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CAN MDCT PREDICT THE INVASIVENESS OF THYMOMA?

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ABSTRACT Thymoma is a rare tumor of the mediastinum. The histological signs of malignancy and CT features of invasiveness do not correspond with each other in all cases. We analyzed 9 histopathologically proven thymomas to predict role of MDCT regarding invasiveness. Histopathological Examination(HPE) and CT were concordant in 4 and discordant in 5 cases. Our series had 1 patient of type C, 1 of type B2, 1 of type A and 2 of AB, which had good correlation of invasiveness on CT. Four cases were discordant.

KEYWORDS :

INTRODUCTION

Mediastinal masses span a wide primary malignant histopathological and radiological spectrum. Lymphoma constitutes 55%, GCT 16%, malignant thymoma 14%, sarcoma 5% and neurogenic tumor 5% (1). Thymoma is a rare mediastinal mass and is the most common anterior mediastinal tumor. Imaging plays a crucial role in diagnosis, staging and follow-up of patients. Thymoma is comprised of epithelial cells and lymphocytes. It may be benign or malignant. The term invasive is applied when there is extension beyond the capsule. It can occur in about 15-40% of thymomas (2). WHO categorized the histopathological types as A, AB, B1, B2, B3 and C (3). Disease- free survival rates are 100% in type A and AB, 83% in B1, B2, 36% for B3 and 28% for type C at 10years. CT findings in invasive thymoma and carcinomas include inhomogeneous mass, infiltration to neighboring structures, pericardium encasing great vessels and extra thymic metastases. We analyzed 9 histopathologically proven thymomas to predict role of MDCT regarding invasiveness.

MATERIAL and METHODS

This prospective study was carried out during the years 2015 and 2016 in the department of Radiology and Imaging sciences of NIMS, Hyderabad after obtaining approval from the ethical committee. Nine consecutive HPE proven cases of thymoma MDCT plain and contrast studies for mediastinal masses were carried out in the standard protocol. HPE classification of thymoma, as suggested by WHO, Masaoka-Koga staging of invasion and the details of CT features like size, margins, calcification, enhancement and extent of invasion were meticulously done in all the nine cases. The observed features were analyzed with respect to invasiveness.

OBSERVATIONS:

Of the 9 cases were studied 6 were females. The maximum was in age group of 40-60 years. The youngest was 22-year-old and oldest 74-years. The radiological features and the corresponding histopathological typing in each of these 9 cases are depicted in table-1 below.

Table: 1- The radiological features and the corresponding histological typing in the studied 9 cases

Case No.	AGE/SEX	SIZE	MARGIN WITH LUNG	CALCIFICATION	ENHANCEMENT	INVASION	TYPE-HPE	Figure No.
1	48M	8CM	IRREGULAR	-	HOMOGENOUS	BV, PERICARDIUM	C	fig1
2	50M	2CM	SMOOTH	-	HOMOGENOUS	-	B2	fig 2
3	22F	4CM	SMOOTH	-	HOMOGENOUS	BV	B2	fig 3
4	54M	2CM	SMOOTH	-	HOMOGENOUS	-	A	fig 4
5	50F	9CM	LOBULATED	-	HOMOGENOUS	-	AB	fig 5
6	49F	8CM	SMOOTH	-	HOMOGENOUS	BV, PERICARDIUM	AB	fig 6
7	59F	6CM	SMOOTH	PUNCTATE	HETEROGENOUS	PERICARDIUM	AB	fig 7
8	48F	5CM	LOBULATED	-	HOMOGENOUS	-	AB	fig 8
9	74F	3CM	SMOOTH	COARSE	HOMOGENOUS	-	AB	fig 9

According to invasiveness, HPE and CT were concordant in 4 and discordant in 5 cases. Our series had 1 of type C, 1 of type B2, 1 of type A and 2 of AB which had good correlation of invasiveness on CT. Four cases were discordant. Three of AB variety showed invasion to various structures and 1 of B2 variety appeared more benign.

