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Research Article

Mediastinal Masses: A Radiological Study of 50 Cases

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Abstract

Objective: The mediastinum is an extremely complex and interesting area of the body. The multitudes of diseases affecting the mediastinum vary considerably, ranging from tumours (benign to extremely malignant) cysts, vascular anomalies, lymph node masses, mediastinitis, mediastinal fibrosis and pneumo- mediastinum.

Methods: The cases were selected based on all patients referred to the Department of Radio-Diagnosis with clinically suspected mediastinal mass lesion or those with a suspicious mediastinal abnormality on chest radiogram were taken up for study. Barium swallow, CT scan and MRI was done.

Results: A total of 50 mediastinal mass lesions were evaluated, 33 were male and l7 were female. Other findings were studied and tabulated.

Conclusion: CT is a highly useful modality for investigation of mediastinal masses. Tuberculosis and esophageal carcinoma are more common in this part of world.

Keywords: Mediastinal masses, computed tomography, tuberculosis, esophageal carcinoma

1. Introduction

Mediastinal lesions include a wide spectrum of pathology, ranging from tumors (benign & malignant), cysts, vascular anomalies, and lymph node masses to diffuse lesions such as pneumomediastinum, mediastinitis, mediastinal fibrosis and encysted pleural effusion[1]. These lesions are challenging problems frequently faced by the radiologist[1].

Mediastinal masses span a wide histopathological and radiological spectrum. The most frequent lesions encountered in the mediastinum are thymoma, neurogenic tumours and benign cysts, altogether representing 60% of patients with mediastinal masses[2]. Neurogenic tumours, germ cell neoplasms and foregut cysts represent 80% of childhood lesions, whereas primary thymic neoplasms, thyroid masses and lymphomas are the most common in adults[2].

Many mediastinal reflections can be appreciated at conventional radiography, and their presence or distortion is the key to the interpretation of mediastinal abnormalities[1]. However, computed tomography (CT) is the most important tool in the evaluation of a mediastinal mass[3]. An excellent soft tissue contrast also designates magnetic resonance imaging (MRI) as an ideal tool to evaluate tumours of the mediastinum[4].

Anterior mediastinal tumours account for 50% of all mediastinal masses, including thymoma, teratoma, thyroid disease and lymphoma[5]. Masses of the middle mediastinum are typically congenital cysts while those arising in the posterior mediastinum are often neurogenic tumours[6].

The present study was undertaken with the objectives of determining the disease pattern affecting the mediastinum and to correlate the CT and MRI findings with the histopathology reports whenever possible.

2. Materials and Methods

The present study was carried out in the Department of Radiology, Gauhati Medical College and Hospital, Guwahati. The period of study was 01.07.2011 to 3l.08.20l2. Study was approved by the Institutional Ethics Review Committee.

The cases were selected based on all patients referred to the Department of Radio-Diagnosis with clinically suspected mediastinal mass lesion or those with a suspicious mediastinal abnormality on chest radiogram were taken up for study. Detailed clinical history was taken in all the patients. Initially X-ray chest (AP and Lateral view) was carried out as a screening investigation in whom it had not done previously. Barium swallow were done as a screening procedure in a patient presenting with dysphagia. Contrast enhanced CT scans were then done in all the patients in whom mediastinal mass suspected except patients with suspected neurogenic tumor or para vertebral lesions. Magnetic Resonance Imaging was done in patients in whom neurogenic tumor or para-vertebral lesion was suspected. An informed and written consent was taken from all the patients undergoing Barium study, CT scans and MRI as a part of standard protocol. The cases with traumatic and cardiac causes were directly excluded.

Radiographs were taken using SIEMENS 800 mAs X—ray machine, single and double contrast barium studies were done using Siemens 800 A x-ray machine with IITV (KLINOSKOP-H/Polydoros-LX/Fluorovision 3000), plain and contrast enhanced CT scans were done using Siemens SOMATOM Spirit dual slice CT machine, MR Imaging were performed with a 1.5-T Body MR imaging system (Magnetom Tim Avanto, Seimens, Erlangen, Germany). CT guided FNAC for the pathological diagnosis was made in most of the cases in this study.

