Original Research Article

Evaluation of mediastinal mass lesions by computed tomography

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Abstract

Introduction: Tumors (benign to severely malignant), cysts, vascular anomalies, lymph node masses, mediastinitis, and mediastinal fibrosis are only few of the disorders that impact the mediastinum. The aim of this study was to examine the computed tomographic characteristics of mediastinal mass lesions in plain and contrast-enhanced scans, as well as the distribution of mediastinal masses and their extension to adjacent structures, and to compare CT findings with pathological diagnosis whenever possible. **Materials and Methods:** Present study was conducted on 42 cases in the age between two to seventy years for a period of November 2019 to March 2021 in the Department of Radio-diagnosis, Alameen Medical College, Bijapur, Karnataka, referred patients from Medicine, Surgery, and evaluated through detailed history, necessary physical examination and computed tomography are carried out using CT scan-GE 16slicescannerwithboth Plain and Contrast study. **Results**: CT with a diagnostic accuracy of 83% is a highly useful modality for the investigation of mediastinal masses. Majority of the masses, showed heterogeneous enhancement, i.e., 45% followed by homogenous enhancement; 26% non enhancing masses constituted 12%. **Conclusion:** CT plays a significant role in the assessment of various mediastinal pathology, regarding diagnosis, distribution pattern and mass effect on adjacent structures.

Keywords: Thymic masses, Anterior mediastinal masses, Computed Tomography.

Introduction

Mediastinal masses span a wide histopathological and radiological spectrum. The histological and radiological spectrum of mediastinal masses is broad. Thymoma, neurogenic tumours, and benign cysts are the most common lesions in the mediastinum, accounting for 60% of patients with mediastinal masses. 80% of children lesions are neurogenic tumours, germ cell neoplasms, and foregut cysts, whereas primary thymic neoplasms, thyroid masses, and lymphomas are the most prevalent in adulthood.

Computed tomography (CT) remains the study of choice for evaluating mediastinal pathologic conditions. This article reviews the variety of disease processes that involve the anterior mediastinum. An emphasis is placed on illustrating specific diagnostic CT features that allow one to distinguish between the different types of anterior mediastinal masses. The techniques for examining the mediastinum are discussed, and the potential advantages and disadvantages of each in specific clinical situations are addressed[1,2].

Cysts, tumours (both malignant and benign), vascular abnormalities, infection of the mediastinum, fibrosis, lymph node enlargement, and fibrosis are some of the disorders that affect the mediastinum. Change in position can demonstrate the malleable nature of the cyst; various criteria were used to demonstrate mediastinal invasion, such as the meeting of the tumour with the mediastinum, the angle between the mass and the mediastinum (greater than 90o), and the main stem bronchus thickness at the proximal end. In terms of clinical date correlation, CT findings are more accurate. A CT scan can help distinguish between benign and malignant tumours. It can tell the difference between a vascular and a non-vascular cause of mediastinum enlargement. Lymphoma enlargement can occur in any compartment, but it is most prevalent in the middle mediastinum[3].

The goal of this study was to examine the computed tomographic characteristics of mediastinal mass lesions in plain and contrast-enhanced scans, as well as the distribution of mediastinal masses and their extension to adjacent structures, and to compare CT findings with pathological diagnosis whenever possible.

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Materials and methods

A one-year cross-sectional study was conducted on 42 patients in the Department of Radiology, Alameen Medical College, Bijapur, Karnataka. Patients of all age groups with a clinically suspected mediastinal spaceoccupying lesions were taken up for the study between 2019 to 2020 with thorough clinical history and clinical examination done before CT examination.

Inclusion criteria

Clinically suspected cases of mediastinal mass, Chest X-ray with mediastinum mass

Exclusion criteria

Traumatic causes, Cardiac Causes and allergic reactions to contrast media.

