

Study of role of CT scan in characterization of mediastinal lesions and its correlation with histopathology report

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Abstract

Background: The mediastinum is an extremely complex and interesting area of the body. The multitude of diseases affecting the mediastinum very considerably, ranging from tumor, cysts, vascular anomalies, lymph node masses, mediastinitis, mediastinal fibrosis, to pneumomediastinum. Present study was aimed to study role of CT scan in characterization of mediastinal lesions and its correlation with histopathology report.

Material and Methods: Present study was descriptive, retrospective and prospective study, conducted in patients of any age/gender, suspected to have mediastinal related complaints and referred to the Department of Radiodiagnosis for CT scan.

Results: In our study most common age group to present with mediastinal lesion is between 31-45yrs (30%) followed by 16-30 yrs age group (24%). Present study included a greater number of male patients (65%) as compared to female patients (35%). In the study out of 100 patients, 90% patients were symptomatic. Majority of the mediastinum lesions were in the anterior mediastinum constituting 58% followed by posterior (22%) and middle (20%) mediastinal compartment, Majority showed heterogeneous enhancement (51%), followed by rim enhancement (18%), 15% of the cases revealed calcification in the mediastinal lesions. In our study 88 cases were histologically verified out of which 80 cases showed finding consistent with CT findings, sensitivity of CT was 90.9% for diagnosing of mediastinal lesions which are confirmed by histologically.

Conclusion: CT is indicated when the clinician suspected mediastinal pathology or diagnosed on plain chest radiographs and in patients who have normal chest radiographs yet there is clinical suspicion of mediastinal disease. CT is very useful in imaging the mediastinum because of its excellent contrast resolution; CT is able to identify normal mediastinal structures, vessels CT is highly sensitive imaging modality for diagnosing mediastinal lesions.

Keywords: CT, mediastinal pathology, contrast resolution; diagnosing mediastinal lesions

Introduction

The mediastinum is an extremely complex and interesting area of the body. The multitude of diseases affecting the mediastinum very considerably, ranging from tumor, cysts, vascular

anomalies, lymph node masses, mediastinitis, mediastinal fibrosis, to pneumomediastinum^[1]. Earlier, the lesions of mediastinum were either passively observed or treated by radiations without benefit of specific diagnosis. Later, the attitude has been to perform early surgery to facilitate the diagnosis and if possible to remove the mass^[2, 3].

Although conventional radiograph can show recognizable abnormalities in many patients with mediastinal pathology, radiography is limited in their sensitivity and ability to delineate the extent of mediastinal abnormalities and relationship of lesions to specific mediastinal structures.

CT allows the differentiation of a mediastinal mass from normal mediastinal structures, characterization of its density, its localization and discrimination of vascular and avascular lesions^[4]. Coexisting lung abnormalities and calcification within the lesions are better appreciated on CT. It is useful for distinguishing vascular variants or benign pathologies of mediastinum such as lipomatosis, from true pathological conditions. CT scanning can differentiate vascular from avascular causes of mediastinal widening^[5]. Mediastinal lymph node abnormalities can be seen in any mediastinal compartment, although they most commonly involve middle mediastinal regions^[6].

Since the advent of CT, a decline in the use of other diagnostic chest procedures likes chest fluoroscopy, tomography and mediastinoscopy. Present study was aimed to study role of CT scan in characterization of mediastinal lesions and its correlation with histopathology report.

Material and Methods

Present study was descriptive, retrospective and prospective study, conducted in department of Radiodiagnosis, at Department of Radiology, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, India. Study duration was of 2 years (July 2016 to October 2018). Study was approved by institutional ethical committee.

Inclusion criteria

- Patients of any age/gender, suspected to have mediastinal related complaints and referred to the Department of Radiodiagnosis for CT scan.

Exclusion criteria

- Patient not consenting for study.
- Contraindication to contrast enhanced ct.
- Pregnancy, Renal failure, Hemodynamic instability.
- Allergy to intravenous iodinated contrast media.

After Requisition form requesting for CT THORAX (P+C) received, detailed clinical history along with clinical examination findings was recorded. The procedure was explained to the patient in detail and informed, written and valid consent as per the proforma was taken. Patient will be evaluated with the help of philips brilliance 64-slice ct scanner and various radiologic characteristics of mediastinal lesion such as origin (thymic, neural, lymph nodal or vascular), CT enhancement pattern (homogenous/heterogeneous enhancement, peripheral enhancement or non-enhancing), density (solid, cystic, fatty), margin (well defined/ ill-defined), calcification, necrosis, invasion of surrounding structures were noted.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version.