3. Results

A total of 50 mediastinal mass lesions were evaluated. Among 50 patients, 33 were male (66%) and l7 were female (34%). The most common age group to present with the mediastinal mass was between 60-69 yrs.

Table 1: Showing age and gender distribution among cases with mediastinal mass lesions

Age groups (years)	Male	Female	Total
0-9	5	2	7
10-19	4	2	6
0-29	3	4	7
30-39	5	0	5
40-49	5	2	7
50-59	3	3	6
60-69	5	4	9
70-79	3	0	3
Total	33	17	50

Figure 1: Showing age distribution of cases of mediastinal mass lesions

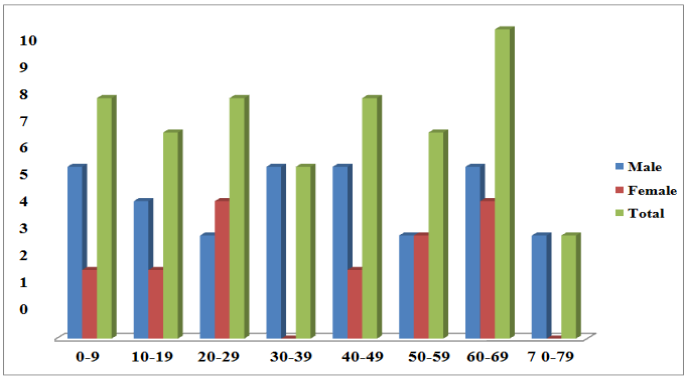


Table 2: Showing nature of mediastinal lesion according to various age groups of the patients

Age groups (years)	Benign	Malignant	Vascular
0-19	9	2	2
20-39	9	2	1
40-59	1	11	1
60-79	4	7	1
Total	23	22	5

In our study of 50 cases, Cough was the most common clinical symptom constituting 48% following by Chest pain 42%, Dyspnea and weight loss 26% each.

3.1 Chest Radiography

In our study, chest radiography (both postero-anterior and lateral projections) of mediastinal was evaluated under the following headings.

a. Location: Out of 50 mediastinal masses evaluated in this study, only 22 masses (44%) could be precisely located in chest X-ray (PA projection).

b. Margins of the lesion

Table 3: Showing margins of the mediastinal lesion on radiograph

Margins	No. of masses	Percentage
Lobulated	10	30.3
Oval	10	30.3
Rounded	4	12.1
Irregular	9	27.3

c. Calcification

Out of 33 mediastinal masses detected on chest radiography only 4 cases showed calcification (12.1%).

d. Associated finding

Table4: Showing associated findings on chest radiographs

Associated findings	No. of cases
Pleural effusion	15
Consolidation	6
Chest wall/ neck swelling	2
Pericardial effusion	1
Vertebral collapse	2
Lung parenchymal opacity nodular/patchy)	2

3.2 Pattern in Barium swallow

Out of 50 mediastinal masses evaluated in this study, 10 patients were subjected to double contrast swallow study. Among them, 3 cases showed normal pattern; whereas 4 cases had stricture, 2 had ulcerative & 1 had polypoidal pattern of swallow.