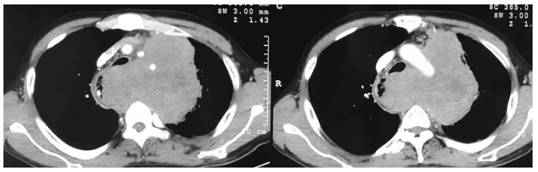

Fig 1: Patient 1: 48M -thymic carcinoma (type C)-Typical features of infiltration of pericardium, esophagus, encasement of vessels

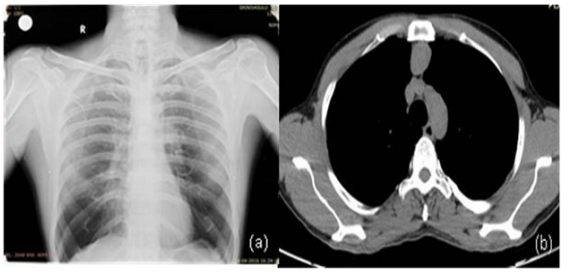

Fig 2: Patient 2: type B2 Thymoma in 50 y/m: known case of Myasthenia Gravis showing small well defined homogenous retrosternal mass

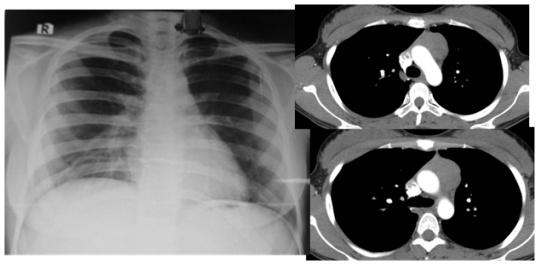

Fig 3: Patient 3: 22F- Type B2- Thymoma –Lesion is invading the pericardium on CT and biopsy also revealed B2 Type of thymoma which is more aggressive

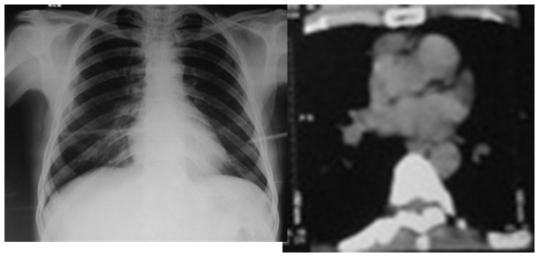

Fig 4: Patient 4: 54M- Type A- the SOL is small and no invasion on CT and it correlates with HPE

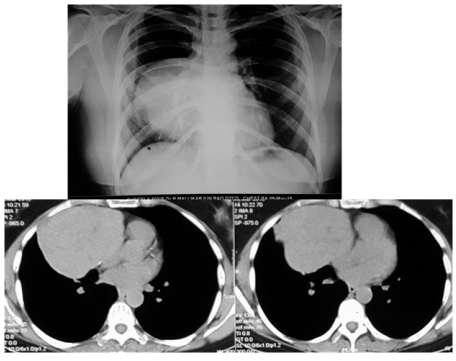

Fig 5: Patient 5: 50F-Type AB. except for size the mass appears noninvasive and HPE also AB type.

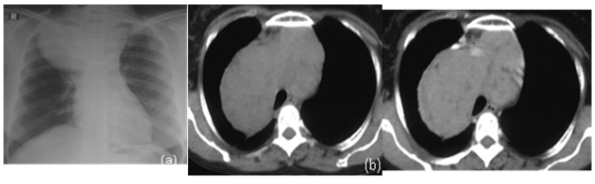

Fig 6: Patient 6: Type AB thymoma in 49 y/f. The mass is large encasing vessels. Invading pericardium, compressing trachea suggestive of invasive Thymoma on CT and turned out to be Type AB which is most benign variety

