ADDIS ABABA UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF RADIOLOGY

RETROSPECTIVE STUDY OF CORRELATION OF RADIOLOGIC DIAGNOSIS OF MEDIASTINAL MASSES WITH PATHOLOGY FINDINGS, TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA UNIVERSITY, ADDIS ABABA, ETHIOPIA.

INVESTIGATOR: DR. SEMIRA MOHAMMED (MD, RADIOLOGY RESIDENT)

A RESEARCH REPORT OF SENIOR PAPER TO BE SUBMITTED TO RADIOLOGY DEPARTMENT, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY IN PREPARATION FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE POST GRADUATE STUDY IN RADIOLOGY.

OCTOBER, 2017

ADDIS ABABA, ETHIOPIA

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OCTOBER, 2017
ADDIS ABABA, ETHIOPIA

ACKNOWLEDGEMENT

I am very grateful to my advisors Amir Alwan (MD, consultant radiologist) and Azmera Gissila (MD, consultant radiologist) for their unreserved guidance and constructive suggestions from the stage of proposal development to this end.

I am indebted with AAU, Department of Radiology for sponsoring this research. I would also like to express my appreciation for my families and colleagues for their unlimited support in conducting this research.

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List of Abbreviations and Acronyms

CHS **.....**College of Health Science

CIs: ..... Confidence Intervals

CT .....Computed Tomography

DWI ..... Diffusion Weighted Image

MRI ..... Magnetic Resonance Image

NHL .....Non Hogdkins Lymphoma

TASH .....Tikur Anbessa Specialized Hospital

TB LAP ..... Tuberclosis Lymphadenopathy

TTNB .....Trans Thoracic Needle Biopsy

Abstract

Background : Mediastinum is a site of non-neoplastic and neoplastic lesions, many of which present as mediastinal masses. In the study of the imaging appearance, distribution, and other features of various mediastinal masses comparison with the histopathologic diagnosis is important to make an accurate diagnosis.

Objective: To assess the imaging pattern of mediastinal masses with pathology correlation.

Method: Hospital based retrospective cross sectional study were conducted at Tikur Anbessa Specialized Hospital [TASH]. All patients who had mediastinal mass and having both imaging and pathology result during the period of January, 2015 to May 2017 were included. Fifty patients were included in the study. Data were entered in Epi-Info version 3.5.1 and analyzed by SPSS version 23.0 software of computer. Descriptive statistics was performed. And sensitivity with 95% confidence intervals (CIs) was calculated for each mediastinal mass and for the overall mediastinal mass.

Result: Anterior mediastinal masses formed 56.0% of total masses, followed by multiple compartments 22.0% and posterior mediastinum masses 16.0%. Based on CT findings thymic masses formed the majority, 39.3%, of anterior mediastinal masses. Whereas the pathology finding showed thymic masses and lymphoma formed the majority of anterior mediastinal masses constituting 35.71% each. Based on CT and pathology findings the majority, 75.0% and 62.5%, of the posterior mediastinal mass were neurogenic tumors respectively. The sensitivity of CT in detecting neurogenic tumors lymphoma, thymoma and thymic carcinoma were 80%, 68.75%, 60.0% and 80.0% respectively. The overall CT sensitivity for diagnosis of mediastinal masses were appears 76.74% with 95% CI (64.11, 89.37).

Conclusion: The most common location of mediastinal mass was anterior mediastinum. Thymic mass and lymphoma are the most common type of mass in anterior mediastinum. Neurogenic tumors were most prevalent tumors of the posterior compartment. Over all computed tomography has 76.74% sensitivity for diagnosing mediastinal masses in TASH. To increase the sensitivity and diagnostic accuracy; there need to be a feedback mechanism from pathology side for each mediastinal mass CT diagnosis.

1. INTRODUCTION

1.1 BACKGROUND

The mediastinum is the space between the lungs and their pleura. It is arbitrarily divided into superior, middle, anterior and posterior sections. These divisions are not anatomical. They are used to describe the location of pathological processes [1].

The anterior mediatinum is posterior to the sternum, anterior to a line drawn along the anterior tracheal wall in the upper mediastinum and the posterior border of the heart in the lower mediastinum. Its contents are thymus, heart, ascending aorta and great vessels, anterior portion of the main pulmonary artery, pericardium, fat, lymph vessels and nodes. The middle mediastinum is between the anterior compartment in front and the posterior compartment behind. Its contents are the trachea and main bronchi, superior vena cava, mid-portion of the aortic arch, azygos arch, lymph nodes, esophagus and descending aorta [2].

