

RADIOLOGICAL PROFILE OF MEDIASTINAL MASSES WITH SPECIAL REFERENCE TO COMPUTED TOMOGRAPHY

Suresh Kumar¹, Sonjjay Pande², Praveen Baghel³, O. P. Bhargav⁴

¹Assistant Professor, Department of Radiodiagnosis, N. S. C. B. Medical College, Jabalpur, Madhya Pradesh.

²Professor, Department of Radiodiagnosis, N. S. C. B. Medical College, Jabalpur, Madhya Pradesh.

³Assistant Professor, Department of Surgery, N. S. C. B. Medical College, Jabalpur, Madhya Pradesh.

⁴Assistant Professor, Department of Pathology, N. S. C. B. Medical College, Jabalpur, Madhya Pradesh.

ABSTRACT

BACKGROUND

Computed tomography is an important procedure for detecting mediastinal masses. Computed tomography findings used to differentiate between inflammatory and neoplastic masses includes location, nature of mass (Solid, Cystic, Vascular), enhancement pattern, status of surrounding fat planes (Maintained or lost), involvement of adjacent structures, associated extramediastinal lesion, presence of calcification and fat.

AIM

To establish utility value of computed tomography and compare with x-ray and histopathological correlation.

MATERIAL AND METHOD

A prospective study is conducted in Department of Radiodiagnosis, N.S.C.B. Medical College, Jabalpur, M.P., over a period of one year (2008-2009) on Radiological profile of mediastinal masses with special reference to computed tomography.

Inclusion Criteria

All patients (Male/Female) of all age group, who were suspected to have some mediastinal mass on conventional radiograph were then referred for CT of mediastinum on GE bright 16 slice machine.

RESULTS

Mediastinal masses were evaluated by GE bright speed 16 slice machine. The age groups ranges from 7 to 80 years. In this study, 36(72%) cases were male and rest of 14(28%) cases were females. In our study most common presenting complaint was cough, breathlessness (86%). In present study out of 50 cases 37 cases (74%) were detected as having neoplastic lesion, 13 cases (26%) was having inflammatory pathology, lymph node metastasis from CA bronchus seen in 27 cases (73%), CA oesophagus 4 cases (11%), pulmonary Koch seen in 11 cases (84%), bronchogenic cyst 1 case (7%), aneurysm of aorta seen in 1 case (7%), 43 cases (86%) have anterior mediastinum involvement. Final diagnosis confirmed by histopathology in all these patients.

CONCLUSION

CT has high accuracy in diagnosis of inflammatory condition and their complication. CT is also sensitive modality for detection, localization, and determination of exact extent of mediastinal neoplasm.

KEYWORDS

Computed Tomography, Mediastinal Mass, Bronchogenic Cyst.

HOW TO CITE THIS ARTICLE: Suresh Kumar, Sonjjay Pande, Praveen Baghel, O. P. Bhargav. "Radiological Profile of Mediastinal Masses with Special Reference to Computed Tomography." Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 97, December 03; Page: 16280-16285, DOI: 10.14260/jemds/2015/2400

INTRODUCTION

Computed tomography is an important procedure for detecting mediastinal masses. Computed tomography findings used to differentiate between inflammatory and neoplastic masses includes location, nature of mass (Solid, cystic, vascular), enhancement pattern, status of surrounding

cystic, vascular), enhancement pattern, status of surrounding fat planes (Maintained or lost), involvement of adjacent structures, associated extramediastinal lesion, presence of calcification and fat.

ANATOMY

DIVISIONS OF THE MEDIASTINUM.⁽¹⁾

It may be divided for purposes of description into two parts: an upper portion and above the upper level of the pericardium, which is named the superior mediastinum; and a lower portion, below the upper level of the pericardium.

This lower portion is again subdivided into three parts, viz., that in front of the pericardium, the anterior mediastinum; that containing the pericardium and its contents, the middle

Financial or Other, Competing Interest: None.

Submission 14-11-2015, Peer Review 15-11-2015,

Acceptance 17-11-2015, Published 03-12-2015.