3.3 Cross sectional imaging of mediastinal mass lesion

In our study of 50 patients of mediastinal mass lesions, on cross sectional imaging (CT scan and MRI), 25 lesions were located in anterior mediastinum, 7 in middle and 18 lesions were in posterior mediastinum.

a. Anterior mediastinal mass

Table 5: Anterior mediastinal lesion distribution

Various Mediastinal Masses	No. of cases	Percentage
Thymic mass	9	36
Germ call tumor	2	8
Vascular malformation	2	8
Thyroid mass	2	8
Tubercular adenopathy	4	16
Metastatic adenopathy	2	8
Lymphoma	3	12
Mediastinal abscess	1	4

b. Middle mediastinal mass

Table 6: Middle mediastinal lesion distribution

Various Mediastinal Masses	No. of cases	Percentage
Tubercular adenopathy	2	28.6
Metastatic adernopathy	2	28.6
Lymphoma	1	14.3
Aortic aneurysm	2	28.6

c. Posterior mediastinal mass

Table 7: Posterior mediastinal lesion

Various Mediastinal Masses	No. of cases	Percentage
Esophageal carcinoma	7	38.8
Esophageal duplication cyst	1	5.6
Tubercular prevertebral abscess	3	16.6
Neurogenic tumor	4	22.2
Extramedullary hematopoiesis	2	11.1
Descending aortic aneurysm with dissection	1	5.6

3.4 Nodal mass

In the study Lymph nodal masses constituted 28% (N=l4) of the total mediastinal masses. Among these, the tubercular lymph node involvement is the predominant constituting 42.8 % followed by lymphoma and metastatic lymph node enlargement, each constituting 30.8%.

3.5 Correlation between CT and pathology

In the study, 38 cases are pathologically verified. Rest 5 cases were of vascular origin. Remaining 7 cases i.e. one thymic hyperplasia, one thymolipoma, 3 tubercular para-vertebral abscesses and 2 extra-medullary hematopoiesis were managed conservatively.

3.6 CT characteristic

Out of 42 cases evaluated with CT scan 29 shows soft tissue density (solid lesion), 6 shows fluid density (cystic lesion), 7 soft tissue fluid density (solid cystic), 2 of the 42 cases shows fat density and 13 of the 42 cases shows calcifications.

Table 8: Density of the lesion on CT scan

Density of Lesion	No. of cases	Percentage
Soft tissue density	29	69.0
Fluid density	6	14.3
Soft tissue + fluid density	7	16.7
Fat density	2	4.8
Calcifications	13	30.9

3.7 Enhancement pattern of the mediastinal mass lesion on CT scan

In the study majority of the lesion showed heterogeneous enhancement i.e. 71.4% (n-30) followed by homogenous enhancement; 16.7% (n=7).

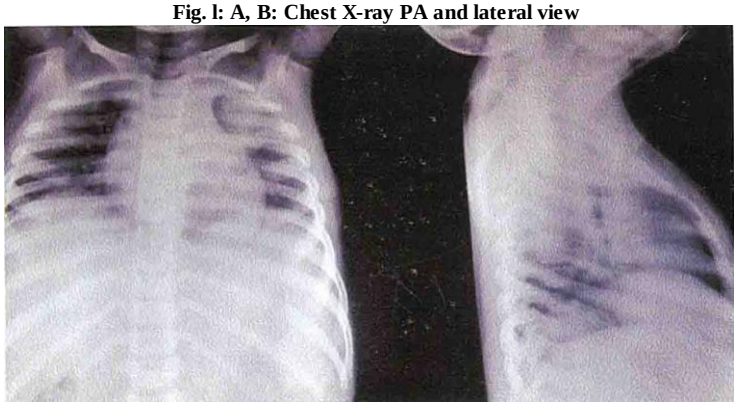
3.8 Vascular encasement by the mediastinal mass lesion

In our study 17 cases (34 %) shows vascular encasement. Out of seventeen, 16 cases wear malignant nature and 1 case was benign.

