Original Article

DOI: 10.17354/ijss/2015/414

Evaluation of Mediastinal Mass Lesions Using Multi-detector Row Computed Tomography and Correlation with Histopathological Diagnosis

Kireet Pulasani[1], Indira Narayanaswamy[2], H V Ramprakash[3]

[1]Senior Resident, Vydehi Medical College and Research Centre, Bangalore, Karnataka, India, [2]Professor, Vydehi Medical College and Research Centre, Bengaluru, Karnataka, India, [3]Professor and Head, Vydehi Medical College and Research Centre, Bengaluru, Karnataka, India

Abstract

Background: Multi-detector row computed tomography (MDCT) is a promising three-dimensional imaging tool allowing substantial anatomical volumes to be routinely covered with isotropic sub-millimeter spatial resolution. MDCT scans precisely localize lesions and biopsy needles diagnostic fine-needle aspiration for both benign and malignant disease processes has become a quite safe and highly accurate procedure.

Aims and Objectives: To correlate MDCT findings of the mediastinal mass lesions with histopathology. To differentiate between benign and malignant mediastinal mass lesions based on MDCT findings. To evaluate MDCT characteristics of mediastinal mass lesions.

Materials and Methods: This study was performed on 50 cases in the age group [6-76] years with clinical or radiological suspicion of mediastinal lesions referred from Departments of Medicine, Surgery and Pediatrics between September 2011 and October 2013 to the Department of radio-diagnosis, Vydehi Institute of Medical Sciences & Research Centre, Bangalore for MDCT evaluation.

Results: The study included 36 cases of benign lesions and 14 malignant lesions. Cases of mediastinal lesions were found between age groups 6 and 76 years. All 50 cases were verified histopathologically. Diagnostic accuracy of 92% and 84% was seen for benign and malignant lesions, respectively.

Conclusion: With the high rate of diagnostic accuracy, MDCT plays a significant role in the assessment of various mediastinal pathology. The maximum number of cases occurred in 4^{th}-6^{th} decade. Anterior mediastinum was the most common compartment to be involved (52%) followed by posterior mediastinum (30%). MDCT definitely has a major role to play in the evaluation of a mediastinal mass regarding diagnosis, distribution pattern and mass effect on adjacent structures.

Key words: Benign, Malignant, Mediastinum, Multi-detector row computed tomography

INTRODUCTION

Computed tomography (CT) is a new method of forming images from X-rays. It was developed and introduced into clinical use by the British physicist Godfrey Hounsfield in 1972. It had a tremendous impact in the field of diagnostic radiology. The introduction of multi-detector row CT (MDCT) into clinical practice in 1998 constituted a fundamental evolutionary step in the development and ongoing refinement of CT imaging techniques. This promising three-dimensional (3D) imaging tool allows substantial anatomical volumes to be routinely covered with isotropic sub-millimeter spatial resolution.[1] The ability of high-resolution MDCT scans to precisely localize lesions and biopsy needles, along with the delineation of adjacent structures, diagnostic fine-needle aspiration for both benign and malignant disease processes has become a quite safe and highly accurate procedure.[2]

Access this article online

IJSS

www.ijss-sn.com

Month of Submission : 08-2015
Month of Peer Review : 09-2015
Month of Acceptance : 09-2015
Month of Publishing : 09-2015

The mediastinum is an extremely complex and interesting area of the body. The multitude of diseases affecting the

Corresponding Author: Indira Narayanaswamy, 2066, 16^{th} D main, HAL II Stage, Bengaluru - 560 008, Karnataka, India. Phone: +910-9480494105/+91-9538323901. E-mail: drindiraniranjan@gmail.com

mediastinum vary considerably, ranging from tumors (benign to extremely malignant) cysts, vascular anomalies, lymph node (LN) masses, mediastinitis, mediastinal fibrosis, and pneumo-mediastinum.[3] Hence, every possible effort has to be made to arrive at a specific diagnosis at the earliest. Although conventional radiographs can now show recognizable abnormalities in many patients with mediastinal abnormalities, radiographs are limited in their sensitivity and ability to delineate the extent of mediastinal abnormalities and the relationship of masses to specific mediastinal structure.[4] With the CT these problems are overcome because of its excellent density resolution and tomographic format helping the clinicians and radiologists in identifying the precise location, extent, and characterization of these masses.[5] Cross-sectional imaging of the mediastinum by CT demonstrates precise anatomic details and is the imaging modality of choice for most the mediastinal lesions.[6-8] This study was done to evaluate the primary mediastinal mass lesions on MDCT by correlating the MDCT findings with histopathology, differentiating between benign or malignant mass lesions and to characterize the mediastinal lesions by MDCT.