Patients underwent pre-procedure CT and antero-posterior and lateral view chest x-ray. The renal parameters were assessed, and patients were asked to fast for at least 4 hours before the contrast study. In cases of deranged renal parameters, patients were advised to hydrate to prevent any contrast related reactions. The patients were positioned in the CT gantry in the supine position.

CT evaluation of the mediastinum is performed with standard dynamic CT or spiral (helical) CT. At our institution and many others, nearly all examinations to evaluate the mediastinum are performed with intravenously administered contrast material. In standard dynamic CT, intra- venous contrast material is injected at a rate of 2-3 mL/sec and a series of eight to 1 2 scans is obtained every minute (depending on the capabilities of the CT scanner). One of the challenges of dynamic CT is to optimize the bolus of contrast material (through the phase of maxi- mum vascular opacification) without creating significant streak artifacts. Spiral CT solves this problem by acquiring data in a volume set. The entire chest can be scanned in 24-32 seconds or less when specific protocols are used. Spiral CT is also a single breath-hold examination, thereby avoiding problems with motion-related artifacts as well as uneven interscan motion re- suiting in loss of data. Volume data sets generated by spiral CT can also be used for multiplanar and three-dimensional imaging. Our current preferred technique for evaluation of a known or suspected mediastinal mass is spiral CT. Although the exact techniques will

vary depending on the scanner used, our present technique for spiral CT performed on a Somatom Plus unit includes 8-mm-thick sections, a table speed of 8 mm/see, and image reconstructions at 4-mm intervals. The examination time is 24- 32 seconds, with 1 20 kVp and 2 10 mAs. For more focused examinations, another protocol is used (4-mm-thick sections, 4-mm/sec table speed, and reconstructions at 2-mm intervals). When dynamic scanning is performed, scanning protocols include consecutive, nonoverlapping 8-mm-thick sections and parameters of 1-second examination time, 120 kVp, and 250 mAs.

Before commencement of the study, ethical clearance was obtained from the Institutional Ethical Committee. After the size, location of the mass, presence of calcification, mass effect on adjoining structures, and infiltration were recorded

Data were recorded in a predesigned and pretested proforma. The data were coded and entered in Microsoft excel worksheet. The categorical data were expressed as rates, ratios, and percentages. The continuous data were expressed as mean ± standard deviation.

Results

Mean age of onset in study is 42.9+19.3 years.

Table-1: Demographic details of study

Gender	Number of cases	Percentages
Age in years		
16-30	6	14.2857143
31-45	10	23.8095238
46-60	7	16.6666667
>61	19	45.2380952
Gender		0
Male	32	76.1904762
Female	10	23.8095238
Symptoms		0
Asymptomatic	2	4.76190476
Symptomatic	40	95.2380952
Clinical symptoms		0
Dyspnoea	29	69.047619
Chest pain	26	61.9047619
Cough	22	52.3809524
Weight loss	28	66.6666667
Fever	12	28.5714286
Haemoptysis	6	14.2857143
Dysphagia	6	14.2857143
Type of lesion		0
Benign	14	33.3333333
Malignant	26	61.9047619
Aneurysm	2	4.76190476

Majority of them in the age group of more than 61 years, most of the patients in the present study were men(76%). Most of the patients presented with symptoms for mediastinal mass lesions, wherein, dyspnoea (29) followed by chest pain (26) were the most common symptoms. Malignancy (26) was observed in many of the patients with mediastinal lesions.