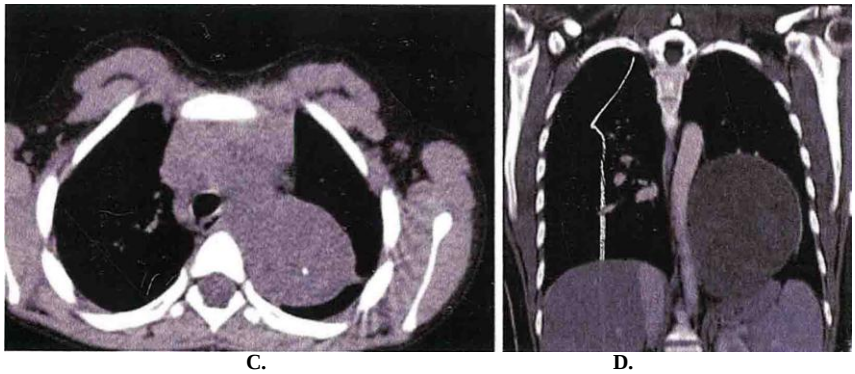
3.9 MRI Features

In our study, 8 patients were undergone MRI. All 8 cases appear hyperintense on T2WI. On T1WI 6 cases (75%) wear hypointense and 2 cases (25%) ware isointense to muscles. Out of eight cases (50%) wear solid, 3 cases (37%) wear solid cystic and 1 case (13%) was vascular in nature.

Fig. l: A, B: Chest X-ray PA and lateral view



A. **B.**



C. **D.**

PA view shows soft tissue opacity in left upper zone, on lateral view this soft tissue appear in posterior mediastinum. C. Axial NECT (Nonenhanced Computed Tomography) of thorax shows hypodense lesion in posterior mediastinum. The lesion shows focus of calcification. D. On CECT (Contrast Enhanced Computed Tomography) this lesion was minimally enhancing. On HP correlation it came out to be a Schwannoma.

Fig. 2: CECT scan shows widening of the middle mediastinum with a large retro tracheal abscess displacing the trachea and esophagus anteriorly. An air-fluid level within the abscess cavity is also seen.

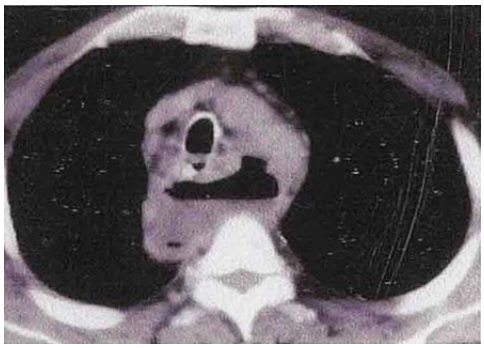
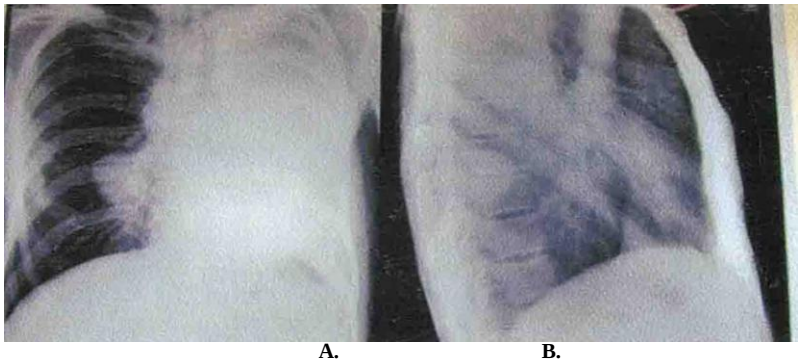
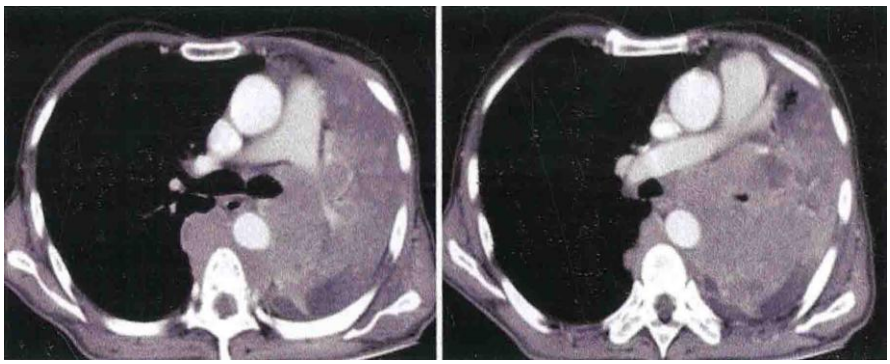


Fig.3: A, B Chest radiograph PA and lateral view.