The differential diagnosis of a mediastinal mass on CT is usually based on several findings, including its location, identification of the structure from which it is arising, whether it is single, multifocal or diffuse, its size and shape, its attenuation, the presence of calcification and its character and amounts, and its opacification following contrast administration.[9,10] In this study, all the cases were subjected to MDCT evaluation for better characterization, extent, probable tissue of origin, and effect on adjoining structures. Plain and contrast studies were performed. The present study comprised of 50 patients.

MATERIALS AND METHODS

All patients referred to Department of Radio-Diagnosis, VIMS & RC between September 2011 and October 2013 with clinical suspicion of mediastinal space occupying lesions or who had a chest radiogram with a suspicious mediastinal abnormality were included in the study. Thorough clinical history and clinical examination was done before CT examination. All the cases taken up for the CT were evaluated for the distribution, MDCT features of the mediastinal mass and also the involvement of adjoining structures. Vascular lesions arising from aorta and cardia, traumatic causes and various types of hernias were excluded from the study.

CT images were obtained with general electrical medical systems 16 slice MDCT machine with 5 mm collimation; 0.6 mm reconstruction interval, gantry rotation speed of 0.6 s, pitch of 1.375:1, 120 kV, and 350 mA were a constant feature for all cases. Routine anteroposterior to program of the thorax was initially taken in all patients in the supine position with the breath held. An axial section of 10 mm thickness was taken from the level of thoracic inlet to the level of suprarenals. In all cases, plain scan was followed by contrast scan. For contrast enhancement initially 80-100 ml of injection of iohexol or in a dose of 300 mg of iodine/kg body weight (in children) was given and axial sections 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., mediastinal window at 320/40; lung window 1400/-600; bone window of 2400/200) 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.

RESULTS

In the study, out of 50 cases, 30 cases (60%) were males and 20 cases (40) were females. Of 2 cases, 14 cases (28%) were children. Among them 8 were males (i.e., 57.2%) and 6 were females (i.e., 48.2%). The most common age group to present with the mediastinal mass was between 46 and 60 years (Table 1).

In present study of 50 cases, Cough was the most common clinical symptom constituting 44% followed by dyspnea 38%, fever 20% and chest pain 20%. In the study, out of 50 cases, 3 cases had no symptoms pertaining to the chest and CT showed the incidental involvement of the mediastinum (Graph 1).

In the study the anterior mediastinal masses formed the majority with 52% (n = 26) of the total masses (Graph 2). Among the anterior mediastinal masses 52% (n = 26), thymic masses formed the majority constituting 26.9% (n = 7), followed by metastatic LN 19.2% (n = 5) (Table 2). Middle mediastinal masses comprised of 18% (n = 9) of the total mediastinal masses. Among them the metastatic LN involvement formed the majority, i.e., 44.5% (n = 4) followed by tuberculosis (TB) LN enlargement constituting 22.2% (n = 2) (Table 3). Posterior mediastinal masses comprised 30% (n = 15) of the total mediastinal masses, the majority were contributed to neural tumors constituting 40% (n = 6) followed by paravertebral abscess constituting 20% (n = 3) (Table 4).

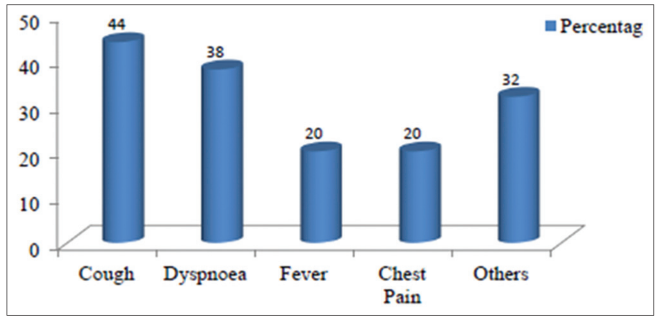
Table 1: Age and sex distribution

Age in years	Male		Female		Total	
	Number of cases	Percentage	Number of cases	Percentage	Number of cases	Percentage
0-15	8	57.2	6	42.8	14	28
16-30	3	37.5	5	62.5	8	16
31-45	4	57.2	3	42.8	7	14
46-60	11	73.3	4	26.7	15	30
>61	4	66.7	2	33.3	6	12
Total	30	60	20	40	50	100

Table 2: Anterior mediastinal lesions distribution

Mediastinal lesions	Number of cases	Percentage
Thymic masses	7	26.9
Metastatic LN	5	19.2
TB LN	4	15.4
Sarcoidosis	1	3.8
Lymphoma	6	23.2
Thyroid mass	2	7.7
Genu cell tumor	1	3.8
Total	26	100

