Evaluation of Thymic Lesions using Multidetector Row Computed Tomography and Correlation with Histopathopathological Diagnosis

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ABSTRACT

Introduction: A variety of lesions are seen involving the thymus and range from hyperplasia to innumerable tumors. Multidetector row Computed Tomography (MDCT) is a promising imaging modality which allows for substantial anatomical volumes to be covered with isotropic submillimeter spatial resolution. Aim of the study was to evaluate MDCT characteristics of thymic lesions proven by histopathology.

Materials and methods: a retrospective study of 35 patients in the age group 5-78years was conducted in in the Departments of Radiodiagnosis and Pathology, Vydehi Institue of Medical Sciences and Research Centre, Bangalore between September 2011 and December 2015. Only histologically proved cases were included in the study. The size, characterization, extent, presence of calcification, invasion of the adjacent structures, lymphadenopathy and metastasis of thymic lesions were evaluated.

Results: The most common thymic lesion was thymoma accounting for 34.28% of the cases followed by thymic lymphoma accounting for 22.8% of cases. Thymic hyperplasia was seen as diffuse symmetric enlargement of the gland. Thymomas were seen as homogeneous solid masses with soft tissue attenuation and well-demarcated borders. Thymic carcinomas appeared as large, multilobulated masses containing areas of low attenuation and calcification. Thymolipomas predominantly showed fat attenuation intermixed with soft tissue representing normal thymic tissue, Thymic lymphomas present as homogenous enlargement of the thymus with mediastinal or hilar lymphadenopathy.

Conclusion: Multidetector row Computed Tomography plays a major role in the evaluation of thymic lesions regarding diagnosis, characterization, distribution and malignancy.

Keywords: carcinoma, hyperplasia, lymphoma, MDCT, thymoma.

INTRODUCTION

The thymus is a lymphatic organ and plays an important role in the development and maturation of the immune system during the childhood.[1] A variety of lesions usually affect the thymus like hyperplasia, thymic epithelial tumors, lymphomas, thymolipomas, carcinoid tumors, germ cell tumors, sarcomas and metastatic tumors. MDCT is a promising imaging modality that allows covering substantial anatomical volumes with isotropic sub -millimeter spatial resolution.[2] with its excellent density resolution and tomographic format, helps Clinicians and Radiologist in identifying the precise location, extent and characterization of mediastinal masses.[3] This study aims to evaluate the MDCT characteristics of thymic lesions which are proven by histopathology.

MATERIAL AND METHODS

This retrospective study included 35 cases of histologically proven thymic lesions and included pathologies like hyperplasia, thymic epithelial tumors like thymoma and thymic carcinoma, lymphomas like Hodgkins and Non-Hodgkins lymphomas, thymolipoma, undifferentiated tumor and round cell tumor.

CT images were obtained with general electrical (GE) Medical systems 16 slice MDCT machine with 5mm collimation, 0.6 reconstruction interval, 0.6 speed gantry rotation, 1.375:1 pitch, 120 KV and 350 mAs. After routine Antero-Posterior scannogram of the thorax in supine position with breath hold. Axial sections of 10mm thickness were taken from the level of thoracic inlet to the level of suprarenals. Plain scan was followed by contrast scan with intravenous injection of 80-100ml of Iohexol for adults and 300mg of Iodine/Kg body weight for children. Multiplanar reconstructions were made and scans were reviewed on a direct display console at various window settings (lung, mediastinum, bone). Data was entered in word excel sheet and values were expressed in percentages.

The lesions were analyzed for their size, location, characterization, presence of calcification, extent, invasion into the adjacent structures, lymphadenopathy and metastases were evaluated. Only histologically proven cases of thymic lesions were included in the study.Lesions other than thymic were excluded and in those thymic lesions where histopathologic reports not available were excluded from the study.

RESULTS

This retrospective and descriptive study of 35 patients included 21 males (60%) and females (40%) (chart1). The most common age group to present with the thymic lesions was in the age group of 41-50 years accounting for 26.66% (Table 1).Majority of the symptoms were non- specific in nature like cough, chest pain and dysphagia.

