International Journal of Radiology and Diagnostic Imaging

E-ISSN: 2664-4444
P-ISSN: 2664-4436
IJRDI 2019**;** 2(2): 36-39
Received: 28-05-2019
Accepted: 30-06-2019

Dr. Shruti Santosh Patil
Associate Professor, Department of Radiology, Mahadevappa Rampure Medical College, Gulbarga, Karnataka, India

Dr. Richesh S Tathode
Post Graduate, Department of Radiology, Mahadevappa Rampure Medical College, Gulbarga, Karnataka, India

Corresponding Author:
Dr. Shruti Santosh Patil
Associate Professor, Department of Radiology, Mahadevappa Rampure Medical College, Gulbarga, Karnataka, India

Evaluation of mediastinal masses using computed tomography

Dr. Shruti Santosh Patil and Dr. Richesh S Tathode

DOI: http://dx.doi.org/10.33545/26644436.2019.v2.i2a.38

Abstract
The Objective of this study is to determine the accuracy of the diagnosis of mediastinal masses by Computed Tomography and to correlate its findings with histopathology. This study reviews the variety of the disease processes involving the mediastinum. Emphasis is based on illustrating the specific diagnostic CT features and its correlation with histopathology findings that allow one to distinguish between the different types of mediastinal masses. Total Number of 30 cases referred to the department of Radio-Diagnosis for clinically suspected Mediastinal masses at Teaching and General Hospital over a period of one year were included in the study. In our study, anterior mediastinum was the most commonly involved compartment, followed by superior mediastinum, posterior mediastinum and middle mediastinum. Lymphoma is most common lesion in anterior mediastinum and superior mediastinum, Teratoma in middle mediastinum and Schwannoma in posterior mediastinum. We conclude that computed tomography definitely has a major role to play in the evaluation of a mediastinal mass regarding the compartmental distribution, mass effect upon adjacent structure and provisional diagnosis.

Keywords: Mediastinal masses, computed tomography, teratoma

Introduction
The mediastinum is embyrologically complex, anatomically diverse and yet remarkably compact. Therefore, it is subjected to development of various pathological lesions. The septum transversum is a thick plate of mesodermal tissue occupying the space between the thoracic cavity and the stalk of the yolk sac. This septum does not separate the thoracic and abdominal cavities completely leaving large openings, the pericardioperitoneal canals on each side of the foregut [1].

The aim of this study is to determine the accuracy of the diagnosis of mediastinal masses by Computed Tomography and to correlate its findings with histopathology. This study reviews the variety of the disease processes involving the mediastinum. Emphasis is based on illustrating the specific diagnostic CT features and its correlation with histopathology findings that allow one to distinguish between the different types of mediastinal masses. The multitude of diseases affecting the mediastinum varies considerably, ranging from tumors (benign to extremely malignant), cysts, vascular anomalies, lymph node masses and mediastinal fibrosis. Hence every possible effort has to be made to arrive at a specific diagnosis at the earliest [2].

Computed Tomography has revolutionized in the diagnosis of mediastinal lesions. It is one of the finest non-invasive imaging modalities available for imaging of the thorax. Computed Tomography has good spatial resolution and shorter imaging time, besides being less expensive and being more widely available. It is capable of defining the precise anatomical details and characterizing the nature, site and extent of the disease. Co-existing lung abnormalities and calcification within the lesions are better appreciated on CT [3].

Transthoracic needle biopsy of the mediastinum is an accurate, safe and cost effective diagnostic tool for the evaluation of mediastinal masses and lymphadenopathy. The technique is most useful in the staging of carcinoma where it serves as a less expensive and minimally invasive alternative to mediastinoscopy for establishing unresectability.

An anterior parasternal approach is preferred for most anterior mediastinal masses, whereas a posterior paravertebral approach is used for posterior mediastinal masses. Midline (substernal) masses can undergo biopsy from a transternal approach. Subcarinal biopsy is

occasionally performed using a left parasternal approach by entering the mediastinum via the connective tissue space between the descending aorta and spine [4], whenever possible; a direct mediastinal approach is preferable to a transpulmonary approach, because of the risk of pneumothorax.