LN: Lymph nodes

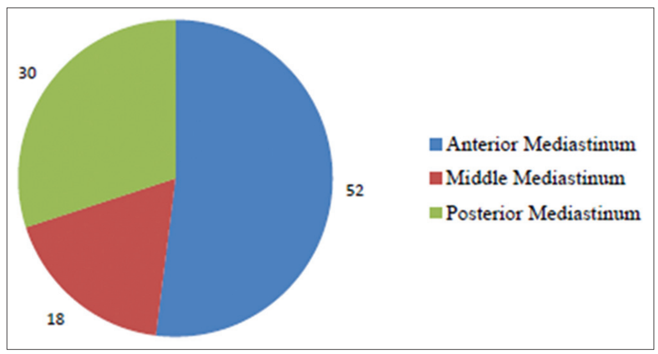


Graph 1: Clinical symptoms distribution

Table 3: Middle mediastinal lesions distribution

Mediastinal lesions	Number of cases	Percentage
Metastatic LN	4	44.5
TB LN	2	22.2
Neuroenteric cyst	1	11.1
Esophageal duplication cyst	1	11.1
Bronchogenic cyst	1	11.1
Total	9	100

TB: Tuberculosis, LN: Lymph nodes



Graph 2: Compartmental distribution of mediastinal masses

Table 4: Posterior mediastinal lesions distribution

Mediastinal lesions	Number of masses	Percentage
Neural tumors	6	40
Paravertebral abscess	3	20
TB LN	2	13.3
Esophageal mass	2	13.3
Extramedullary hemopoiesis	1	6.66
Lymphangioma	1	6.66
Total	15	100

TB: Tuberculosis, LN: Lymph nodes

Among the thymic masses, thymoma constituted 42.8% (n = 3) and is seen predominantly in age group of 46-60 years and males outnumbered females in the ratio of 2:1. Thymic hyperplasia comprised 28.6% (n = 2) and was seen in the age group of 0-15 years. In the study of 6 cases of neurogenic tumors, neurofibroma constituted 50% (n = 3), ganglioneuroblastoma16.6% (n = 1), schwannoma 16.6% (n = 1) and paraganglioma 16.6% (n = 1).

In the study, lymph nodal masses constituted 40% (n = 20) of the total mediastinal masses. Among these the metastatic LN involvement is the predominant constitutes 39.1% (n = 9) followed by TB LN enlargement 34.8% (n = 8).

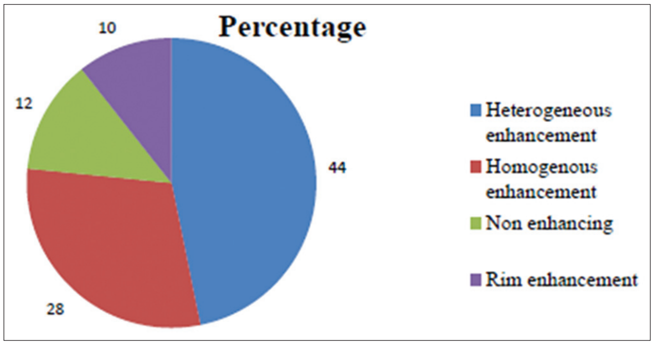
In the study, majority of the masses, showed heterogeneous enhancement, i.e., 44% (n = 22) followed by homogenous enhancement; 28% (n = 14) non enhancing masses constituted 12 (n = 6) (Graph 3).

In the study, majority were solid masses constituting 54% (n = 27) of the cases followed by solid and cystic masses in 22% (n = 11) of the cases (Graph 4). In the study, 24% (n = 12) of the cases showed calcification in the mediastinum mass (Graph 5). Mass effect was noted in 62% of the cases and was predominantly noted on the airways.

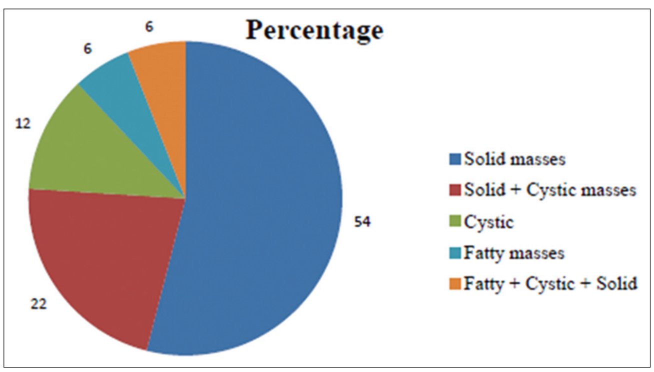
DISCUSSION

In present study of 50 cases, 35 of benign and 11 malignant cases correlated with histopathological examination (HPE), With the sensitivity of MDCT for evaluating the benign lesions is 95%, specificity is 91%, with a positive predictive value of 97% and for malignant lesions sensitivity 78%, specificity is 33% positive predictive value of 84% (Table 5).