The posterior mediastinum is between the posterior part of the heart and the thoracic spine, extending down behind the posterior part of the diaphragm as it slopes inferiorly. Its contents are vertebral bodies, paravertebral tissues, descending aorta, posterior azygos vein, hemiazygos vein and lymph nodes [1, 2].

The primary masses most often found in the anterior compartment are thymic tumors (thymomas , thymic carcinomas, thymic carcinoid tumors, and thymolipomas), thymic cysts, germ cell tumors, Hodgkin and non-Hodgkin lymphomas , intrathoracic goiter , thyroid tumors, parathyroid adenomas, connective tissue tumors (eg, lipomas, liposarcomas, lymphangiomas, lymphangiohemangiomas, hemangiomas), and pericardial cysts [2].

Masses of the middle mediastinum include thyroid tumor, goiter, tracheal tumors, aortopulmonary paraganglioma (chemodectoma), bronchogenic cysts , and lymphomas. A middle mediastinal mass may also represent lymphadenopathy as a result of infectious, malignant (metastatic), and idiopathic (eg, sarcoidosis) etiologies. Thymic masses and pericardial cysts have been reported in the middle mediastinum, however, these lesions generally occur in the anterior mediastinum [3].

The posterior mediastinum is the location of most neurogenic tumors, esophageal tumors and duplication cysts, hiatus hernia, and neurenteric cysts. Extramedullary hematopoiesis, pancreatic pseudocyst, and achalasia have all been reported as unusual causes of a posterior mediastinal mass [4].

Most mediastinal tumors in adults are either asymptomatic (found on plain chest radiographs or computed tomographic (CT) scans obtained for other reasons or are associated with vague complaints such as aching pain or cough. By comparison, tumors in children are more often symptomatic and may cause respiratory difficulty and recurrent pulmonary infection. Severe pain is typically a sign of advanced, invasive disease [5].

Multiple signs and symptoms may arise due to involvement of different mediastinal or surrounding structures. Airway compression can lead to recurrent pulmonary infection and/or hemoptysis, esophageal compression can cause dysphagia , involvement of the spinal column can result in paralysis, phrenic nerve damage can present with an elevated hemidiaphragm, hoarseness can occur due to recurrent laryngeal nerve involvement , Horner's and superior vena cava syndromes arise due to sympathetic ganglion and superior vena caval involvement, respectively. Some mediastinal tumors are associated with systemic diseases such as thymoma with myasthenia gravis, immune deficiencies, and red cell aplastic anemia.The thymic carcinoid tumor are associated with Cushing syndrome, goiter with thyrotoxicosis, and parathyroid adenoma with hyperparathyroidism. The evaluation of a newly diagnosed mediastinal mass is directed by its anatomic location and by patient age. Appropriate imaging techniques are subsequently selected, which frequently lead to a specific diagnosis or at least a limited differential diagnosis [6].

From the imaging modalities, many mediastinal reflections can be appreciated at conventional radiography (CR), and their presence or distortion is the key to the interpretation of mediastinal abnormalities .The PA and lateral chest radiographs should be carefully evaluated. The anterior junction line, the posterior superior junction line, the pleuroesophageal stripe, right paratracheal stripe, aortopulmonary window, azygoesophageal recess, right and left paraspinal line, the retrosternal clear space, the retrotracheal space (Raider's Triangle), and the retrocardiac space must be specifically examined. Previous radiographs are also important for comparison with current studies [7].

Ultrasonographic evaluation may be used to differentiate cystic from solid masses and relate them to surrounding structures. Although CT and MRI are typically more accurate than ultrasound, the latter may be useful in selected situations. As an example, ultrasound is used in the evaluation of masses and cystic structures in close proximity to the heart and pericardium, a setting in which an assessment of extracardiac and intracardiac structures may be helpful [8].

A chest computed tomography (CT) scan, preferably with intravenous water soluble contrast material, is indicated whenever a mediastinal mass is detected on a chest radiograph. The CT scan can help define the anatomic location of the mass, determine its morphology and attenuation coefficient (cystic, fatty, enhancement characteristics, and soft tissue), and multiplicity of masses, and also relate the mass to vascular structures in the mediastinum [9].

