Research Article

A study of mediastinal mass lesions by various imaging modalities

Nipa Patidar[1], Ketan Patel[1], Parul Dutta[2], Bhavesh Goyani[3]

[1]Department of Radiology, Surat Municipal Institute of Medical Education and Research, Surat, Gujarat, India.
[2]Department of Radiology, Gauhati Medical College, Guwahati, Assam, India.
[3]Department of Radiology, GMERS Medical College, Valsad, Gujarat, India.
Correspondence to: Nipa Patidar, E-mail: rockki1234@gmail.com

Received October 24, 2015. Accepted October 26, 2015

Abstract

Background: The diseases affecting the mediastinum very considerably, ranging from tumor, cysts, vascular anomalies, lymph node masses, mediastinitis, mediastinal fibrosis, to pneumomediastinum. For accurate diagnosis various imaging modalities are now available, which helps in in-depth study of various masses.

Objective: To study imaging appearance, distribution, and other features of various mediastinal mass lesions. Also to compare the various modality of imaging findings with each other and with histopathologic diagnosis.

Materials and Methods: This is a prospective study carried out in suspected cases of mediastinal masses. All participants were underwent various imaging procedures such as chest radiographs, barium swallowing study, computerized tomography (CT) scan, and magnetic resonance imaging.

Result: Of total 50 participants, 23 had benign, 22 had malignant, and 5 had vascular lesions. The most common site of mediastinal mass was anterior mediastinum (25), in which the most common type of masses was of thymic origin (9). Masses of posterior mediastinum (18) were other common types, with esophageal carcinoma (7) being the most common lesion. In the CT scan, of 42 lesions, 29 showed solid, 6 showed cystic, and 7 showed mixed consistencies, whereas 13 showed calcifications.

Conclusion: The most common type of mass in anterior mediastinum is thymic mass. CT scan and magnetic resonance imaging help the clinicians and radiologists in identifying the precise location, extent, and characterization of these masses.

KEY WORDS: Mediastinal masses, computerized tomography scan, magnetic resonance imaging

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] This approach was more productive and effective than the former but the injunction that surgery be performed under any circumstances has led to the omission of certain valuable diagnostic measures, and surgery sometimes performed unnecessarily.

However, in the era of health-care reforms neither patients with mediastinal masses can be put for surgery or radiotherapy, nor can they be left for a period of closed observations, as the period of inactivity is noted without danger, as a case of operable mediastinal mass progress to stage of in operability and cure. Early detection of the mediastinal mass is therefore important in differentiating and treating benign and malignant lesions. Mediastinal disease is usually initially demonstrated on a chest radiograph and appears as mediastinal soft tissue mass, widening of mediastinum, or a pneumomediatinum. However, many a times chest radiograph appears normal in presence of mediastinal disease.[4]

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.24102015217	

After revolutionary invention of computed tomography (CT) by Dr. GN Hounsfield in 1972, it immerged as the choice for assessing the mediastinal masses.[5] It is the most useful investigation for localizing, characterizing, and demonstrating the extent of a mediastinal mass and its relationship to adjacent structures. Multidetector CT following intravenous contrast medium with multi-planar reforms provide an excellent assessment of mediastinal structure, including vessels, and has largely obviated the need to proceed to magnetic resonance imaging (MRI) for imaging in the coronal and sagittal planes. CT is also utilized for guided biopsy, plan resection, and follow response to therapy.

MRI remains useful for imaging suspected neurogenic tumors, for demonstrating intraspinal extension of a mediastinal mass and for further evaluating the relationship of a mass to the heart, pericardium, and larger intrathoracic vessels. MRI may have advantages over contrast-enhanced computed tomography (CECT) for distinguishing between solid tissue and adjacent vessels and may be useful for confirming that mass is cystic.[6] Since the advent of CT and MRI, a decline in the use of other diagnostic chest procedures such as chest fluoroscopy, tomography, mediastinoscopy, arteriography, and thoracotomy has occurred. The skepticism and controversy that greeted the introduction of this expensive modality has gradually faded away.

The objective of this study was to study imaging appearance, distribution, and other features of various mediastinal mass lesions. Also to compare the various modality of imaging findings with each other and with histopathologic diagnosis.