The most common thymic lesion was thymoma accounting for 12 cases (34.28%), followed by thymic lymphoma accounting for 8 cases (22.8%). Among the lymphomas, commonest was Hodgkin's accounting for 55.55% (5 cases) and NHL accounting for 45.55 %(3 cases). Thymic carcinoma accounted for 5 cases (14.2%) and hyperplasia for 4 cases

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(11.4%). Pure thymic hyperplasia was seen in 3cases (75%) and lymphoid hyperplasia seen in 1 case (25%). 2 cases (6.66%) of thymic cyst (uni and multilocular) and 2 cases of thymolipoma were seen. Poorly differentiated tumors and round cell tumor accounted for one case each (2.88%). (Table 2)

DISCUSSION

The study included 35 patients between the age group of 5 to 78 years. 21 cases (60%) were males and 14 (40%) were females. (Chart 1) Most of the thymic lesions were seen in 41-50 groups accounting for 26.6%. Thymic Lymphomas were seen commonly in pediatric, young adults and below the age of 42yrs, whereas thymic carcinomas were seen above the age of 40 years. Thymomas were seen in all ages between 18 to 78 years, in contrary to the study by Naidich et a1[4] who reported, thymomas were commonly seen between the age group of 50- 60 years. Thymic lymphomas were seen in paediatric age, young adults and below the age of 42 years. Thymic carcinoma was seen above the age of 40 years. Thymomas were the most common lesion accounting for 12 cases (34.28 %), followed by thymic lymphomas accounting for 8 cases (22.8%). Chen et al[5] studied 34 patients of thymic masses on CT and reported that thymomas constituted 91% and thymic cyst 2.9%. Whereas, in our study, thymomas constituted only 34.28 and thymic cyst for 5.7%, this may be due fact that occurrence of lymphoma is more common in Indian population.

MDCT features of thymic lesions

Thymus

At CT, the thymus appears as a bilobed tirnagular structure located in the anterior mediastinum, anterior to the great vessels and distal SVC.[6] On CT, the normal thymus follows the shape of the adjacent vessels. The size of the thymus has been extensively studied with modalities like CT and MR. Baron et al[6] opined that the mean thickness thickness of a normal thymus decreased with advancing age, from 1.1cm (+/-0.4 cm) for the 6-19 year age group to 0.5 (+/- 0.27 cm), for the patients over the age of 50 years. Maximum thickness of 1.8cms in patients under the age of 20 years and 1.3cms in patients over the age of 20 years is considered as hyperplasia.

Thymic hyperplasia

There are two distinct histologic subtypes of thymic hyperplasia, true hyperplasia and lymphoid hyperplasia.

On CT, both true hyperplasia and lymphoid hyperplasia were seen as diffuse and symmetric enlargement of the thymus and was difficult to distinguish between the two based on imaging findings alone.[7] Diffuse symmetric enlargement of the gland is the key morphologic feature of hyperplasia (Figure 1) and differentiates it from tthymoma which presents as focal mass.[8]

Thymic cysts

Congenital thymic cysts are commonly seen in the upper neck and anterior mediastinum.

At CT, unilocular cyst was seen as cystic structure with clear fluid and thin wall. No solid component or contrast enhancement was noted. Multilocular cyst was seen as multiseptated cyst with thick wall, with wall showing enhancement.

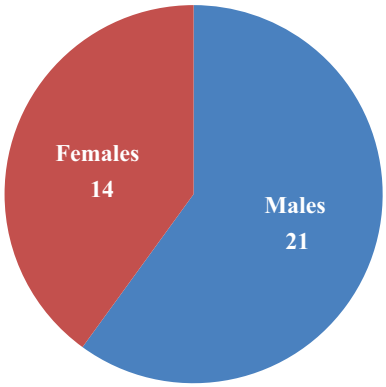

Chart-1: Shows sex distribution of thymic lesions. Male to female-21:14 (60%:40%)

Age in years	Number	Percentage
<10	4	13.33
11-20	3	10
21-30	4	13.33
31-40	6	20
41-50	8	26.66
51-60	2	6.66
61-70	2	6.66
>70	1	3.33

Table-2: Shows age distribution of the thymic lesions.