Although the CT scan cannot give a pathologic diagnosis, it will often yield all the information needed to direct further therapy. However, computed tomography (CT) is the most important tool in the evaluation of a mediastinal mass [10].

An excellent soft tissue contrast also designates magnetic resonance imaging (MRI) as an ideal tool to evaluate tumors of the mediastinum [11]. Assessment of preoperative relationships with the pericardium, heart cavities, spinal cord and vascular involvement is a common indication.MRI is helpful when a history of previous contrast material anaphylaxis or renal failure precludes the performance of an adequate CT or when chest wall, spinal, or vascular involvement is suspected. MRI is specifically indicated in the evaluation of neurogenic tumors, since the multiplanar imaging potential often gives significant additional information. It is especially useful in detecting an intraspinal component to a neurogenic "dumbbell" tumor [12]. It may also provide valuable information in cases of possible vascular invasion and in the evaluation of cystic lesions. Finally, in cases of thymic lesions, chemical shift MRI imaging may distinguish between thymic hyperplasia and thymic neoplastic disease, and this could obviate the need for tissue diagnosis [13].

1.2 STATMENT OF THE PROBLEM

Mediastinal masses span a wide histopathological and radiological spectrum. The multitude of diseases affecting the mediastinum vary considerably, ranging from tumor, cysts, vascular anomalies, lymph node masses, mediastinitis, mediastinal fibrosis, to pneumomediastinum[14].

The most frequent lesions encountered in the mediastinum are thymoma, neurogenic tumours and benign cysts, altogether representing 60% of patients with mediastinal masses [15]. Neurogenic tumours, germ cell neoplasms and foregut cysts represent80% of childhood lesions, whereas primary thymic neoplasms, thyroid masses and lymphomas are the most common in adults [7]. Anterior mediastinal tumors account for 50% of all mediastinal masses, including thymoma, teratoma, thyroid disease and lymphoma [16]. Masses of the middle mediastinum are typically congenital cysts while those arising in the posterior mediastinum are often neurogenic tumours [17].

The age of the patient can help predict the etiology of a mediastinal mass. In infants and children, neurogenic tumors and enterogenous cysts are the most common mediastinal masses [18]. In adults, neurogenic tumors, thymomas, and thymic cysts are most frequently encountered lesions [19]. Since both Hodgkin's and non-Hodgkin lymphoma and germ cell tumors are most common between the ages of 20 and 40, the likelihood of a mediastinal mass being malignant is increased among patients in this age group [5].

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. 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 [7].

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 times chest radiograph appears normal in presence of mediastinal disease. After invention of computed tomography (CT), it immerged as the choice for assessing the mediastinal masses. It is the most useful investigation for localizing, characterizing, and demonstrating the extent of a mediastinal mass and its relationship to adjacent structures. 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 [14].

When these various imaging techniques are used in order to evaluate the mediastinal masses, accurate evaluation must be taken into account before beginning the treatment because every mass requires its own particular type of treatment [20].

Although clinical data, location in the mediastinum and radiological findings all aid in narrowing the differential diagnosis, a tissue diagnosis helps in guiding management of mediastinal lesions. Due to proximity of the mediastinum to heart and great vessels, careful assessment is necessary in taking tissue sample. In addition there is a complexity and difficulty in diagnosing mediastinal lesions on Fine Needle Aspiration Cytology (FNAC) or even in surgical biopsy material [21].

The purpose of this research is to study correlation of the mediastinal masses imaging findings with the histopathologic diagnosis. It will also asses our institutional experience on the imaging appearance, distribution, and other features of various mediastinal masses.

1.3. Significance of the study

The purpose of this study is to see our institutional experience of mediastinal lesions on imaging and correlation with the histopathology. As there is no published data on this area in Ethiopia, this study can reveal the reality.

This fact can also prompt those who are interested to conduct further research on this area, not only hospital based but also country based.

