a tumor. Cardiac tumours are diverse in clinical presentation and the manifestation may also vary according to

localization, size, and aggressiveness.

Despite wide variations in histological subtype, imaging modalities can help to differentiate benign from malignant tumours and furthermore, on occasion enable a specific diagnosis. The prevalence of vegetations decreased significantly with the reduction of infective endocarditis cases. Unique echocardiographic appearance and specific clinical history of the vegetation make the diagnosis easier, however thrombus remains to be by far the commonest cardiac mass and distinction of it and other tumour mimics from true neoplasia is of critical importance.

Sometimes a mass may be discovered for the first time at echocardiography or thoracic/cardiac computed tomography (CT) performed for another indication. In case of clinical suspicion, TTE, TEE and MRI are performed in sequence. The initial imaging method is usually TTE however it is exceedingly operator dependant and patient-related factors such as body habitus are significant limitations. In addition, complete assessment of an invading mass may be limited with its restricted field of view [11].

TEE provides a more detailed assessment, especially for small (<1 cm) masses, masses within the atria and those associated with the valves (12), nevertheless, tissue characterization in both TTE and TEE is quite limited and an accurate differential diagnosis between thrombi, benign and malignant tumours is mostly not possible [11].



Unrestricted field of view, high temporal resolution and excellent soft-tissue contrast are favorable features of cardiac MRI and it is considered to be the reference technique for further differentiation and characterization of cardiac masses [13].

Multidetector CT is an alternative technique in the assessment of cardiac masses especially for the patients who have limitations to undergo MRI. Despite variety of imaging modalities and developments in the techniques, to reach an accurate diagnosis may be challenging. Our results are valuable in terms of supporting this challenge.

As a cardiac mass is a rare clinical entity, various studies have been published from different centers presenting their experience [14-19]. In these reports, metastatic cardiac tumors took the first place and were far more common than primary tumors. Primary cardiac tumors were extremely rare and usually benign. Myxoma is the most common primary benign tumor and series of myxoma have also been reported frequently from different centers [20-22] as well as sarcomas, the most frequently seen primary malignant cardiac tumors [23-25].

Scheffel H *et al* compared the imaging features of atrial myxomas and thrombi using CT and aimed to assess the accuracy of CT for determining the origin of myxomas in comparison with surgical findings [26].

The results of their study demonstrated that atrial myxomas and thrombi can usually be differentiated by their distinguishing features of size, origin, shape, mobility, and prolapse. However they also stated that CT

may fail in some cases by the means of differential diagnosis. This article focuses on the correlation between clinical prediagnosis and histopathological evaluation. Our results revealed that thrombi still remain to be the cause of diagnostic dilemma. Developments in the imaging modalities will enable differentiating them from true neoplasms and will prevent redundant surgery.

CONCLUSION

Further developments are required in radiological evaluation of cardiac masses. Although high temporal resolution and excellent soft-tissue contrast are provided particularly in the MRI, differentiation of true neoplasms from tumor mimics still remains to be a clinical challenge.

ACKNOWLEDGMENT: None

CONFLICTS OF INTEREST:

On behalf of all authors, the corresponding author states that there is no conflict of interest.

STATEMENT OF HUMAN AND ANIMAL RIGHTS:

All procedures performed in human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

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