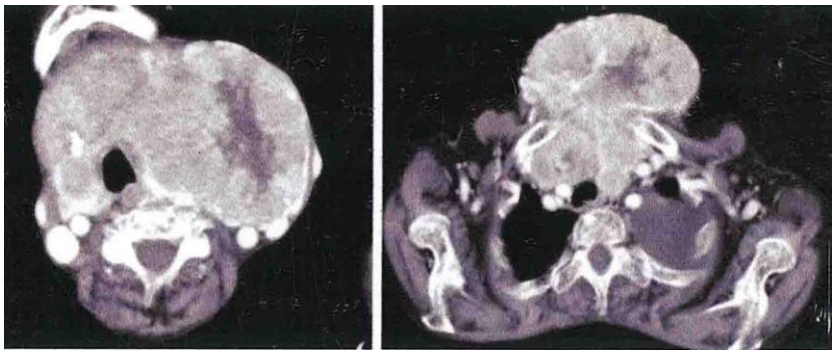
A. **B.**



C. **D.**

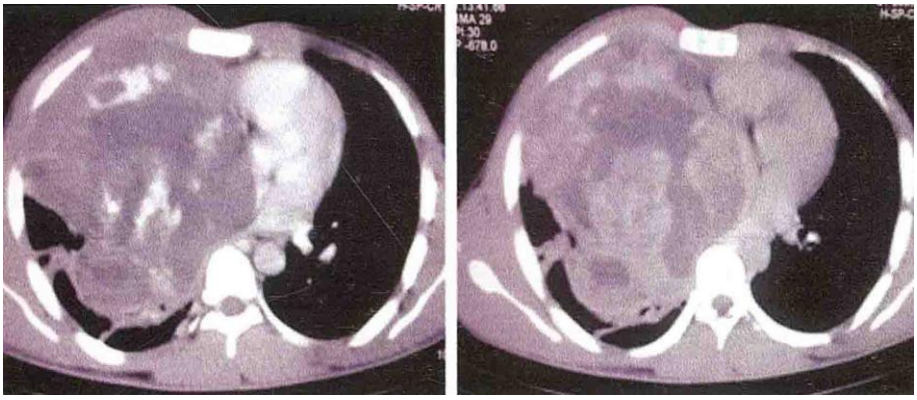
PA (Postero-Anterior) view shows dense homogeneous shadow seen involving left hemithorax. There is silhouetting with cardia and left hemidiaphragm. Another soft tissue shadow seen in right lower zone. Lateral view shows soft tissue opacity in mid and posterior mediastinum. C, D. Axial CECT thorax shows heterogeneously enhancing mass lesion with epicentre in posterior mediastinum with encasement of bronchovascular structures. There is similar soft tissue component in spinal canal with reduction in spinal reserve. There is left sided pleural effusion. On histopathological correlation it came out to be a Ganglioneuroma.

Fig.4— A, CECT neck shows heterogeneously enhancing mass lesion showing internal areas of necrosis, arising Hom thyroid. Note the focus of calcification within the mass. B, CECT thorax shows mediastinal extension of the thyroid lesion with posterior displacement of mediastinal contents. On HP correlation it came out to be a papillary ca thyroid.