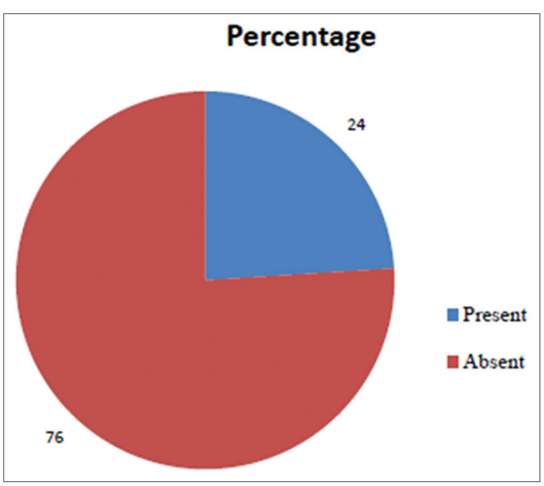
The present study did not correlate with HPE in 4 cases (Table 6). In one case, the diagnosis of mediastinal lipomatosis was given on MDCT, but histopatholigical diagnosis was thymolipoma. Both these entities have similar findings on CT, except that thymoilipoma has soft tissue strandings within the fat density lesion suggestive of thymic tissue.[8] One case was diagnosed as tubercular LN on MDCT, histopathological diagnosis was metastastic LN. The node showed peripheral rim enhancement with central area of hypodensity (necrosis) (Figure 3). This is the feature seen both in tubercular and metastatic LN and can be difficult to differentiate unless calcification is seen.[11,12] Another case, showed LN with homogenous enhancement and no egg shell calcifications on MDCT leading to the erroneous diagnosis of lymphoma rather than sarcoidosis. The absence of calcification can cause confusion between the two entities. One case of retrosternal mass with calcification was diagnosed as thyroid carcinoma on MDCT and histopathological diagnosis was goiter with benign nodular calcification. In the absence of infiltration into the adjacent structures and regional LN, benign entity should have been considered.



Graph 3: Computed tomography enhancement pattern of mediastinal masses



Graph 4: Distribution of the masses based on their attenuation



Graph 5: Number of masses with calcifications

In present study, granulomatous lesions constituted 16%, which is greater in comparison to Wychulis *et al.*[6] study (i.e., 6.3%) probably due to the higher prevalence of TB in comparison to the western population. According to Im *et al.*[9] series, right paratracheal LN enlargement was seen in 87% of cases whereas Present study showed 60% involvement. Similarly in Im *et al.*[9] study, 52% of the TB LN enlargement showed central areas of low attenuation with rim enhancement on contrast study. The present study showed 40% involvement. The present study had 3 cases of paravertebral abscess (5.6%) which was associated with vertebral body destruction.

In present study, the thymic tumors formed the majority with 14%, which is similar to studies conducted by Cohen *et al.*[11] In a study by Chen *et al.*[13] on 34 patients with CT diagnosis of thymic mass, thymoma constituted 42% and thymic cyst 2.9%. Whereas present study of 7 patients with thymic mass, thymoma constituted 42% and hemihyperplasia 28 %. According to Naidich *et al.*,[14] Thymoma is most common seen between 50 and 60 years that is comparable to this study in which the 3 patients with thymoma where of age 40, 48 and 48 years, respectively.

Intrathoracic goiters are also common cause of mediastinal enlargement. Thyroid masses account for 11-15% of mediastinal masses.[15] In the present study, they represented only 4% of the cases.

MDCT Characteristics of Mediastinal Masses

The normal thymus conforms to the shape of the adjacent vessels on CT, whereas a thymic mass does not intend to. Furthermore, a mass gives rise to focal swelling, usually centered away from the midline, whereas the normal gland is approximately symmetrical.

Thymic cyst

Congenital are typically unilocular, contains clear fluid of water density with a thin wall usually <6 cm in diameter. Acquired are usually multilocular, wall of variable thickness

Table 5: CT diagnosis and final diagnosis

Mediastinal lesions	Final diagnoses	Percentage	CT diagnosis	Percentage
Bronchogenic cyst	1	2	1	2
Mediastinal LN with carcinoma lung	9	18	8	19
Esophageal duplication cyst	1	2	1	2
Esophageal mass	2	4	2	4
Germ cell tumor	1	2	1	2
Paraganglioma	1	2	1	2
Lymphangioma	1	2	1	2
Lymphoma	6	12	7	14
Neuroblasloma	1	2	1	2
Neuroenteric cyst	1	2	1	2
Neurogenic tumor	4	8	4	8
Paravertebral abscesses	3	6	3	6
Extramedullary hemopoiesis	1	2	1	2
TB LN	8	16		18
Retrosternal goitre	1	2		
Thymic cyst	1	2	1	2
Thymic hyperplasia	2	2	2	4
Thymolipoma	1	2		
Thymoma	3	6	3	3
Sarcoidosis	2	4	1	2
Mediastinal lipomatosis			1	
Carcinoma thyroid			1	
Total	50	100	50	100

CT: Computed tomography, TB: Tuberculosis, LN: Lymph nodes

Table 6: Correlation with histopathology

CT diagnosis	Histopathologic diagnosis	HPE benign	HPE malignant
Thyroid CA	Benign nodule	+	
Mediastinal lipomatosis	Thymolipoma	+	
TB LN	Metastatic LN	-	+
Lymphoma	Sarcoidosis	+	-