Corresponding Author:

Dr. Suresh Kumar,

F-54, Doctors Colony,

Medical College Campus,

Jabalpur-482003, Madhya Pradesh.

E-mail: suresh6932@gmail.com

DOI:10.14260/jemds/2015/2400.

mediastinum; and that behind the pericardium, the posterior mediastinum.

CONTENTS OF THE MEDIASTINUM

SUPERIOR MEDIASTINUM

It contains the origins of the Sternohyoidei and Sternothyreoidi and the lower ends of the Longi colli; the aortic arch; the innominate artery and the thoracic portions of the left common carotid and the left subclavian arteries; the innominate veins and the upper half of the superior vena cava; the left highest intercostal vein; the vagus, cardiac, phrenic, and left recurrent nerves; the trachea, esophagus, and thoracic duct; the remains of the thymus and some lymph glands.

ANTERIOR MEDIASTINUM

It contains a quantity of loose areolar tissue, some lymphatic vessels which ascend from the convex surface of the liver, two or three anterior mediastinal lymph glands, and the small mediastinal branches of the internal mammary artery.

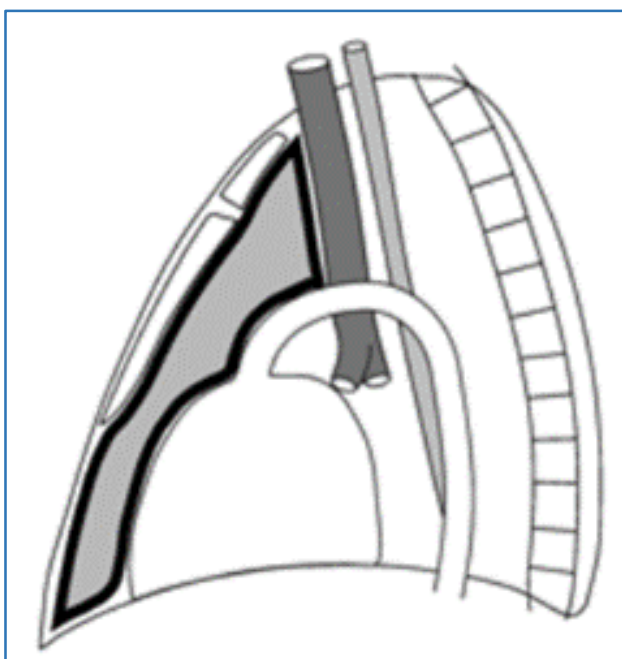
MIDDLE MEDIASTINUM

It contains the heart enclosed in the pericardium, the ascending aorta, the lower half of the superior vena cava with the azygos vein opening into it, the bifurcation of the trachea and the two bronchi, the pulmonary artery dividing into its two branches, the right and left pulmonary veins, the phrenic nerves, and some bronchial lymph glands.

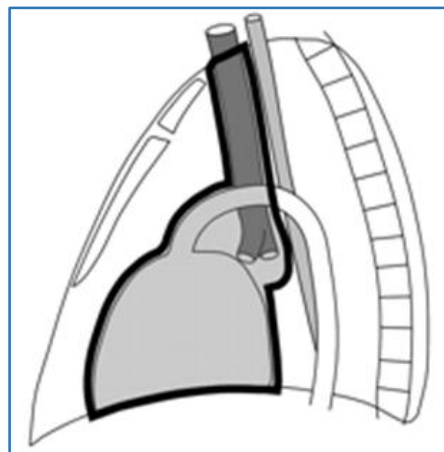
POSTERIOR MEDIASTINUM

It contains the thoracic part of the descending aorta, the azygos and the two hemiazygos veins, the vagus and splanchnic nerves, the esophagus, the thoracic duct, and some lymph glands.