Thymic lesions	Number	Percentage
Thymic hyperplasia	4	11.4
Thymic cyst	2	5.7
Thymoma	12	34.28
Thymic carcinoma	5	14.2
Thymolipoma	2	5.7
Thymic lymphoma	8	22.8
Undifferentiated	1	2.8
Round cell	1	2.8
Total	35	100

Table-3: Shows distribution of thymic lesions.

Thymic tumors

Tumors of the thymus are classified into epithelial tumors including thymoma and thymic carcinoma, lymphomas including Hodgkin's and Non-Hodgkin's lymphomas, thymolipoma, carcinoid tumor, germ cell tumors, sarcoma and metastatic tumors. In adults, thymoma is the most frequent primary tumor of the thymus. In children, lymphoma is the most common primary tumor of the thymus.

Thymic epithelial tumors

Thymomas are considered as benign or low grade malignant tumors arising from the epithelium.[10] Patients with thymoma are asymptomatic or at times may be symptomatic due to pressure effects on adjacent structures inducing symptoms such as dyspnea, dysphagia, hoarseness of voice or superior vena cava syndrome., cough, and chest pain. One- third to one- half of patients develops myasthenia gravis.[10] They can occur adjacent to the junction of the great vessels and pericardium, in the costophrenic angles or adjacent cardiac borders and rarely in the neck or other mediastinal compartments.[10]

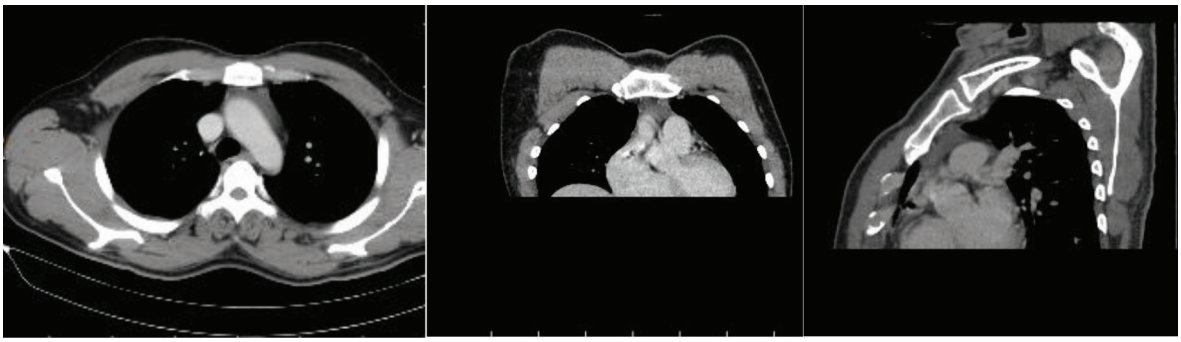

Figure-1: Axial, coronal and sagittal sections of thymic hyperplasia.

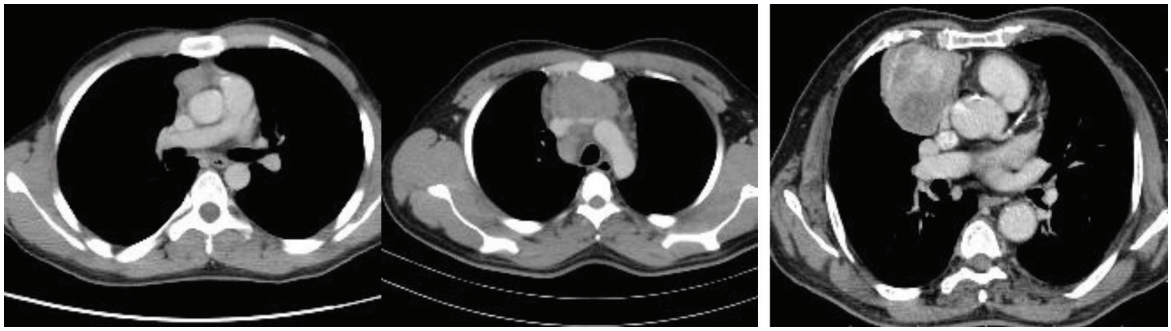

Figure-2a,b,c: CT images of thymoma, invasive thymoma and thymic carcinoma.