CT: computed tomography, HPE: Histopathological examination, TB: Tuberculosis, LN: Lymph nodes

and range in size from 3 to 17 cm in diameter, sometimes septations and calcification of the cyst wall may be seen.[16]

Thymoma

On CT, thymomas appear as homogenous soft tissue density masses, which are usually sharply demarcated and oval, round or lobulated in shape, project to one side of the mediastinum, and do not conform to the normal shape of the thymus (Figure 1). Rarely, cystic with discrete nodular components, except in patients with cystic masses, thymomas usually enhance homogenously and not uncommonly may contain calcium. Pleural implants may be present which are often unilateral and usually unassociated with pleural effusion. Large tumors have areas of hemorrhage, necrosis or cyst formation.

Thymic carcinoma

Thymic carcinoma cannot be distinguished from thymoma on CT unless enlarged LN are visible in the mediastinum or distant metastases are evident.[17] On CT, seen as homogenous soft tissue mass or heterogeneous with areas of cystic necrosis. Calcification is seen in 10-40% cases. Obliteration of fat planes and extension into pericardium and pleura is usually seen.

Thymolipoma

CT shows a fatty mass with varying amounts of intermixed soft tissue representing thymic tissue. Sometimes it is predominantly fatty so that it is impossible to distinguish a thymolipoma from a mediastinal lipomatosis.[18]

Germ cell tumors

Germ cell tumors include benign and malignant teratoma, seminomas, embryonal carcinoma, endodermal sinus (yolk sac) tumor, choriocarcinoma, and mixed types.

Teratoma

MDCT often shows combination of fluid filled cysts, fat, soft tissue and areas of calcification (Figure 5). Calcification seen in 20-80% of cases, being focal, rim like, or rarely representing teeth or bone. A fat fluid level is particularly diagnostic. Cystic teratoma characteristically has a thick wall, soft tissue septations and in homogenous areas approaching fatty attenuation values, within a predominantly near water density mass; differentiates from other benign cysts.[5]

Seminoma

Typically, primary mediastinal seminomas are large, smooth or lobulated, homogenous soft tissue masses, although small areas of low-attenuation may be seen. Obliteration of fat planes is common and pleural or pericardial effusion may be present.

Non-seminomatous germ cell tumors: On MDCT, these tumors usually show heterogeneous opacity, including ill-defined areas of low attenuation secondary to necrosis and hemorrhage or cystic areas. They often appear infiltrative, with obliteration of fat planes and may be spiculated calcification may be seen.

Thyroid masses

The MDCT appearance of a mediastinal goiter is variable, but the goiter can confidently diagnosed when continuity of the mass with the thyroid is visible. MDCT is at greatest value in defining the morphologic extent. Marked irregularity of the gland contour, loss of distinct mediastinal fascial planes and/or presence of cervical or mediastinal adenopathy should signal potential malignancy.[19]

Parathyroid adenoma

When visible on CT, they usually appear homogenous in density. In anterior mediastinum, they may be indistinguishable from small thymic remnants, small thymomas or small LN and are usually found in the expected location of the thymus. CT correctly identifies parathyroid adenoma preoperatively in 81% of patients.[20]

Primary mediastinal lymphoma (PML)

An anterior mediastinal mass often associated with enlarged nodes in the middle and posterior mediastinum, PML often affects extrathoracic sites at time of diagnosis particularly abdomen, head and neck.

On CT Hodgkin's lymphoma is characterized by the presence of a discrete anterior and superior mediastinal mass with surface lobulation. Surface lobulation of main mass is due to involvement of multiple nodes and coalescence. Masses typically exhibit homogenous soft tissue attenuation, while large tumors may exhibit heterogeneity with complex low attenuation representing necrosis, hemorrhage, and cystic degeneration. It commonly involves cervical, mediastinal, hilar, and paraaortic nodes.[21]

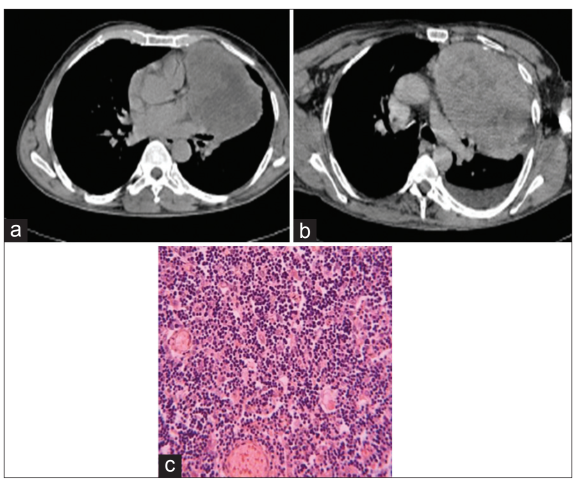


Figure 1: (a and b) Computed tomography images of thymoma, (c) histopathology slide 1: Thymoma