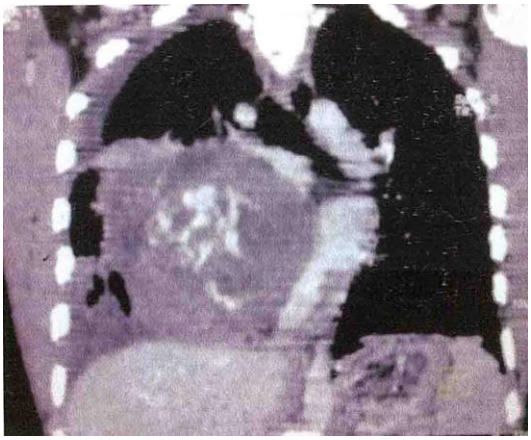


A. **B.**

Fig.5- A, B axial and C- coronal CECT thorax, showing heterogeneously enhancing solid cystic mass lesion in right hemithorax with epicentre in anterior mediastinum. Intensely enhancing intemal irregular septae suggests intemal neovascularisation. The soft tissue component of the lesion shows delayed enhancement, image B. The patient had elevated level of AFP and bHCG suggests non-seminomatous germ cell tumor.



A. **B.**



C.

4. Discussion

According to the Davis *et al*[7] study in 400 consecutive patients with mediastinal masses, chest pain constituted the most common symptom. In the present study, cough was the most common symptom followed by chest pain.

Table 9: Distribution of mediastinal mass on cross sectional imaging (CT & MRI) compared with other studies.

Mediastinum	Strollo DC *et al*[8]	Persent study	Merten OF *et al*[9] (508 children)	Present study (n=12 children)
Anterior mediastinum	50%	50%	46%	50%
Middle mediastinum	50%	14%	20%	16.6%
Posterior mediastinum	-	36%	34%	33.4%

In the present study, 12 out of 42 cases were detected by CT scan and 1 out of 8 cases were detected by MRI, which were not detected by chest radiographs, which accounts for an increased sensitivity of CT by 28.6% and MRI by 12.5%. The reason for more accurate detection of mediastinal masses by CT and MRI are the multi planer study, superimposition of bony and cardiovascular shadow is not a problem and retrosternal and retro cardiac areas are well visualized with CT and MRI.

Table 10: Distribution of individual masses compared with other studies

Mediastinal masses	Present study (50 cases) in Percentage	Cohen *et al*[10] (230 cases) in Percentage	Wychulis *et al*[11] (1064 cases) in Percentage	Davis *et al*[7] (400 cases) in Percentage
Neural tumors	8	16.9	19.9	14
Thymic tumor	18	24.3	19.4	17
Lymphoma	8	15.7	10.1	16
GCT	4	10	9.3	11
Vascular	10	1.7	-	4
Thyroid	4	4.2	5.3	-
CA esophagus	14	2.6	2.4	3
Tubercular adenopathy	12	22.9	3.4	4
Miscellaneous	22		30.2	31

In our study the thymic tumors formed the majority with 18%, which is similar to studies conducted by Cohen *et al*[10] and Davis *et al*[7]. Chemical-shift MRI has been shown to be useful in distinguishing normal thymus and thymic hyperplasia from thymic neoplasms and lymphoma[12]. Diffusion-weighted MRI (DWI) is another special application that unveils minute metabolic and biophysical differences between tissues[13]. Chemical shift is the phenomenon that is seen when an isotope possessing a nuclear magnetic dipole moment resonates at a spectrum of resonance frequencies in a given magnetic field. These resonance frequencies, or chemical shifts, depend on the chemical environments of particular nuclei. Mapping the spatial distribution of nuclei associated with a particular chemical shift (e.g., hydrogen nuclei associated with water molecules or with lipid groups) is called chemical shift imaging[14]. Diffusion-weighted magnetic resonance imaging (DW-MRI) provides image contrast through measurement of the diffusion properties of water within tissues[15].

Ultrasound or CT scan-guided CNB (core needle biopsy) in combination with FNAC (fine needle aspiration cytology) are safe, minimally invasive, and cost-effective procedure, which can provide a precise diagnosis in the anterior mediastinal mass lesions, and may obviate the need for invasive surgical approach. FNAC usually suffice for carcinomatous lesions but CNB should be performed whenever the diagnosis of carcinoma is equivocal or noncarcinoma lesions are suspected[16].