1.4. LITERATURE REVIEW

In a study done on 400 patients with primary lesions of the mediastinum seen at Duke University Medical Center; of these, 99 (25%) had a primary cystic lesion. The primary tumors included thymic neoplasms (17%), neurogenic tumors (14%), lymphoma (16%), germ cell tumors (11%), and a miscellaneous group. Malignant neoplasms were present in 166 patients (42%). The anterosuperior mediastinum was the most commonly involved site of a primary cyst or neoplasm (54%), followed by the posterior mediastinum (26%) and the middle mediastinum (20%). Symptoms were present in 62% of the patients and included chest pain (30%), dyspnea (16%), fever and chills (20%), and cough (16%). Of the lesions found on routine chest roentgenograms, 83% were benign. In contrast, 57% of the lesions in symptomatic patients were malignant [5].

In study done on 27 patients, in Tribhuwan University Teaching Hospital, Nepal. In this study, 66.6% of the cases were benign, 26% were malignant and the rest were inconclusive. The patient demographics in this study were with a wide age range, 4 months-70 yrs with M: F ratio of 1.33:1. The study had a predominance of primary mediastinal lesions (23 cases, 92%) while metastatic tumors accounted for only 2 cases (8%) out of the diagnosed cases.

Among the malignant category, 71.5% were primary and 28.5% were metastatic lesions. Majority of lesions had anterior mediastinal presentation, (19 cases, 70.3%) followed by posterior mediastinum (7 cases, 25.9%). Germ cell tumor and NHL, lymphoblastic type was seen to occur in the first to second decade of life, whereas thymoma was seen commonly in fifth to sixth decade of life. This study showed thymoma followed by germ cell and neurogenic tumours as common lesions of the mediastinum. Neurogenic tumors were commonly seen in the posterior Mediastinum. In the posterior mediastinum, a single case of high grade sarcoma was found in a young female. In a 4 month old child, necrotisizing granulomatous lymphadenitis with possibility of Tuberculosis was reported in a lesion of the anterior compartment[21].

In study done on Eighty -five patients with mediastinal masses in University of Sulaimani, Iraq with the mean age of 35 years and there was male predominance. About 93% of the patients were symptomatic. Lymphoma formed about 33% of the mediastinal diseases, about 38% of anterior mediastinal masses and about 46% of middle mediastinal masses.

Lymphoma was also the commonest cause of anterior and middle mediastinal masses in the pediatric age group 44.44% and 66.66% respectively. Thymomas were contributing to form 20.7% of anterior mediastinal pathology. Thymic cysts presented in 2.35% of patients, normal thymic tissue was found in 28.5% of patients with myasthenia gravis, Thymolipoma was representing 4.8% of the thymic masses.

Mediastinal germ cell tumors represent 11.76% from these 70% were malignant, leaving benign teratoma to represent only 30% of the patients. Neurogenic tumors constituted 69.2% of posterior mediastinal tumors, neuroblastoma was the commonest. Tuberculous lymphadenopathy was present in 7.06%, Sarcoidosis was found in 3.5% of patients, taking 23% of middle mediastinal pathologies, Primary mediastinal hydatid cyst were representing about 2.35% of the mediastinal masses and about 14.3% of posterior mediastinum, Solitary fibrous tumor was representing about 2.35% of the mediastinal masses. Mediastinal thyroid tumors in this study represented only 1.18% of the cases. Mediastinal meningocele also represented 1.18%, malignant diseases formed about 56.5% of the pathologies [22].

In study done on case records of 91 patients; from a single institute primary mediastinal tumors were seen commonly in males with mean age of 37.48 ± 17.04 years. As many as, 97%, of patients were symptomatic at presentation. Superior venacaval obstruction was seen in 28% of the patients. Majority of the tumors had anterior mediastinal presentation. Pleural effusion was seen in 20% of the patients, but diagnosis was obtained in only 1%. In adults, thymoma (39%), lymphoma (30%) and germ cell tumor (15%) were the common tumors. In the pediatric population, lymphoma, primitive neuro endocrine tumors and neuroblastoma were the common tumors [23].

In study conducted on 95 patients in Mashhad University of Medical Sciences, Iran .The study consisting of 51(53.68%) men and 44(43.31%) women. The mean age of the patients was 35.4±16.52 years. Among the three compartments, anterior mediastinum was the most recurrent site for the mediastinal masses of 66(68.42%) patients, Lymphoma of 39 (41.05%) patients and thymic tumors of 17 (17.89%) patients while cysts were most likely to be found in the middle compartment of 10 (10.52%) patients and neurogenic tumors in posterior compartment of 19 (20%) patients. The most common presenting symptoms of the patients

were dyspnea, chest pain, fever and weight loss. Other symptoms included neck mass, dysphagia, back pain and hoarseness.