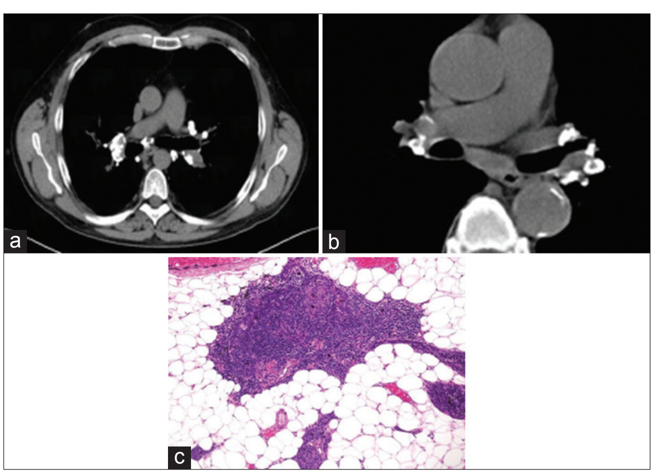


Figure 2: (a and b) Computed tomography Images of sarcoidosis, (c) histopathology slide 2: Sarcoidosis

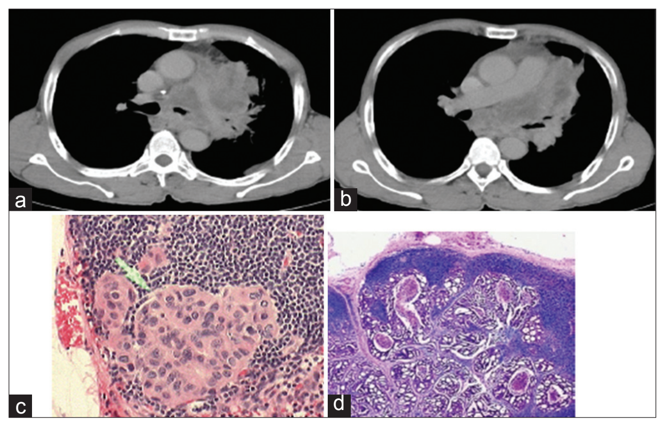


Figure 3: (a and b) Computed tomography Images of mediastinal lymphadenopathy due to carcinoma lung, (c) histopatholgy slide: Metastatic deposit from adenocarcinoma

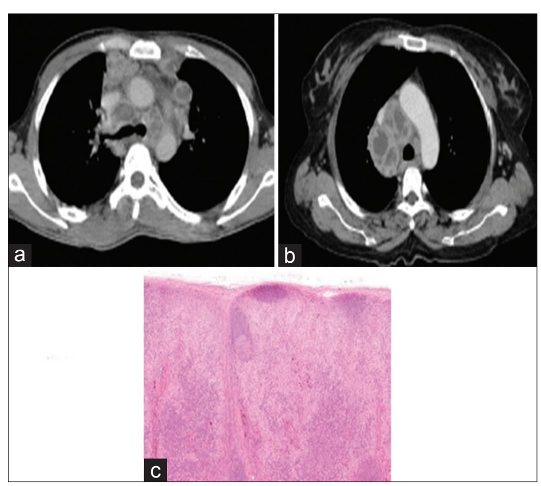


Figure 4: (a and b) Computed tomography of tubercular lymphnodes, (c) histopathology slide 4 – tubercular lymphadenitis

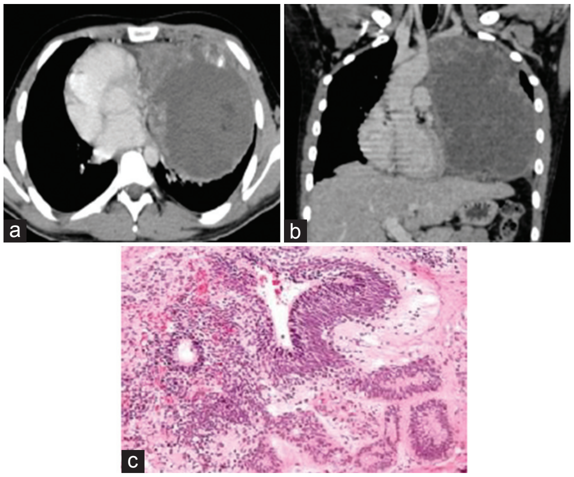


Figure 5: (a and b) Computed tomography images of germ cell tumor with calcifications, (c) histopathology slide 5 - germ cell tumor