Materials and Methods

It was a prospective study carried out at Gauhati Medical College and Hospital, Guwahati, India, during July 2011 to August 2012. The Human Research Ethics Committee approval was taken before starting the study.

Patients were selected from the referred patients to the Department of Radiodiagnosis. An informed written consent was taken before enrollment in the study. Detailed clinical history was elaborated. Patients with clinically suspected mediastinal mass lesion or with a suspicious mediastinal abnormality on chest radiogram were taken for the study. Barium swallow was carried out as a screening procedure in patients presenting with dysphagia. The CECT scan was carried out in all patients with mediastinal mass suspected except patients with suspected neurogenic tumor and paravertebral lesion. An MRI was carried out in patients with neurogenic tumor and paravertebral lesion.

Radiographs were taken using 800mA X-ray machine (Siemens, Munich, Germany). Barium contrast studies were carried out using 800mA X-ray machine with IITV (KLINOSKOP-H/Polydoros-LX/Flurovision 3000)

Plain- and contrast-enhanced CT scans were carried out using SOMATOM Spirit dual slice CT Machine (Siemens).

MR imaging was performed with a 1.5 tesla body MR imaging system (magnetom tim avanto, Siemens, Erlangen, Germany).

Result

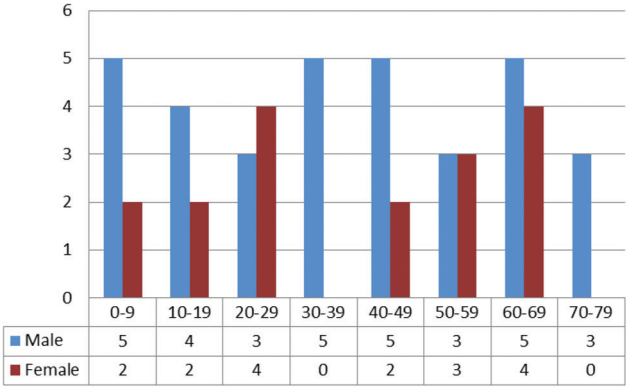
A total of 50 patients of mediastinal mass lesions were evaluated during the period of July 1, 2011 to August 31, 2012. Figure 1 shows the age- and gender-wise distribution of the mediastinal mass. As seen in the figure, proportion of men (66%) was more than that of women (34%). Also the most common age group was 60–69 years.

Of 50 participants, 23 had benign, 22 had malignant, and 5 had vascular lesions. Benign lesions (18) were commonly seen below 40 years of age while malignant lesions (18) were more common after 40 years of age. The most common presenting symptom was cough followed by chest pain, dyspnea, and weight loss. Other symptoms were fever, hemoptysis, and chest wall swelling.

In chest radiograph, only 33 cases were found mediastinal mass. The margin of lesions was lobulated (10), oval (10), rounded (4), or irregular (9). Four cases showed calcification of mass lesion on chest radiograph. Other associated findings in chest radiograph were pleural effusion (15), consolidation (6), chest wall/neck swelling (2), vertebral collapse (2), or pericardial effusion (1). Barium swallow was carried out in 10 patients, which shows stricture in 4 patients, ulcerative lesion in 2, and polypoidal in 1.

Through cross-sectional imaging (CT scan and MRI) exact location of mediastinal mass lesions was identified. Forty-two patients were undergone CT scan and eight were undergone MRI. The most common location was anterior or posterior mediastinum. However, for descriptive purpose seven lesions that have both anterior and middle mediastinal component were considered in anterior mediastinal lesions. Because, they had epicenter or major component in anterior mediastinum. Similarly, lesion has middle and posterior mediastinal component and all three mediastinal components were considered in middle mediastinal lesions.

Table 1 shows classification of mediastinal mass lesions. The most common type of lesion in the anterior mediastinum was thymic in origin. Among them, thymoma (five) was the most common. Others were thymic hyperplasia (two), thymolipoma (one), and thymic carcinoma (one). Other common



	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79
Male	5	4	3	5	5	3	5	3
Female	2	2	4	0	2	3	4	0

Figure 1: Age- and gender-wise distribution of patients of mediastinal mass.