Results

In our study most common age group to present with mediastinal lesion is between 31-45yrs (30%) followed by 16-30 yrs age group (24%). Present study included a greater number of male patients (65%) as compared to female patients (35%).

Table 1: Age Distribution

Age in Years	No. of cases	Percentage
0-15	16	16%
16-30	24	24%
31-45	30	30%
46-60	14	14%
>61	16	16%
Gender		
Male	65	65%
Female	35	35%

In the study out of 100 patients, 90% patients were symptomatic.

Table 2: Symptomatic and asymptomatic patient distribution

	No. of patients	Percentage
Symptomatic	92	90%
Asymptomatic	8	10%

In our study of 100 cases, Cough was the most common symptom (50%) followed by dyspnea and chest pain 15%.

Table 3: Clinical Symptom Distribution

Clinical symptoms	No of patients	Percentage
Cough	50	50%
Dyspnea	15	15%
Fever	12	12%
Chest pain	15	15%
Other	8	08%

In our study, the majority of the mediastinum lesions were in the anterior mediastinum constituting 58% followed by posterior (22%) and middle (20%) mediastinal compartment,

Table 4: Compartmental distribution of mediastinal lesions

Compartment	No of cases	Percentage
Anterior mediastinum	58	58%
Middle mediastinum	20	20%
Posterior mediastinum	22	22%

In our study among the anterior mediastinal lesions, TB lymph node lesions formed the majority of all of them (34.4%), followed by metastatic lymph nodes (20.6%), thymic lesions (10.3%) & thyroid lesion (12%).

Table 5: Anterior mediastinal lesions distribution

Anterior mediastinal lesions	No of cases	Percentage
TB lymph nodes	20	34.4%
Metastatic lymph nodes	12	20.6%
Thymic lesions	6	10.3%
Thyroid lesion	7	12%
Lymphoma	5	8.68%
Aortic	8	13.7%

Middle mediastinal lesions comprised of 20% of the total mediastinal lesions. Among them TB lymph node involvement formed the majority i.e. 45%.

Table 6: Middle mediastinal lesions distribution

Middle mediastinal lesions	No of cases	Percentage
TB lymph nodes	9	45%
Metastatic lymph nodes	5	25%
Esophageal duplication cyst	3	15%
Bronchogenic cyst	2	10%
Pericardial cyst	1	05%

In our study posterior mediastinal lesions comprised 22% of the total mediastinal lesions. Majority of the posterior mediastinal lesions were neural tumors and TB lymph nodes which are 22.72% each.

Table 7: Posterior mediastinal lesion distribution

Posterior mediastinal lesions	No of cases	Percentage
Neural tumours	5	22.7%
Neuroenteric cyst	1	04%
TB lymph nodes	5	22.72%
Paravertebral abscess	4	18.1%
Esophageal lesion	3	13.6%
Hiatus hernia	4	18.1%
Total	22	100%

In this study majority showed heterogeneous enhancement which comprised 51% followed by rim enhancement which comprised 18%; none enhancing lesions constituted 12% (n=7); homogeneous enhancement was seen in 9% of patients. 6 cases showed intense vascular enhancement of these 4 were Aortic aneurysm and 2 were dissection. Enhancement pattern was not applicable to 4 cases of hiatus hernia in which diagnosis was made if there contrast within the hernia. In our study majority were solid lesions which comprised 52%. Of the total cases. In my study 15% of the cases revealed calcification in the mediastinal lesions.

Table 8: CT features of mediastinal lesions

CT features	No of cases	Percentage
Enhancement pattern		
Intense enhancement	6	6%
Rim enhancement	18	18%
Non-enhancing	12	12%
Heterogeneous	51	51%
Homogeneous	9	9%
Not applicable	4	4%

Nature		
Solid	52	52%
Solid +cystic	34	34%
Vascular	8	8%
Cystic	6	6%
Calcification		
Present	15	15%

In our study 88 cases were histologically verified out of which 80 cases showed finding consistent with CT findings, 8 cases showed different findings compared to CT findings. Out of these 8 cases one case was diagnosed as thymoma on CT, and showed features of invasive thymic carcinoma on histopathology. 4 cases which was diagnosed as tubercular lymphadenopathy appeared to be sarcoidosis on histopathology and two cases with CT diagnosis of tubercular lymph node was shown to be metastatic lymph nodes on histopathological examination. From above table, sensitivity of CT is 90.9% for diagnosing of mediastinal lesions which are confirmed by histologically.