Pneumothorax is the principal complication of CT guided chest biopsy occurring in 25% to 43% of patients. Most patients with pneumothorax require no therapy, but 5% to 18% may require placement of a chest tube, hence equipment for immediate chest tube placement should be available whenever a chest biopsy is performed. Hemoptysis can also occur after CT guided thoracic biopsy (less than 5%) and almost always is self-limited [5]. With recent advances in immunohistochemical and core biopsy techniques, transthoracic needle biopsy has become more accurate for establishing the initial diagnosis for lymphoma and for confirming recurrent disease. Core needle biopsy has improved the accuracy of transthoracic needle biopsy and is particularly useful when fine needle aspiration fails to yield a specific diagnosis, when lymphoma or a non carcinomatous lesion is suspected [6].

CT gives much more detail of extent and involvement of disease. This also underlines the importance of close cooperation with the histo-pathologist and the clinicians in diagnosis and management.

The additional role of CT in performing CT guided biopsies of lesions cannot be over emphasized.

Methodology

All cases referred to the department of Radio-Diagnosis for clinically suspected Mediastinal masses over a period of one year were included in the study.

Sample size: 30 cases.

Type of study: Prospective Study.

Inclusion Criteria:

Patients with symptoms of clinically suspected Mediastinal Masses investigated by CT scan and subsequently proved by histopathology.

Exclusion Criteria

- Patients with prior treatment elsewhere on presentation.
- Recurrent mediastinal masses after treatment.
- Patient with abnormal renal function test and contrast sensitivity.

All the cases were studied on a PHILIPS ACCESS computed tomography machine.

Preparation of patient

Patients were kept nil orally 4 hrs prior to the CT scan to avoid complications while administrating contrast medium. Risks of contrast administration were explained to the patient and consent was obtained prior to the contrast study.

Technique

Routine anteroposterior topogram of the thorax was initially taken in all patients in the supine position. An axial section of 10mm thickness was taken from the level of thoracic inlet to the level of suprarenal. In all cases pre-contrast study was followed by post-contrast study, image acquisition was done with intermittent suspended inspiration. For post-contrast study, 80-100ml of dynamic intravenous injection of Omnipaque (iohexol USP equivalent to 300mg of Iodine; tromethamine 1.2 mg; edetate calcium disodium 0.1 mg) at a dose of 1.2 ml/ Kg body weight (in children) was given and axial section were taken from thoracic inlet to the level of suprarenals.

Sagittal and coronal reconstructions were made wherever necessary. The magnification mode was commonly employed, and the scans were reviewed on a direct display console at multiple window settings (i.e. soft tissue (mediastinal) window, Lung window and Bone window to examine the wide variation of tissue density and also to look for osseous involvement.

The pre and post contrast attenuation values, the size, location of the mass, presence of calcification, mass effect on adjoining structures and others associated findings were studied.

Results

Computed Tomography had a significant role in the assessment of various mediastinal masses which were initially detected on the chest radiographs. Maximum numbers of cases were seen in 4th to 6th decade and in males. Most common symptom is Cough.

In our study, isolated compartmental involvement is common in posterior mediastinum (n=7, 23.4%) followed by superior (n=4, 13.3%) middle (n=4, 13.3%) and anterior mediastinum (n=3, 10%). However the anterior mediastinal is most commonly involved in trans-compartmental lesions (n=12, 40% and n=2, 6.7%). Therefore anterior mediastinum (n=17, 56.7%) was collectively the most common compartment involved, followed by superior mediastinum (n=16, 53.3%), posterior mediastinum (n=9, 30.1%) and middle mediastinum (n=6, 20.0%).

In the study, Lymphoma 37.5%, Lymphoma and Thymic masses 31.25%, Ca. esophagus and Schwannoma were the most common mediastinal masses in the anterior, superior, middle and posterior mediastinal compartments respectively.

Calcification is noted in 33.3% of cases. Schwannoma, Teratoma and Ca. Thyroid show calcification consistently. Areas of fat attenuation are seen in 6.7% cases. All the cases of teratoma show fat attenuation areas. Mass effect upon the adjacent mediastinal structures is observed in 70% of the cases and is predominantly noted upon the mediastinal vessels.

All the cases were verified with histopathology and CT accurately predicts the diagnosis in 93.4% of cases.