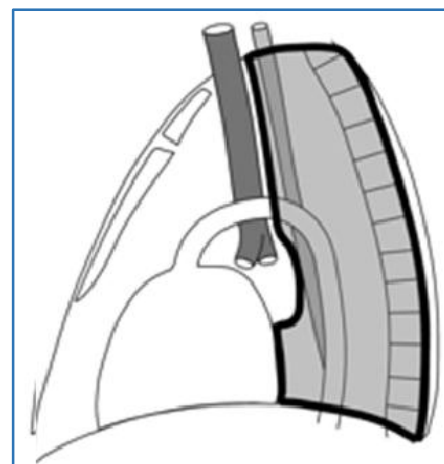
FELSON'S METHOD



Anterior Mediastinum



Middle Mediastinum



Posterior Mediastinum

In this method the anterior mediastinum includes the pericardium and its contents and lies anterior to a line extending from the posterior margin of the cardiac shadow upwards along the anterior margin of the trachea. The middle mediastinum includes all structures behind this line and anterior to a line drawn connecting a point on each vertebral body 1cm posterior to its anterior margin. The posterior mediastinum is essentially the paravertebral gutter.

AIMS AND OBJECTIVES

The study was carried out with the following aims and objectives:

- To determine the disease pattern of various mediastinal masses.
- To establish utility value of computed tomography.
- To compare the CT findings with x-ray and histopathological findings whenever possible.

MATERIAL AND METHODS

This study entitled "Radiological evaluation of mediastinal masses" was carried out at the Department of Radiodiagnosis, Netaji Subhash Chandra Bose Medical College and Hospital, Jabalpur, between the time period October 2008 to October 2009.

Study Population

The series consists of all patients (Male/female) referred to computed tomography with suspected diagnosis of

mediastinal masses on radiograph. It also included patients with normal radiograph, but with strong clinical suspicion of mediastinal masses.

Equipment Used

X-ray will be done on WIPRO Dx Machine (500mAs). Patient will be scanned on the Multislice CT machine (GE BRIGHT SPEED 16 slice).

METHODS

All patients recruited in the study were examined in detail with complete history and physical examination.

- Routine hematological tests, other relevant investigations were obtained in all patients.
- Whenever possible, the diagnosis was confirmed by FNAC/Biopsy and operative findings.

CT scan of mediastinum requires imaging of the thorax into axial planes. Reformatting in coronal and sagittal planes was done using software provided.

Diagnostic images were stored on computer in jpeg version after converting the DICOM file to jpeg file using an e-film software.

OBSERVATIONS

Gender	Nos.	Percentage
Female	14	28
Male	36	72
Grand Total	50	100

Table 1: Gender Distribution

Age Distribution	Female	Male	Total
1 to 10	0	1	1
11 to 20	2	1	3
21 to 30	1	2	3
31 to 40	1	0	1
41 to 50	4	5	9
51 to 60	4	15	19
61 to 70	1	5	6
71 to 80	1	7	8
Grand Total	14	36	50

Table 2: Age and Gender Distribution

ETIOLOGY	FEMALE	MALE	TOTAL	%
Malignant	9	28	37	74%
Inflammatory	5	6	11	22%
Miscellaneous	0	2	2	4%
Grand Total	14	36	50	100 %

Table 3: Etiopathological Distribution of Cases

Age Range	Inflammatory	Neoplastic	Misc.
1 to10	0	0	1
11 to 20	3	0	0
21 to 30	1	2	0
31 to 40	0	1	0
41 to 50	1	8	0
51 to 60	5	14	0
61 to 70	0	5	1
71 to 80	1	7	0
Grand Total	11	37	02

Table 4: Age Distribution of Pathologies

COMPARTMENT INVOLVED	NUMBER	PERCENTAGE
Anterior	43	86%
Middle	30	60%
Posterior	2	4%

Table 5: Various Mediastinal Compartments Involvement

MEDIASTINUM INVOLVED	INFLAMMATORY	NEOPLASTIC	MISC
Anterior	11	32	0
Middle	2	27	1
Posterior	0	1	1

Table 6: Mediastinum Involved in Various Pathologies

SYMPTOMS	NO. OF CASES	PERCENTAGE
Cough	43	86%
Breathlessness	30	60%
Chest pain	28	56%
Dysphagia	20	40%
Fever	20	40%
Hemoptysis	15	30%
Hoarseness of voice	5	10%
Swelling over chest	3	6%
Pain in abdomen	2	4%
Back pain	2	4%
Vomiting	1	2%