Table 9: Statistical analysis

	Total (Mediastinal lesions)	Gold standard investigation	
		Consistent with CT finding	Not consistent with CT finding
Anterior mediastinum	58	52	6
Middle mediastinum	20	20	0
Posterior mediastinum	22	20	2
Total	100	92	8

Discussion

Radiographic evaluation of the mediastinum has been widely used for investigating the location and the extent of the mediastinal lesions within the thorax. Clinically, a plain chest radiograph taken in two planes (PA and lateral) provides basic information on the location of a mediastinal lesion. Computed tomography or MRI (or both) will routinely complement the chest radiograph.

According to Sutton^[3] anterior division lies in front of the anterior pericardium and trachea, the middle division lies within the pericardial cavity but including the trachea, and the posterior division lies behind the posterior pericardium and trachea. According to Felson^[7] mediastinal compartments are ascertained from the lateral roentgenogram as follows: An imaginary line is drawn upward from the diaphragm long the back of the heart and front of the trachea to the neck. This divides anterior from middle mediastinum. A second imaginary vertical line connects a point on each of the thoracic vertebra 1 cm behind its anterior margin. This divides middle from posterior mediastinum.

In a similar to study Dubashi B *et al.*,^[8] noted that 97% patients were symptomatic and 3% were asymptomatic. In present study, 92% patients were symptomatic and 8% patients were asymptomatic.

In present study, cough was the most common clinical symptom (50%) followed by Dyspnea and fever (20%), chest pain (15%). In study of 400 consecutive patients with mediastinal masses, Davis *et al.*,^[9] noted that chest pain was most common symptom (30%), followed by fever (20%). Singh G *et al.*,^[10] noted affection of males (61.1%) more compare to females (38.9%). Similar findings were noted in present study.

In our study, the majority of the mediastinum lesions were in the anterior mediastinum constituting (58%) followed by posterior (22%) and middle (20%) mediastinal compartment, which is similar to the study conducted by Devis *et al.*,^[9] in 1987 wherein anterior, middle

and posterior mediastinum constituted 54%, 20% and 26% respectively.

In our study on CT total 3 cases (50%) were diagnosed to be thymoma, 33.6% were thymic cyst, 16.6% were thymic hyperplasia. In a study done by Cohen *et al.*,^[11] on 230 patients with CT diagnosis of thymic mass, thymoma constituted 55.4%, thymic cyst 19.6% and thymic hyperplasia 10.7%.

In our study, tuberculous, metastatic and lymphoma were the pathologies of nodal enlargement and they comprised 67.7%, 30% and 8% respectively of total cases of nodal lesions. In the study by Kumar A *et al.*,^[12] tubercular lymph nodes constituted 34.3% of total mediastinal nodes, which is similar to our study (35%).

In our study 20 cases showed mediastinal lymph nodal enlargement, 18 had diagnosis consistent with CT findings. However in 2 cases CT and histological diagnosis did not match. 1 case diagnosed on CT as tubercular lymph nodes were found to be Hodgkin's lymphoma. And one case of lymphoma diagnosed on CT was found to be tubercular lymph nodes on histopathology.

CT Scan helps to differentiate mediastinal lesions based on their characteristic appearance like solid, cystic, fat density, calcification and enhancement pattern. Involvement of adjacent structures can be well demonstrated. Pulmonary, bony, hepatic, adrenal metastasis can be seen on CT thorax^[13].

CT helps to localize the lesion and can assess the extent of the lesion. It is able to characterize the characteristics of lesion based their site, nature, enhancement. The additional role of CT in performing CT guided biopsies of lesions cannot be over emphasized.

Conclusion

CT is indicated when the clinician suspected mediastinal pathology or diagnosed on plain chest radiographs and in patients who have normal chest radiographs yet there is clinical suspicion of mediastinal disease. CT is very useful in imaging the mediastinum because of its excellent contrast resolution; CT is able to identify normal mediastinal structures, vessels CT is highly sensitive imaging modality for diagnosing mediastinal lesions.

Conflict of Interest: None to declare.

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