Table 1: Compartmental distribution of mediastinum masses

Compartment	Number	Percentage
Superior	4	13.3
Anterior	3	10
Middle	4	13.3
Posterior	7	23.4
Superior and Anterior	12	40
Anterior and Middle	2	6.7
Middle and Posterior	2	6.7

Table 2: Superior Mediastinal Lesions distribution

	Number	Percentage
Thymoma	2	12.5
Thymic Ca.	3	18.7
Ca. Thyroid	2	12.5
Ca. Lung with MLN	2	12.5
Lymphoma	5	31.25
Teratoma	2	12.5

Table 3: Anterior Mediastinal Lesions distribution

	No of cases	Percentage
Thymoma	2	12.5
Thymic carcinoma	2	12.5
Lymphoma	6	37.5
Ca. lung with MLN	3	18.7
GCT	1	6.2
Teratoma	2	12.5

Table 4: Middle mediastinal Lesions distribution

	Number	Percentage
Teratoma	2	40
Ca. Oesophagus	2	40
LM of Oesophagus	1	20

Table 5: Posterior mediastinal masses distribution

	Number	Percentage
Schwannoma	3	33.3
Neuroendocrine Tumor	1	11.1
NB	1	11.1
Osteoclastoma	1	11.1
LM of Oesophagus	1	11.1
Teratoma	1	11.1
Ganglioneuroma	1	11.1

Table 6: Thymic masses distribution

	Number	Percentage
Thymoma	3	60
Thymic Ca	2	40

Table 7: Definition of mediastinal masses on CT

Definition of the mass	Number of cases	Percentage
Well defined	21	70
Ill defined	9	30

Table 8: CT Diagnosis

Mediastinal masses	Number of cases	Percentage
GCT	1	3.3
Thymoma	3	10
Lymphoma	6	20
Schwannoma	3	10
Neurogenic tumour	2	6.7
Ca. Thyroid	2	6.7
NB	1	3.3
Ca. Lung MLN	3	10
Thymic Ca.	2	6.7
Teratoma	3	10
LM of Oesophagus	1	3.3
Ca. Oesophagus	2	6.7
Ganglioneuroma	1	3.3

Discussion

Computed tomography imaging techniques have contributed significantly to the detection, characterization and staging of mediastinal masses.

The initial detection of mediastinal masses can be achieved mainly by chest radiograph (Frontal and Lateral views) and once found, they can be localized, further characterized and staged by CT. However the main objective is to determine if the lesion is malignant or benign, as accordingly the further management depends.

In the present study, an attempt has been made to study the characteristics of various mediastinal masses and to correlate the CT findings with the histopathology findings.

Our study comprises a total of 30 patients from in-patient department and is conducted for a period of 1year in the department of Radio diagnosis.

In our study, anterior mediastinum was the most commonly involved compartment (n=17, 56.7%), followed by superior mediastinum (n=16, 53.3%) posterior mediastinum (n=9, 30.1%) and middle mediastinum (n=6, 20.0%). Lymphoma is most common lesion in anterior mediastinum (n=6, 37.5%) and superior mediastinum (n=5, 31.2%), Teratoma (n=2, 40%) in middle mediastinum and Schwannoma (n=3, 33.3%) in posterior mediastinum.

In our study, the cases which were referred to department of Radio diagnosis suspecting Mediastinal masses were evaluated with Computed Tomography.

In our study of 30 cases, cough was the most common clinical symptom constituting 80% followed by dyspnea 53.3%, chest pain 23.3% and fever 16.6%.

According to the Davis *et al.* [7] study in 400 consecutive patients with mediastinal masses, chest pain constituted the most common symptom i.e. 30%, followed by fever 20%.

Felson in 1978 in a series of 550 cases reported, there is no predilection for the masses to occur in the anterior mediastinum. But he reported more number of cases being seen in the anterior mediastinum followed by posterior and middle mediastinum. In our study, isolated compartmental involvement is common in posterior mediastinum (n=7, 23.4%) followed by superior (n=4, 13.3%) middle (n=4, 13.3%) and anterior mediastinum (n=3, 10%). However the anterior mediastinal is most commonly involved in trans-compartmental lesions (n=12, 40% and n=2, 6.7%). Therefore anterior mediastinum (n=17, 56.7%) was collectively the most common compartment involved, followed by superior mediastinum (n=16, 53.3%), posterior mediastinum (n=9, 30.1%) and middle mediastinum (n=6, 20.0%).