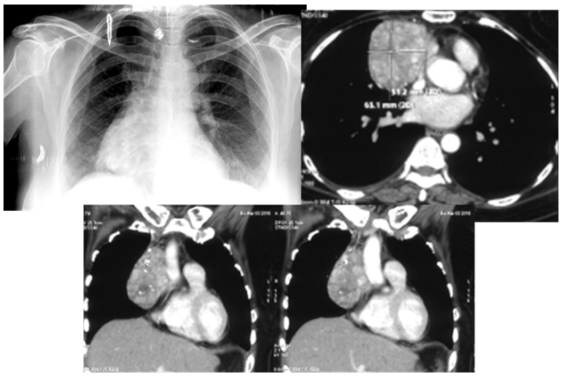

Fig 7: Patient 7: 59F- Thymoma (WHO type AB) size, heterogenicity, pericardial invasion indicates invasiveness of mass. Foci of calcifications seen within the mass

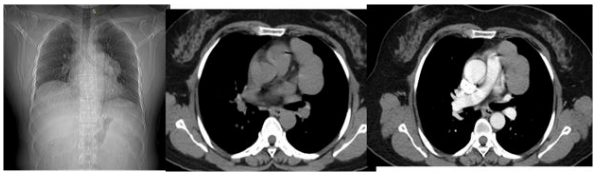

Fig 8: Patient 8: 48F- Type AB. This case shows well defined lobulated mass with no invasion and homogenous in texture suggestive of noninvasive Thymoma and HPE also correlates the finding

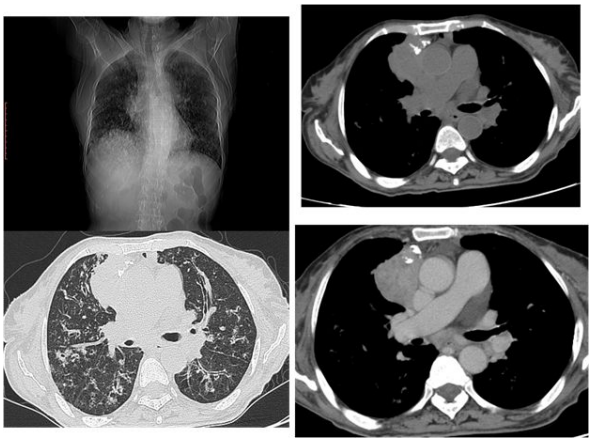

Fig 9: Patient 9: 74F- Thymoma AB with Goods syndrome: well defined homogenously enhancing mass with calcification. HRCT image of lung shows infiltration and bronchiectasis

DISCUSSION:

Thymoma is the most common neoplasm of anterior mediastinum, typically presenting in 5 to 6th decades in both sexes. Our study had more females than males. Since masses detected at early stage and the appropriately treated advanced lesions have very good prognosis, one should try to predict invasiveness of thymoma by CT scan. Our study tried to analyze the CT appearance and HPE in all the cases.

Most thymomas are localized solid masses. One third of cases show hemorrhage, necrosis and cystic component. Thirty to 50% of thymomas present with myasthenia gravis and 10-15% of all myasthenia gravis can show thymoma (4). One in ten cases of thymoma can present with Goods syndrome as in our series and 5% have red cell aplasia (5). Goods syndrome is due to paraneoplastic syndrome which manifests as pulmonary infiltrations, bronchiectasis and exudative enteropathy. This is due to hypo-gamma-globulinemia and immune deficiency. Thymoma may be associated with SLE, polymyositis and myocarditis (6). HPE classification of thymoma, as suggested by WHO is shown in table-2 (7).