On each of CT and MR scanning, the size of tumour, contour, perimeter of capsule, septum, haemorrhage, necrotic or cystic component, homogeneity within tumour, presence of mediastinal lymphadenopathy, pleural effusion and great vessel invasion are assessed. In addition, presence of calcification is assessed on CT and signal intensities of the tumour are assessed on MRI[13]. Inhomogeneous appearance on CT or MRI differentiates liposarcoma from lipoma[17].

In our study, tubercular adenopathy constituted 12% which is greater in comparison to previous studies probably due to higher prevalence of Tuberculosis in comparison to the western population. Similarly, in our study, esophageal carcinoma constituted 14% of cases which is higher than the previous studies probably due to its high prevalence in Assam.

5. Conclusion

It can be concluded that CT is a highly useful modality for investigation of mediastinal masses. It has definitely a major role to play in the evaluation of a mediastinal mass regarding the distribution pattern, diagnosis and mass effect upon adjacent structures. The pitfall of the study is the lack of other sophisticated technique like Chemical-shift MRI, Diffusion-weighted MRI (DWI) etc.

Tubercular adenopathy and esophageal carcinoma are the common mediastinal masses in this part of world.

Reference

1. Prasad A, Chauhan BKS. Computerised tomographic evaluation of mediastinal lesions: Pictorial essay. *Indian J Radiol Imaging* 2001;11:65-70
2. Laurent F, *et al*. Mediastinal masses: diagnostic approach. *Eur Radiol*. 1998; 8:1148–1159.
3. Takahashi K, *et al*. Computed tomography and magnetic resonance imaging of mediastinal tumors. *J Magn Reson Imaging*. 2010; 32:1325–1339.
4. Puderbach M *et al*. MR imaging of the chest: a practical approach at 1.5 T. *Eur J Radiol* 2007; 64:345–355.
5. Tomiyama N, *et al*. Anterior mediastinal tumors: diagnostic accuracy of CT and MRI. *Eur J Radiol*. 2009; 69:280–288.
6. Duwe BV, *et al*. Tumors of the mediastinum. *Chest*. 2005; 128:2893–2909.
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 1. Tumors of the anterior mediastinum. *Chest* 1997; 112:511-522.
9. Merten OF. Diagnostic Imaging of Mediastinal masses in children. *Am J Roentgenol* 1992; 158:825-832.
10. Cohen AJ, Thompson LN, Edwards FH *et al*. Primary cysts and tumors of the mediastinum. *Ann Thorac Surg* 1991; 51: 378-386.
11. Wychulis AR, Payne WS, Clagett OT *et al*. Surgical treatment of mediastinal tumors: a 40 year experience. *J Thorac Cardiovas Surg* 1971; 62:. 379-392.
12. Ackman JB, *et al*. MRI of the thymus. *AJR Am J Roentgenol*. 2011; 197:15–20.
13. Juanpere S *et al*. A diagnostic approach to the mediastinal masses. *Insights Imaging*. Feb 2013; 4(1): 29–52.
14. Brateman L. Chemical shift imaging: a review. *Am J Roentgenol*. 1986 May; 146(5):971-80.
15. Charles-Edwards EM, deSouza NM. Diffusion-weighted magnetic resonance imaging and its application to cancer. *Cancer Imaging*. 2006; 6(1): 135–143.
16. Nasit JG *et al*. Anterior mediastinal masses: A study of 50 cases by fine needle aspiration cytology and core needle biopsy as a diagnostic procedure. South Asian J Cancer. 2013 Jan-Mar; 2(1): 7–13.
17. Molinari F, *et al*. Fat-containing lesions in adult thoracic imaging. *Am J Roentgenol*. 2011; 197:795–813.