The results indicated that 35 cases had anterior mediastinal mass and 2 had posterior mediastinal mass. Of the 35 cases of anterior mediastinum, 19 lymphoma, 10 thymoma, 2 thymic carcinoma, 1seminoma, 1 non-seminoma and 2 teratoma were diagnosed by TTNB.. Pathologic results after diagnostic evaluations and surgery were as follow: out of 39 cases of lymphoma, 29 were Hodgkins and 10 were non-Hodgkins. Thymic tumors accounted for 14 thymoma, 2 thymic carcinoma and one thymic cyst.

Furthermore, out of 10 cases of germ cell tumors, 4 were teratoma, 3 were seminoma and 3 were non-seminoma. Also, 19 cases of neurogenic tumors located in posterior mediastinum consisted of schwannoma (n=8), neurofibroma (n=8), ganglioneuroblastoma (n=2) and neuroblastoma (n=1). Additionally, 10 cases of mediastinal masses in the middle compartment were all proven to be cystic and consisting of bronchogenic cyst (n=4), pericardial cyst (n=4) and enteric cyst (n=2) [20].

In study done on 50 patients in Institute of Medical Sciences & Research Centre, Bangalore for MDCT evaluation.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. Cough was the most common clinical symptom constituting 44% followed by dyspnea 38%, fever 20% and chest pain 20%. Out of 50 cases, 3 cases had no symptoms pertaining to the chest and CT showed the incidental involvement of the mediastinum. The anterior mediastinal masses formed the majority with 52% (n = 26) of the total masses. 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). 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). 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 constituting20% (n = 3). Among the thymic masses, thymoma constituted 42.8% (n = 3) and

was 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). 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). The 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) .In addition, majority were solid masses constituting 54%(*n* = 27) of the cases followed by solid and cystic masses in 22% (*n* = 11) of the cases . In which 24% (*n* = 12) of the cases showed calcification in the mediastinum mass. Mass effect was noted in 62% of the cases and was predominantly noted on the airways [24].

In study done on 120 patients in Ludhiana, India ,the commonest symptom with which patient presented was cough 53% followed by dyspnoea 50%,chest pain 20% and fever 17%. Anterior mediastinal lesions were the commonest accounting for 38.3%. Posterior mediastinal lesions accounted for 16.67% of the cases followed by middle and then superior mediastinal lesions accounting for 13.3% and 11.67%respectively. On adults which depicted that anterior mediastinum constituted 54% of the masses followed by posterior and then middle which constituted 26% and 20% respectively. Twenty-four cases (20%) showed masses in multiple compartments of mediastinum. Out these 24 cases, 10 cases (41.6%) involved both anterior and middle mediastinum, eight cases (33%) involved both middle and posterior mediastinum and six cases (25%) involved all compartments anterior/middle/posterior of mediastinum. The masses commonly found in multiple compartments were predominantly the lymph nodal masses due to carcinoma lung, lymphoma or tuberculosis. Besides nodal masses, other lesions involving multiple compartments were bronchogenic cyst, bronchogenic carcinoma with mediastinal invasion.
Majority of mediastinal masses were benign lesions and seen most commonly in the age group of 31-40 years. 38.3% (n =46) of the mediastinal masses were malignant and seen

most commonly in the age group of 51-60 years *i.e*. sixth decade of life. Intrathoracic goiters represented 6.7% of mediastinal lesion.

Thymic lesions constituted 10% of all mediastinal lesions. Among thymic lesions, thymoma constituted 83%. Lymphoma constituted 10% of the mediastinal masses. Neurogenic tumors constituted 8.3% (n = 10) of all mediastinal lesions and all 10 (100%) were nerve sheath tumors which further comprised of 80% (n = 8) schwannomas and 20% neurofibromas (n = 2). Tubercular granuloma constituted 33.3%, tubercular LAP was the commonest lesion in the study and constitutes 15% [25].