Table 7: Clinical Symptomatology of Patients

NO. OF CASES IN	PEDIATRIC AGE GROUP (≤13 YRS)	ADULTS	TOTAL PERCENTAGE
Pulmonary Koch's with lymphadenopathy n=11	0	11	84.6%
Bronchogenic cyst n=1	1	0	7.7%
Aneurysm of aorta n=1	0	1	7.7%

Table 8: Spectrum of Benign Lesions of Mediastinum

Authors	No. of cases
RD Pugatch et al.	49
GM Graeber et al.	42
Rebner M et al.	132
Wytenbach R et al.	78
Motoc A et al.	38
Present Study	50

Table 9: Number of Cases Studied

Gender Distribution of Cases

The present study included 50 patients ranging from 1 day to 80 years of age; 74% of the patients were males in the present study, whereas only 26% of the patients were females. GM Graeber et al.² evaluated 42 patients. The present studies showed male predominance.

Clinical Manifestations

The patients who were referred for radiological evaluation presented with various clinical manifestations such as cough, breathlessness, fever, chest pain, dysphagia, etc. In study done by RD Pugatch et al.³ in five patients with anterior mediastinal mass, three were asymptomatic and two complained of chest pain. The most common clinical manifestation in the present study was cough, which was present in 40 cases. The second most common clinical symptom was breathlessness, which was present in 37 cases.

Mediastinum Involved

In the present study, anterior mediastinum was the most common involved compartment followed by middle mediastinum; posterior mediastinum was least commonly involved compartment.

Classification of Mediastinal Lesions

Rebner M et al.⁴ showed CT is an important modality for imaging mediastinal masses, and certain CT attenuation features (Fat, calcium or water attenuation, contrast enhancement) are well known to suggest specific diagnoses. Metastatic disease and lymphoma accounted for 69% of masses in his series. In present study primary lesions other than lymphoma accounted for 20%, whereas metastatic disease and lymphoma accounted for 80% of mediastinal masses.

Nature of the Lesions

In the study done by Massie RJ et al.⁵ Thirty-one of the 55 (56%) lesions were malignant. In the study done by Wytttenbach R et al.⁶ the 28 of 38 mediastinal masses were malignant. Present study included wide range of mediastinal lesions including both benign and malignant pathologies. In the present study, majority of the lesions were malignant, accounting for 72% of the total cases which was comparable to the study done by Wytttenbach R et al.⁶ in whose study 74% of the lesions were malignant.

Loss of Surrounding Fat Planes

In the present study 27 out of 37(73%) malignant masses showed loss of fat planes, whereas no case of benign pathology showed obliterated fat planes.

Frequency of Lesions

In the study done by Wytttenbach R et al.⁶ 45 of 59 cases (76.27%) of mediastinal and chest wall tumors in children is malignant. In the study done by Massie RJ et al.⁵ thirty-one of the 55(56%) lesions were malignant in children. In present study most common mediastinal lesions were pulmonary Koch's with mediastinal lymphadenopathy and bronchogenic cyst.

In adult's most common mediastinal mass was lymph nodal metastasis from carcinoma bronchus followed by lymphoma, CA esophagus, pulmonary Koch's with mediastinal lymphadenopathy, metastasis from other primaries.

Density of Lesions on Unenhanced Scan

In the present study, all the cases of lymphoreticular malignancies (n=4) and malignant neoplastic conditions

(n=33) and benign conditions (n=11) showed soft tissue attenuation on precontrast scan. Fat density was present only in 2 cases of dermoid enabling their confident diagnosis on CT. Vascular lesion was present in 1 case in the form of aortic aneurysm. Fluid density was seen in 1 case of bronchogenic cyst. In study done by Rebner M et al.⁴ he showed that certain CT attenuation features (Fat, calcium or water attenuation, contrast enhancement) are well known to suggest specific diagnoses.