Our study is similar to the study conducted by Strollo et a1[8]in 1997 wherein anterior mediastinum constituted 50% of the masses.

In our study, Lymph nodal masses formed majority of the cases with 30% and Lymphoma (66.7%) being most common lymph nodal mass. Thymus lesions forms 16.7% of the cases and Thymoma being most common thymic mass. Neural tumors forms 16.7% of the cases and Schwannoma being most common neural tumor.

In the similar studies conducted by Cohen *et al.* [9] and Davis *et al.* [10] found thymic lesions as common mediastinal lesions. In a study by Chen *et al.* [11] on 34 patients with CT diagnosis of thymic mass, thymoma constituted 91%, thymic cyst 2.9%. Whereas in our study, of the 5 patients with thymic mass, thymoma constituted 60% and thymic carcinoma constitute 40%. According to Naidich *et al.* [12] Thymoma is most commonly seen between 50-60 years which is comparable to our study in which the 3 patients with thymoma where of age 44, 62 and 63 years

respectively.
In our study majority of the masses are well defined (n=21, 70%), Hypodense (n=26, 86.7%) and show moderate (n=26, 86.7%) and Heterogenous contrast enhancement (n=25, 83.3%).
All the lesions were soft tissue attenuating. However, other attenuations like Calcification (33.3%), Fluid (26.7%) and Fat (6.7%) were also seen.
Mass effect on adjacent structures is seen in 70% cases. Metastasis is seen in 16.7% cases.

Conclusion
We conclude that computed tomography definitely has a major role to play in the evaluation of a mediastinal mass regarding the compartmental distribution, mass effect upon adjacent structure and provisional diagnosis.

References

1. Morgenthaler TI, Brown LR, Colby TV, Harper CM, Coles DT. Thymoma. Mayo Clin Proc. 1993; 68:1110-1123.
2. Strollo DC, Rosado de Christenson ML, Jett JR. Primary mediastinal tumors: Part II, Tumors of the middle and posterior mediastinum. Chest 1997; 112:1344-57.
3. Kim JH, Goo JM, Lee HJ, Chung MJ *et al.* Cystic tumours in the anterior mediastinum - Radiologic pathologic correlation. J Comput Assist Tomogr. 2003; 27(5):714-723.
4. Lee KH, Song KS, Kwon Y, Lee I, Lee JS, Um TH. Mesenchymal tumours of the thorax - CT findings and pathological features. Clin Radiol. 2003; 58:934-944.
5. Sadler TW. Body cavities, Chapter 10. In Sadler(ed) TW Langman's Medical embryology, 9th edition, Lippincott Williams and Wilkins, Philadelphia. 2004, 211-222.
6. Shanks SL, Kerley P. (eds) In Roentgen signs in clinical practice, W.B. Saunders Company, Philadelphia 1962; 3:862 -892.
7. Davis *et al.* Primary cysts and neoplasms of the mediastinum: Recent changes in clinical presentations, methods of diagnosis, management and results. Ann Thorac Surg. 1987; 44:229-37.
8. Strollo DC, Rosado de Christenson ML, Jett JR. Primary mediastinal tumors. Part Tumors of the anterior mediastinum. Chest. 1997; 112:511-522.
9. Cohen AJ, Thompson LN, Edwards FH *et al.* Primary cysts and tumors of the mediastinum. Ann Thorac Surg 1991; 51:378-386.
10. Armstrong P. Mediastinal and Hilar disorders. In: Armstrong P Wilson AG, Dee P, Hansell OM (eds) Imaging of diseases of the chest, Mosby, London. 2000, 789-892.
11. Chen J, Weisbrod GL, Herman SJ. Computed tomography and pathologic correlations of thymic lesion. J Thoracic Imaging. 1988; 3:61-65.
12. Naidich DP, Webb WR, Muller NL, Zerhouni EA, Seigelmann SS. Mediastinum, Chapter 2 In: Naidich DP, Muller NL, Zerhouni EA, Webb WR, Krinsky GA (eds) Computed tomography and Magnetic Resonance of the thorax, 3rd edition, Lippincott Williams and Wilkins, Philadelphia, 1999, 38-160.