Non-Hodgkin's lymphoma comprises of mediastinal large B-cell lymphoma and lymphoblastic lymphoma and is more common in children than Hodgkin's lymphoma. Large cell lymphomas are typically confined to the mediastinum and contiguous nodal areas initially without showing extrathoracic disease at presentation. It may present with hematogenous spread to kidney, liver, ovary, adrenal gland, GI tract, and central nervous system during disease progression or at recurrence. CT demonstrates mediastinal mass without surface lobulation, often associated with vascular involvement and pleural or pericardial effusion. Lymphoblastic lymphoma is characterized by mass without surface lobulation involving vascular structures often associated with pleural and pericardial effusion, systemic nodal involvement including cervical, axillary, para aortic, mesenteric and inguinal groups and by hepatomegaly and splenomegaly.[22]

Sarcoidosis

In the order of decreasing frequency, paratracheal, aortopulmonary, subcarinal, and prevascular LN are commonly involved.[23] LN shows dense or stippled or egg shell calcification and rarely enhance or appear necrotic (Figure 2).

TB

The enlarged LN usually shows central area of low attenuation on MDCT with peripheral enhancement (Figure 4).

Pleuropericardial cyst

MDCT shows thin walled unilocular water density (0-20 HU) cystic structure. Wall may calcify. Majority of them arises in the anterior cardiophrenic angle, more so on the right side.[23]

Bronchogenic cyst

MDCT typically shows sharply marginated thin walled mediastinal mass of homogenous soft tissue or water attenuation. Rarely, calcification of the cyst wall is present. When dense, bronchogenic cysts may be difficult to distinguish from solid lesions. An important clue can be their lack of enhancement following contrast administration.[24]

Esophageal duplication cysts

On MDCT indistinguishable from bronchogenic cyst except for the location.

Neuroenteric cysts

MDCT appearance is same as that of other duplication cyst, but the presence of vertebral abnormality points to the diagnosis, vertebral anomalies are present in half of the cases.

Lymphangiomas

MDCT usually shows a smooth, lobulated mass, which may mold to or envelop, rather than displace, the adjacent mediastinal structures. They are either unilocular or multilocular with near water density. Calcification is rare. Thin enhancing septations within the mass may be seen.[25]

Neurogenic tumors

At CT, many neural tumors have mixed density, including low attenuation region, on non-contrast enhanced CT Schwannoma often demonstrate lower attenuation than skeletal muscle because of their high lipid content, interstitial fluid and areas of cystic degeneration. Neurofibromas are often more homogenous and show higher attenuation than schwannomas because they have fewer of these histologic features. These lesions are heterogeneously enhancing following contrast administration.

Plexiform Neurofibromas are seen in association with neurofibromatosis-1, on CT demonstrates low attenuation infiltrative masses along the mediastinal nerves and sympathetic chain.

Mediastinal paragangliomas

Rounded soft tissue masses which are usually extremely vascular and therefore enhance brightly Paravertebral lesions.

Tuberculous paravertebral lesions

CT scan is excellent for visualization of endplate destruction, fragmentation of the vertebrae, and paravertebral calcifications. Inflammatory collections and masses are best seen after the contrast administration. Small necrotic foci are recognized by CT scans but are difficult to find in the conventional radiographs. Extension into the canal of epidural abscesses and bony fragments are well demonstrated on axial CT images. MDCT is also used for guiding percutaneous biopsy and postdrainage follow-up.

Extramedullary hemopoietic tissue

Extramedullary hematopoietic tissue typically produces one or smoother, lobular, spherical masses in the paravertebral gutter, usually in the lower thorax, often they are bilateral and symmetrical. Extramedullary hemopoietic tissues are low-density masses due to fat content.

Esophageal carcinoma

Narrowing of the esophageal lumen or dilatation caused by obstruction. Thickening of the esophageal wall, either symmetric or asymmetric. Loss of periesophageal fat planes, with or without evidence of invasion of surrounding organs.

CONCLUSION

MDCT plays a significant role in the assessment of various mediastinal pathology with an accuracy of 92% on the whole, 97% and 84% for benign and malignant lesions, respectively, MDCT is a promising 3D imaging tool which allows substantial anatomical volumes to be routinely covered with isotopic sub-millimeter spatial resolution highly useful for the investigation of mediastinal masses. MDCT definitely has a major role to play in the evaluation of a mediastinal mass lesions regarding their characterization and differentiating between benign and malignant lesions.