Table 1: Classification of mediastinal mass lesions

Anterior mediastinal mass lesions	Number of cases	Middle mediastinal mass lesions	Number of cases	Posterior mediastinal mass lesions	Number of cases
Thymic mass	9	Tubercular adenopathy	2	Esophageal carcinoma	7
Germ cell tumor	2	Metastatic adenopathy lymphoma	2	Esophageal duplication cyst	1
Vascular malformation	2	Lymphoma	1	Tubercular paravertebral abscess	3
Thyroid mass	2	Aortic aneurysm	2	Neurogenic tumor	4
Tubercular adenopathy	4	—	—	Extramedullary hematopoiesis	2
Metastatic adenopathy	2	—	—	Descending aortic aneurysm	1
Lymphoma	3	—	—	—	—
Mediastinal abscess	1	—	—	—	—
Total	25	Total	7	Total	18

lesions were tubercular lesions like in anterior mediastinum adenopathy (four), middle mediastinum adenopathy (two), and paravertebral abscesses (three) in posterior mediastinum. The most common lesion of posterior mediastinum was esophageal carcinoma (seven). A total of 14 (28%) nodal masses were found: 6 tubercular, 4 metastatic, and 4 lymphoma.

In the CT scan, of 42 lesions, 29 showed soft tissue density (solid lesion), 6 showed fluid density (cystic lesion), and 7 showed mix soft tissue and fluid density. Among 42 lesions, 13 showed calcification and 2 showed fat density. The enhancement pattern of mediastinal mass on CT scan showed that 30 lesions had heterogeneous, 7 homogeneous, and 5 intense patterns.

In this study, total eight patients had undergone MRI. All cases appeared hyperintense on T2W1. While on T1W1, six cases were hypointense and two were isointense to muscle. Of eight cases, four were solid, three were solid cystic, and 1 was vascular in nature.

Discussion

The mediastinum is the site for a vast range of disease varying from tumors, cysts, vascular lesions, lymph node masses, to mediastinitis. Although conventional radiographs can show recognizable abnormalities in many patients, many patients with mediastinal pathologies, radiographs are limited in sensitivity and ability to delineate the extent of mediastinal abnormality and relationship of masses to specific mediastinal structures. With the CT scan, these problems are overcome because of its excellent density resolution and tomographic format and therefore CT plays important role in the evaluation of mediastinum. The CT scan has helped the clinicians and radiologists in identifying the precise location, extent, and characterization of these masses.

The common presenting symptom was cough in this study. About 24% patients had complaint of cough. Other common complaints were chest pain (21%) and dyspnea (13%). The study conducted by Davis et al.[7] showed that the chest pain (30%) was the most common presenting symptom and cough (16%) was the second most common symptom. It was nearly same. These symptoms were due to mass effect of mediastinal lesions and were dependent on the location of mass.

The precise location of mass in the mediastinum by chest radiograph could be carried out only in 29 patients (58%) in this study. The study conducted by Salonen et al.[8] showed a similar finding with frequency (56%). A total of 10 patients were undergone barium swallow study. Among them, seven patients were presented with dysphagia. And on a double-contrast barium study, four patients found stricture, which is similar to the study conducted by Levine et al.[9]

In this study, the most common location of mediastinal mass was anterior mediastinum (50%), followed by posterior mediastinum (36%) and middle mediastinum (14%). The study conducted by Strollo et al.[10] showed similar finding with the most common location was anterior mediastinum (50%). In children also the most common location was anterior mediastinum (50%), which is in consistence with the study conducted by Merten,[11] in which it is 46%.

As stated in result, 42 cases had undergone CT scan. Among them, 29 showed soft tissue density, 6 showed fluid density, and 7 showed both type of densities, whereas 13 showed calcification. On histopathology it was found that 11 were in benign lesion and 2 were in malignant lesion, that is, mediastinal extension of papillary carcinoma of thyroid and thymic carcinoma. Calcification in malignant lesion was not common. However, it was documented in studies conducted by Theros[12] as 1% and Zerhouni et al.[13] as 7%. In this study, 28.6% more lesion by CT scan and 12.5% more lesion by MRI located the mediastinal mass, which were not located by chest radiograph. It is correlated with study conducted by Muhur et al. (1982), where detection rate was 34% more by CT scan.