Pattern of Contrast Enhancement

In the present study, post contrast scan was done routinely in all patients and enhancement pattern were divided into three categories: homogeneous, heterogeneous and lesions showing no enhancement. Lymphoreticular malignancy was the commonest group to show homogeneous contrast enhancement, in which 3 out of 4 showed homogeneous enhancement whereas heterogeneous contrast enhancement with necrotic areas was seen most commonly in case of malignant lesions (n=33) and in one case of the congenital lesions no contrast enhancement was seen

Cystic or Solid Nature of Mass

Computed tomography could generally differentiate between solid or non-solid nature of mass. In present study 2 cases are of non-solid nature, which included 1 case of vascular lesions, 1 case each of bronchogenic cyst. In study conducted by GM Graeber et al.² 22 of 25 patients had accurate assessment as to the cystic or solid nature of the lesions (88%).

SUMMARY

- X-ray and CT scan of mediastinum were done in all 50 patients presenting with symptoms and signs of mediastinal mass.
- Detailed history with clinical examination, laboratory investigation and histopathology reports were obtained.
- X-ray and CT scans of these patients were carefully evaluated and provisional diagnosis was made.
- Diagnosis was confirmed either by histopathology or by positive response to treatment.
- The males were the predominantly affected sex in all the etiologic lesions occurring in mediastinum.
- The malignant lesions were most common. The common age of involvement pertaining to malignant lesions was 51 to 70 years of age group.
- The most common mediastinum to be involved in inflammatory as well as neoplastic lesions was anterior mediastinum and least one to get involved was posterior mediastinum.
- Neoplastic lesions in present study most commonly affected the age group of patients above 50 years.
- In present study, it was possible to diagnose malignant neoplasms by studying the loss of fat planes. The extension of these lesions was accurately depicted on computed tomography.
- Computed tomography is very specific between differentiating solid and nonsolid lesions of mediastinum.

CONCLUSIONS

1. CT scan evaluates soft tissue details of mediastinum. It is the most cost effective modality available for mediastinal evaluation.
2. Wide spectrum of disease affecting the mediastinum can be detected by CT.
3. CT has high accuracy in diagnosis of inflammatory conditions and their complications. It is also a very sensitive modality for detection, accurate localization and determination of exact extent of mediastinal neoplasms.

BIBLIOGRAPHY

1. Warwick R and Williams PL. The respiratory system in Gray anatomy. Descriptive and applied. 1973: Longmans Green and Company, London.

2. Graeber GM, Shriver CD, Albus RA, Burton NA, Collins GJ, Lough FC and Zajchuk R. The use of computed tomography in the evaluation of mediastinal masses. The Journal of Thoracic and Cardiovascular Surgery, Vol 91, 662-666.
3. Pugatch RD, Faling LJ, Robbins AH, and Spira R. CT diagnosis of benign mediastinal abnormalities. American Journal of Roentgenology, Vol 134, Issue 4, 685-694.
4. Rebner M, Gross BH, Robertson JM, Pennes DR, Spizarny DL, Glazer GM. CT evaluation of mediastinal masses. Comput Radiol 1987 May-Jun;11(3):103-10.
5. Massie RJ, Van Asperen PP, Mellis CM. A review of open biopsy for mediastinal masses. J Paediatr Child Health 1997 Jun;33(3):230-3.
6. Wyttenbach R, Vock P, Tschäppeler H. Cross-sectional imaging with CT and/or MRI of pediatric chest tumors. Eur Radiol 1998;8(6):1040-6.