Table-2: Compartmental distribution of mediastinum masses

features	Compartment/lesions	No of Cases	Percentage
Frequency of masses	Anterior Mediastinum	23	54.7619048
	Middle Mediastinum	6	14.2857143
	Posterior Mediastinum	13	30.952381
Anterior Mediastinal Lesions distribution	Thymic masses	7	30.4347826
	Metastatic Lymph Node	5	21.7391304
	TB Lymph Node	3	13.0434783
	Aortic Mass	3	13.0434783
	Lymphoma	3	13.0434783
	Thyroid Mass	1	4.34782609
	Germ cell Tumour	1	4.34782609
		23	
Middle mediastinal Lesions distribution	Metastatic Lymph Node	4	66.6666667
	TB Lymph Node	1	16.6666667
	Neuroenteric cyst	1	16.6666667
			0
Posterior mediastinal masses distribution	Neural tumors	5	38.4615385
	Paravertebral abscess	3	23.0769231
	TB Lymph Node	2	15.3846154
	Oesophageal mass	1	7.69230769
	Hydatid cyst	1	7.69230769
	Paravertebral hematoma	1	7.69230769

Anterior mediastinal mass is most common that is 54% of total mass. we have also found that thymic masses were commonly found in anterior mediastinum (30.4%) followed by metastatic lymph node. In present study middle mediastinal mass was (14%) of total masses. In middle mediastinum metastatic lymph node masses were most common that is 66% followed by tuberculosis lymph node enlargement that was 16%. Posterior mediastinum masses which compered of 31% of total masses, neural tumor are common in here that is 38%. Para vertebral abscess is second most common,

Table-3: Correlation between CT and Histopathology

Mediastinal Masses	Total	Histological findings	Nonverifying
Anterior Mediastinum	23	19	4
Middle Mediastinum	6	5	1
Posterior Mediastinum	13	11	2

Histologically 7 lesions are nor verifying with the CT findings ie 35 cases(83%) are correlating.

Table-4: Pattern of CT enhancement and the type of mediastinal mass distribution

Characteristics of lesion		No. of cases	Percentage
CT enhancement pattern of mediastinal masses	Heterogeneous Enhancement	19	45.2380952
	Homogenous Enhancement	11	26.1904762
	Non enhancing	5	11.9047619
	Rim enhancement	4	9.52380952
	Intense enhancement	3	7.14285714
Distribution of the masses based on their nature	Solid masses	23	54.7619048
	Solid +Cystic masses	9	21.4285714
	Cystic	5	11.9047619
	Vascular masses	3	7.14285714
	Fatty masses	1	2.38095238
	Fatty +Cystic +Solid	1	2.38095238

Majority of the masses, showed heterogeneous enhancement, i.e., 45% (n = 19) followed by homogenous enhancement; 26% (n = 11) non enhancing masses constituted 12% (n =5).