REFERENCES

1. Webb WR. Advances in computed tomography of the thorax. Radiol Clin North Am 1983;21:723-39.
2. Protopapas Z, Westcott JL. Transthoracic hilar and mediastinal biopsy. Radiol Clin North Am 2000;38:281-91.
3. Benjamin SP, McCormack LJ, Effler DB, Groves LK. Primary tumors of the mediastinum. Chest 1972;62:297-303.
4. Armstrong P. Mediastinal and hilar disorders. In: Armstrong P, Wilson AG, Dee P, Hansell OM, editors. Imaging of Diseases of the Chest. London: Mosby; 2000. p. 789-892.
5. Sones PJ Jr, Torres WE, Colvin RS, Meier WL, Sprawls P, Rogers JV Jr. Effectiveness of CT in evaluating intrathoracic masses. AJR Am J Roentgenol 1982;139:469-75.
6. Wychulis AR, Payne WS, Clagett OT, Woolner LB. Surgical treatment of mediastinal tumors: A 40 year experience. J Thorac Cardiovasc Surg 1971;62:379-92.
7. Baron RL, Levitt RG, Sagel SS, Stanley RJ. Computed tomography in the evaluation of mediastinal widening. Radiology 1981;138:107-13.
8. Rosado-de-Christenson ML, Pugatch RD, Moran CA, Galobardes J. Thymolipoma: Analysis of 27 cases. name Am J Respir Crit Care Med 2001;357:1191-4.
9. Im JG, Itoh H, Shim YS, Lee JH, Ahn J, Han MC, *et al.* Pulmonary tuberculosis: CT findings – early active disease and sequential change with anti-tuberculous therapy. Radiology 1993;186:653-60.
10. Müller NL, Mawson JB, Mathieson JR, Abboud R, Ostrow DN, Champion P. Sarcoidosis: Correlation of extent of disease at CT with clinical, functional, and radiographic findings. Radiology 1989;171:613-8.
11. Cohen AJ, Thompson L, Edwards FH, Bellamy RF. Primary cysts and tumors of the mediastinum. Ann Thorac Surg 1991;51:378-84.
12. Felson B, editor. The mediastinum. Chest Roentgenology. Ch. 11. Philadelphia: W.B. Saunders; 2002. p. 389-420.
13. Chen JL, Weisbrod GL, Herman SJ. Computed tomography and pathologic correlations of thymic lesions. J Thorac Imaging 1988;3:61-5.
14. Naidich DP, Webb WR, Muller NL, Zerhouni EA, Seigelmann SS. Mediastinum. In: Naidich DP, Muller NL, Zerhouni EA, Webb WR, Krinsky GA, editors. Computed Tomography and Magnetic Resonance of the Thorax. 3rd ed., Ch. 2. Philadelphia: Lippincott Williams and Wilkins; 1999. p. 38-160.
15. Prasad A, Chauhan BK. Computerized tomographic evaluation of mediastinal lesions – Pictorial assay. Indian J Radiol Imag 2001;11:65-70.
16. Armstrong P, Padley S. The normal chest. Grainger and Allison's Diagnostic Radiology: A Textbook of Medical Imaging. 4th ed., Vol. 1, Ch. 14. London: Churchill Livingstone; 2001. p. 294-6.
17. Hartmann CA, Roth C, Minck C, Niedobitek G. Thymic carcinoma. Report of five cases and review of the literature. J Cancer Res Clin Oncol 1990;116:69-82.
18. Baron RL, Lee JK, Sagel SS, Levitt RG. Computed tomography of the abnormal thymus. Radiology 1982;142:127-34.
19. Armstrong R, Padley SP. The mediastinum. In: Grainger RG, Allison D, Adam A, Dixon AK, editors. Diagnostic Radiology. 4th ed., Vol. 1, Ch. 17. London: Churchill Livingstone; 2001. p. 353-76.
20. Cates JD, Thorsen MK, Lawson TL, Middleton WD, Foley WD, Wilson SD, *et al.* CT evaluation of parathyroid adenomas: Diagnostic criteria and pitfalls. J Comput Assist Tomogr 1988;12:626-9.
21. Lazzarino M, Orlandi E, Paulli M, Boveri E, Morra E, Brusamolino E, *et al.* Primary mediastinal B-cell lymphoma with sclerosis: An aggressive tumor with distinctive clinical and pathologic features. J Clin Oncol 1993;11:2306-13.
22. Tateishi U, Müller NL, Johkoh T, Onishi Y, Arai Y, Satake M, *et al.* Primary mediastinal lymphoma: Characteristic features of the various histological subtypes on CT. J Comput Assist Tomogr 2004;28:782-9.
23. Kuhlman JE, Fishman EK, Hamper UM, Knowles M, Siegelman SS. The computed tomographic spectrum of thoracic sarcoidosis. Radiographics 1989;9:449-66.
24. Aktogu S, Yuncu G, Halilçolar H, Ermete S, Buduneli T. Bronchogenic cysts: Clinicopathological presentation and treatment. Eur Respir J 1996;9:2017-21.
25. Jeung MY, Gasser B, Gangi A, Bogorin A, Charneau D, Wihlm JM, *et al.* Imaging of cystic masses of the mediastinum. Radiographics 2002;22:S79-93.

How to cite this article: Pulasani K, Narayanaswamy I, Ramprakash HV. Evaluation of Mediastinal Mass Lesions Using Multi-detector Row Computed Tomography and Correlation with Histopathological Diagnosis. Int J Sci Stud 2015;3(6):156-163.

Source of Support: Nil, **Conflict of Interest:** None declared.