Fig. 1: Chest X-ray PA View

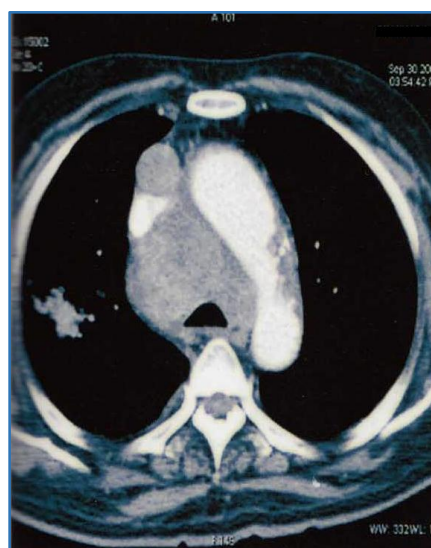


Fig. 3: Post-Contrast Image

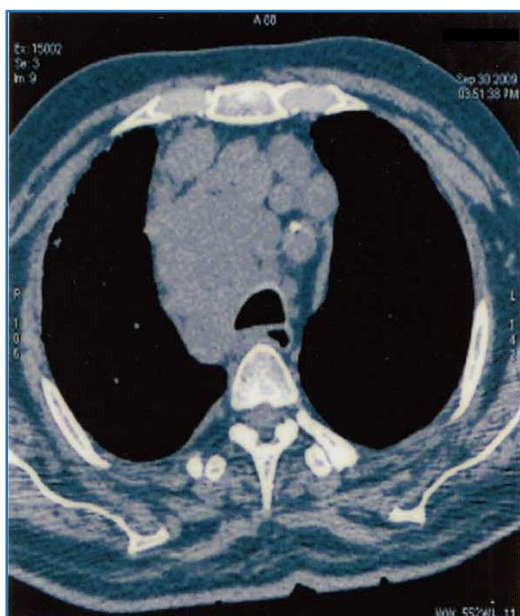


Fig. 2: Pre-Contrast Image

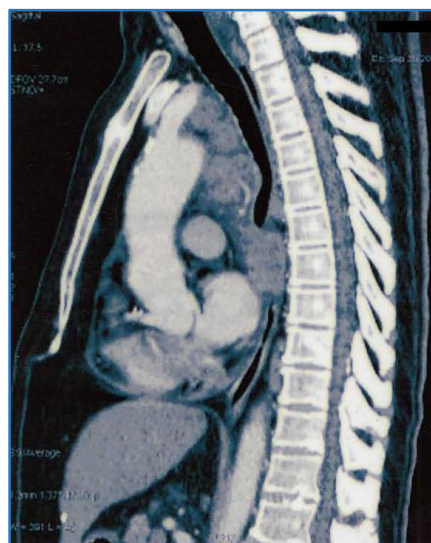


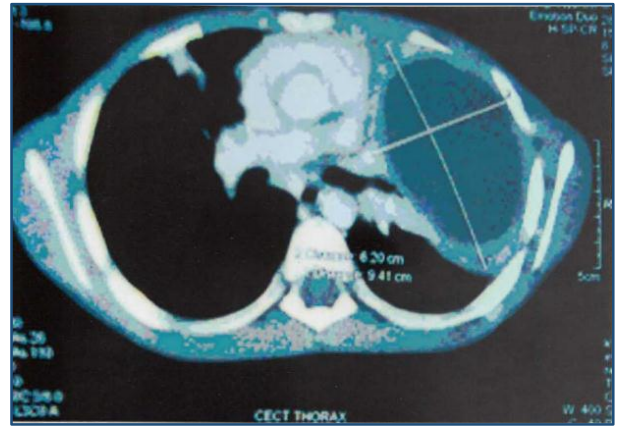
Fig. 4: Recon. Image

Axial pre- and post-contrast image showing soft tissue attenuation mass lesion without calcification, which on contrast showing subtle enhancement with lobulated margin occupying superior and middle mediastinum suggestive of lymph node mass.



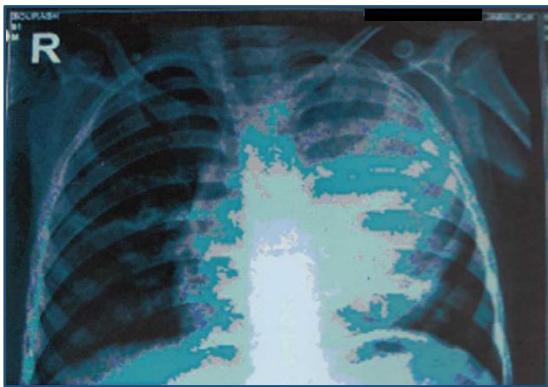
Fig. 1: Pre-Contrast Image

Soft tissue density seen involving upper and middle Lt. lung fields with smooth regular margins.



Post-Contrast Image

Well defined cystic lesion extending from Lt. parahilar region to lateral chest wall in lung parenchyma s/o bronchogenic cyst.



Chest X-ray PA View