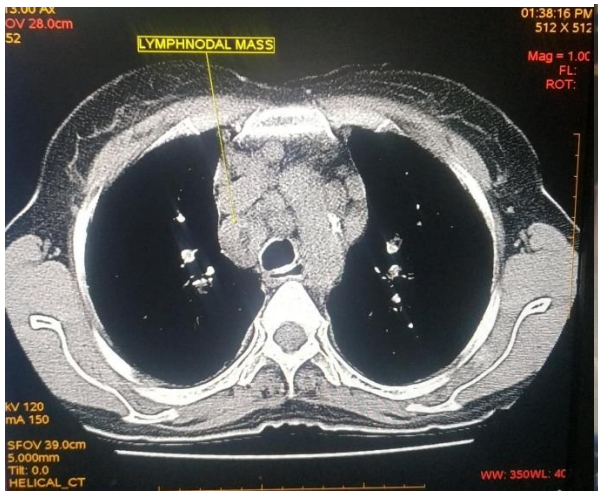

Fig. 1: Lymphnodal mass

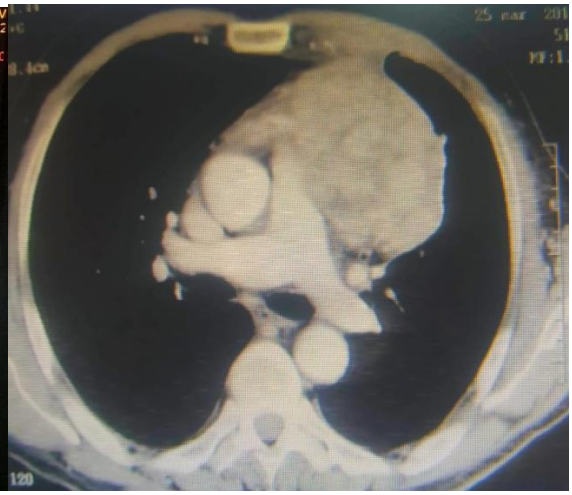

Fig.2: Anterior mediastinal mass - Thymoma

Discussion

The following study was conducted out with the aim of determining mediastinum diseases and, whenever possible, correlating CT findings with histopathological reports. Majority of the symptoms were of non-specific nature like cough, chest pain, fever, dysphagia etc. ese symptoms were mainly due to the masses from the mediastinal lesions and were dependent on the location of the mass. Anterior mediastinal masses mostly presented with a cough and dyspnoea probably due to tracheal compression. Middle mediastinal lesions presented with dysphagia due to either involvement of the esophagus or its compression.

In present study Malignancy seen in 61.9 % of the patients with mediastinal lesions. In concordance with a study conducted by Arumugam et al[4]., who reported malignant lesions and benign lesions in 62% and 38% of the patients, respectively. This was similar to the study conducted by Pulasani et al[5]., who observed, among the thymic lesions, thymoma was the most common (42.8%) lesion detected on CT. Study conducted by Carter et al.[6], also interpreted thymoma as the common lesion among the thymic lesions.

In our study of 42 cases, the majority of the mediastinum masses were in the anterior mediastinum constituting 54% followed by posterior and middle mediastinal compartment. According to the study conducted by Strollo et al[7,8].anterior mediastinum constituted 50% of the masses. Studies conducted by Dubashi et al[9]. and Juanpere et al[10], concluded that anterior mediastinum is the most common compartment to be involved in mediastinal masses.

Thymic masses (30.4%) were the most common lesions. This was similar to the study conducted by Pulasani et al.[5], who observed, among the thymic masses, thymoma was the most common lesion detected on CT. Study conducted by Carter et al.[6], also interpreted thymoma as the common lesion among the thymic lesionswhereas in the study conducted by Pulasani et al.[5], neural tumours were most common in the posterior mediastinal lesions. According to a study by

Nakazono et al[11], schwannoma is the most common mediastinal neurogenic tumour, which is similar to the present study(38%).

In the present study, heterogeneous enhancement was common, similar to a study conducted by Kaur et al.[12], which showed heterogenous enhancement in 58.3% cases. Other findings were also comparable and consistent with the same study, which included solid component and cystic component. Arumugam et al[4]. reported calcification in most of the cases (60%), which was contradictory to our study, however infiltration, mass effect, lymphadenopathy and pleural effusion were comparable with our study. In the present study CT and endoscopy guided biopsy was conducted in many cases, however biopsy was conducted in few patients due to inadequate blood profile or disagreement for biopsy. CT diagnosis in most cases correlated with the histopathological diagnosis. The cases that were interpreted as thymoma and lymphoma were observed to be masses of the lung on histopathological analysis. It could be due to invasive lesions from the lungs can infiltrate into the mediastinum resulting in false interpretation of a mediastinal mass.

Fine needle aspiration cytology is considered an adequate evaluation and when done under the guidance of CT the results are very good. However, core biopsies are preferable whenever lymphoma or thymoma is suspected.

Limitations

The observations noted in the present study need further validation due the potential limitations of the study, which include single centre study, smaller sample size, fewer numbers of paediatric cases, and male preponderance.

Conclusion

Although a number of disease processes and tumors may involve the anterior mediastinum, CT can yield useful diagnostic information to facilitate their distinction.

Computed tomography plays an important role in determining the organ of origin, distribution pattern, and extent of a mediastinal mass, as well as its density and mass effect on surrounding tissues.

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