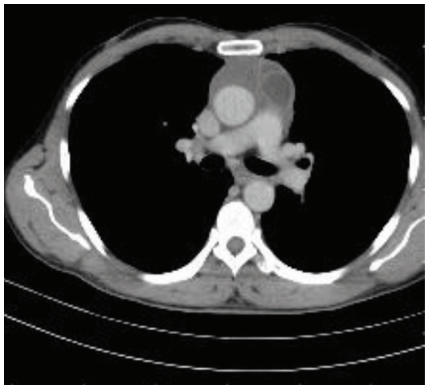

Figure-3: CT image of thymic enlargement with adjacent mediastinal lymphadenopathy suggestive of thymic lymphoma

As per WHO classification of thymomas, they are classified based on the invasiness into type A and AB, which are encapsulated and clinically benign. Type B has greater likelihood of invasiveness (especially Type B3) and Type C are almost always invasive.[9]

Thymomas

On CT scans, thymomas Type A and AB were seen as homogeneous solid masses with soft tissue attenuation and well-demarcated borders. (Figure 2a) They appeared as oval, round, or lobulated masses and did not conform to the shape of the thymus.[10] large thymomas revealed areas of cystic or necrotic degeneration without any calcification.

Type B3 (invasive thymomas) were seen encasing the mediastinal structures (especially the SVC) and infiltrating into fat planes (Figure 2b). Invasion into the lung was seen as irregular interface between the mass and lung parenchyma. Pleural thickening, nodularity and effusion were also seen indicating pleural invasion by the thymoma.

Type C thymomas or carcinomas appeared as large, multilobulated masses with areas of low attenuation without any calcification (Figure 2c). It was difficult to distinguish thymic carcinomas from thymomas based on imaging findings alone.[11] Features like distant metastasis and mediastinal lymphadenopathy when seen suggests thymic carcinoma.

Thymolipoma

Thymolipomas are usually asymptomatic and manifest as large anterior mediastinal masses. Due to their soft and pliable nature, they drape themselves around the heart and adjacent mediastinal organs.

On CT, a thymolipoma was seen as huge anterior mediastinal mass extending into the lung bases, stimulating elevated hemidisphragm.[12] Another thymolipoma was seen as fat attenuation mass in the anterior mediastinum. Both thymolipomas predominantly showed fat attenuation intermixed with soft tissue representing normal thymic tissue.[3]

Thymic lymphomas

Thymic lymphomas typically occur in younger age group than thymomas and tend to be more aggressive and responsive to therapy.[13] Lymphoma may involve the thymus as part of disseminated disease or as an isolated site. Hodgkin lymphoma accounts for the majority of the thymic lymphoma.

On CT, lymphomas with thymic infiltration were seen as homogenous enlargement of the thymus in the presence of mediastinal or hilar lymphadenopathy (Figure 3). Some of the lymph nodes in the Hodgkin's lymphoma appeared cystic.

A round cell tumor of thymus was seen as soft tissue attenuation mass in the anterior mediastinum with areas of calcifications within. Undifferentiated tumor of thymus was seen as unremarkable anterior mediastinal mass with no distinct features.

CONCLUSION

Multidetector row Computed Tomography plays a major role

in the evaluation of thymic lesions regarding diagnosis, distribution and characterization. It can clearly identify hyperplasia, thymoma, thymolipoma, thymic cyst and thymic lymphoma due its excellent density resolution and tomographic format.

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