Table:2- The WHO classification of thymoma histo-pathological types [original and modified]

Description	1999 WHO classification	2004 WHO classification
Spindle cells	A	A
Mixed spindle cells and lymphocytes	AB	AB
Lymphocytes >epithelial cells	B1	B1
Mixed lymphocytes and epithelial cells	B2	B2
Predominate epithelial cells	B3	B3
Thymic carcinoma	C	C

Masaoka-Koga staging of invasion is as follows: Stage 1: tumor is completely encapsulated; Stage 2a: microscopic invasion to capsule; Stage2b: microscopic invasion into adjacent fat; Stage 3: invasion into adjacent structures (blood vessels, pericardium and

lung): Stage 4: Pleural/pericardial dissemination or lymph node or hematogenous mets. All our patients were in stage 1 to 3. None was in stage 4.

Radiologically, thymoma presents as unilateral well defined smooth anterior mediastinal mass, location varies from retrosternal location, thoracic inlet to costophrenic angle. Sometimes, there may be thickening of anterior junctional line or a small nodule as seen in Fig 2 and 4. In advanced stages the margin may be irregular with lobulated contour, elevated dome and shows pleural nodule (Fig 1). Size of theses masses varies greatly (1-20Cm) (Fig 1 and 4). Outline may be lobulated as seen in case 8 (Fig 8). Heterogeneous enhancement described in one third of cases, but we observed it in only one case (Fig 7). Contrast enhanced scan is essential to know the invasion to surrounding structures (Fig 1). It is not unusual to see cystic thymoma. If a soft tissue nodule observed in a cystic anterior mediastinal mass, thymoma is to be suspected. It was not observed in present series; may be due to too small number being included. Calcification may be occasionally noticed which may be punctuate, linear along the capsule or may be coarse in the tumor matrix as in our case no. 9 (Fig 9)

Three new studies have compared Masaoka Koga staging with CT findings. In two retrospective analyses (8, 9) assessing 50 and 58 patients of thymoma respectively, the authors analyzed the CT invasion into adjacent structures by looking at the obliteration of peri-tumoral fat plane and to differentiate stage 1 lesion from stage 2 to 4. They observed it was not helpful making this differentiation. However lobulated contour, irregular margin, cystic/necrotic region within the mass and multifocal calcifications were more suggestive of invasive thymoma in univariate analysis. The only case with irregular margins was invasive thymoma in both CT and HPE (Fig 1). Heterogenicity and lobulated contour are often observed in AB Thymoma (Fig 7, 8). Only case (case no-3) had lobulation and on HPE it was B2 Thymoma.

Our series had 9 cases and 1 of type C, 1 of type B2, 1 of type A and 2 of AB had good correlation of invasiveness on CT. Four cases were discordant. Three of AB variety showed invasion to various structures and 1 of B2 variety appear more benign. In the series reported by HC Hung, of 42 cases (17 invasive thymoma and 25 had thymic carcinoma) 17% of invasive thymoma and 80% of thymic carcinoma showed invasion on CT scan (10). Hence invasiveness cannot be predicted 100% on CT, as in our series. In the study by Kondo et al, frequency of invasion to neighboring organs increased according to tumor subtype A (0%), AB (6%), B1 (19%), B2(25%), B3(42%) and C (89%) (3). Though AB variety showed invasion in 6 % in above series, our study had larger number (75%) and B2 had 50%. AB type of thymoma is more common. CT could not predict invasiveness of thymoma. Though AB variety is mostly non-invasive, can show invasion to neighboring structures on CT. Tomiyama N et al found that Thymoma with lobulated contour was associated with type B2, B3 tumor (11). But in our series, 1 of B2 and 2 of AB tumor showed lobulated contour. Even MRI has similar limitation to detect the invasiveness. FDG PET can be used to detect metastases. Thymomas have an indolent course and 5-year survival is 65-80% and thus need a long follow up (12). CT scan of chest should be done yearly for 5 years and chest X-ray yearly thereafter up to 11 years.

CONCLUSION

AB type of thymoma is the common type and CT scan cannot always predict invasiveness of thymoma. Though AB variety is mostly noninvasive on HPE, it can show invasion to neighboring structures on CT scans in some cases.

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