By histopathology examination, 100% (15 of 15) lesions diagnosed as benign by CT, came out as benign ,while 95.2% (20 of 21) came out as malignant that were diagnosed as malignant on CT scan. So, the accuracy of CT diagnosis is quite good.

The comparison of the types of lesions between present study and other studies conducted by Cohen et al. and Davis et al. shows nearly similar frequency of different types of lesions such as thymic tumor, neural tumors, lymphoma, germ

cell tumors, vascular lesions, and esophageal carcinoma. However, incidence of tubercular lesions such as adenopathy and paravertebral abscess is greater (18%) in this study. It is due to more prevalence of tuberculosis in comparison to western countries.

Conclusion

The most common location of mediastinal mass is anterior mediastinum. And the most common type of mass in anterior mediastinum is thymic mass. CT scan and MRI help the clinicians and radiologists in identifying the precise location, extent, and characterization of these masses.

References

1. Johnson D, Shah P, Collins P, Wingley C. Heart and mediastinum. In: *Gray's Anatomy*, Chapter 59, 39th edn. New York: Churchill Livingstone, 2008. pp. 976–7.
2. Whitten CR, Khan S, Munneke GJ, Grubnic S. A diagnostic approach to mediastinal abnormalities. Radiographics 2007; 27(3):657–71.
3. Gregson RHS, Whitehouse RW, Wright AR, Jenkins JPR. The mediastinum. In: *Textbook of Radiology and Imaging*, Chapter 2, Vol 1, 7th edn., Suttton P (Ed.). London, UK: Churchill Livingstone, 2003. pp. 57–86.
4. Stones PJ, Torres WE, Colvin RS, Meier WL, Sprawls P, Rogers JV Jr. Effectiveness of CT in evaluating intrathoracic masses. AJR Am J Roentgenol 1982;139(3):469–75.
5. Hounsfield GN. Computerized transverse axial scanning (tomography). 1. Description of system. Br J Radiol 1973;46(552):1016–22.
6. Naidich DP, Webb WR, Muller NL, Zerhouni EA, Krinsky GA, Seigelman SS (Eds.). Mediastinum. In: *Computed Tomography and Magnetic Resonance of Thorax*, Chapter 2, 3rd edn. Philadelphia: Lippincott Williams and Wilkins, 1999. pp. 38–160.
7. Davis RD Jr, Oldham HN Jr, Sabiston DC Jr. Primary cysts and neoplasms of the mediastinum: recent changes in clinical presentation, methods of diagnosis, management, and results. Ann Thorac Surg 1987;44(3):229–37.
8. Salonen O, Kivisaari L, Standertskjöld-Nordenstam CG, Oksanen K, Lappalainen K. Chest radiography and computed tomography in the evaluation of mediastinal adenopathy in lymphoma. Acta Radio 1987;28(6):746–50.
9. Levine MS, Chu P, Furth EE, Rubesin SE, Laufer I, Herlinger H. Carcinoma of the esophagus and esophagogastric junction: sensitivity of radiographic diagnosis. AJR Am J Roentgenol 1997;168(6):1423–6.
10. Strollo DC, Rosado de Christenson ML, Jett JR. Primary mediastinal tumors. Part 1: tumors of the anterior mediastinum. Chest 1997;112(2):511–22.
11. Merten DF. Diagnostic imaging of mediastinal masses in children. AJR Am J Roentgenol 1992;158(4):825–32.
12. Theros EG. 1976 Caldwell Lecture: varying manifestation of peripheral pulmonary neoplasms: a radiologic–pathologic correlative study. AJR Am J Roentgenol 1977;128(6):893–914.
13. Zerhouni EA, Scott WW Jr, Baker RR, Wharam MD, Siegelman SS. Invasive thymomas: diagnosis and evaluation by computed tomography. J Comput Assist Tomogr 1982;6(1):92–100.
14. Cohen AJ, Thompson LN, Edward FH, Bellamy RF. Primary cyst and tumors of the mediastinum. Ann Thorac Surg 1991; 51(3):378–86.
15. Devis et al. Mediastinal masses: a 10 year study based on 315 cases. J Thoracic cardiovascular surgery. 1956;32:728.

How to cite this article: Patidar N, Patel K, Dutta P, Goyani B. A study of mediastinal mass lesions by various imaging modalities. Int J Med Sci Public Health 2016;5:1408-1411

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