In study done on 73 patients in department of surgery on Patterns of mediastinal tumors operated at the Tikur Anbessa Hospital, Addis Ababa, Ethiopia from August 2005-2011.In the six years, 73 patients were operated, 49 (67.1%) were males, the and male to female ratio being 2.04:1. The mean age of patients was 35.9 +/- 10.5 years (range 14 to 74). Forty-five (61.6%) had lesions of the anterior mediastinum, 23 (31.5%) in the posterior mediastinum and 5 (6.8%) in the middle. The commonest anterior mediastinal tumors were thymic origin and thymic lesions were found more common in females (17:7 ratio). From the 23 patients with posterior mediastinal tumors, 18 had benign neurogenic tumors (4 of which were dumbbell tumors). Chest pain and shortness of breath (dyspnea) were the two most common symptoms in 31 (42.4%) of the patients. Twenty three patients (31.5%) were asymptomatic, and all had benign lesions. None of the malignant lesions were asymptomatic. The rate of malignancy in this study was 24 (32.8%), of which 19 (79.1%) were in the anterior compartment [26].

2. OBJECTIVES

2.1 General objective

- To assess the CT pattern of mediastinal masses with histopathology correlation.

2.2 Specific objectives

- To describe CT characteristics and distribution of mediastinal masses.
- To identify the prevalence of the various mediastinal mass among patients present with mediastinal mass.
- To compare CT findings with histopathological diagnosis
- To find out the sensitivity of CT for diagnosing mediastinal masses.

3. METHODS AND MATERIALS

3.1 Study area and period

The study was conducted at TASH, College of health science, Addis Ababa University, Addis Ababa Ethiopia. TASH is located in the nation's capital, Addis Ababa, and is the largest referral as well as the main teaching hospital in the country. The study was conducted from March-August, 2017 G.C.

3.2 Study design

Hospital based retrospective cross sectional study was conducted to address the specific objectives.

3.3 Population

3.3.1 Source population

The source population were all patients with mediastinal mass who were evaluated at radiology CT unit.

3.3.2 Study population

The study population were all Patients with mediastinal mass and who have both CT as well as histopathology result during the period from January 2015 to May 2017.

3.3.3 Inclusion and exclusion criteria

3.3.3.1 Inclusion criteria

All patients with mediastinal mass having both pathology and cross sectional imaging during study period

3.3.3.2 Exclusion criteria

Patients with mediastinal mass; and who didn't have either imaging or pathologic result.

3.4 Sampling technique and sample size

All patients with mediastinal mass within the study period and who had CT and biopsy results were included in the study.

3.5 Data collection procedure

Data were collected by the principal investigator using data extraction format. All patients with clinical diagnosis of mediastinal mass seen at radiology CT unit were identified from

the daily registry. Patient's card was collected from archives. All data regarding demographic, clinical information and Histopathology &imaging result were retrieved from the chart and reports.

3.6 Data analysis and interpretation

Data was entered and cleaned in Epi Info for windows version 3.5.1 and exported to SPSS version 23 statistical software for analysis. Frequency, proportion, mean with standard deviation were conducted to describe the data used. Then sensitivity with 95% confidence intervals (CIs) was calculated for each mediastinal mass and for the overall mediastinal mass.

3.7 Ethical considerations

In order to respect patient's bill of right, regulation of the hospital where the study was conducted, ethical considerations were taken in to account. Any piece of information was kept confidential by not recording names of patient. Approval from IRB was obtained and formal letter were written from radiology department to pathology and the Card archive before commencing the data collection process.

4. RESULT

4.1 Demographic and clinical profile of the participants:

This study was conducted on 50 patients consisting of 26 (52.0%) men and 24 (48.0%) women. The mean age of the patients was 34.26 with SD ±15.75 years.

Of 50 cases, 3 cases (6.0%) were pediatrics. The most common age group to present with the mediastinal mass was found between 16 and 30 years. Most of the study participants, 22 (44.0%) were evaluated in 2016 (Table 1).

Table 1:- Socio demographic characteristics of study participants who are evaluated for Mediastinal mass at TASH, from January, 2015 to May, 2017 Addis Ababa, Ethiopia.

Variable	**Frequency**	**Percentage**
Age in Years		
0-15	3	6.0
16-30	23	46.0
31-45	12	24.0
46-60	9	18.0
≥61	3	6.0
Sex		
Male	26	52.0
Female	24	48.0
Year of Radiologic Evaluation		
2015	19	38.0
2016	22	44.0
2017	9	18.0

Regarding clinical presentation of the participants; Cough was the most common clinical symptom constituting 22 (44.0%) followed by shortness of breath 8 (16.0%), and chest pain 6 (12.0%). 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 (Figure 1).

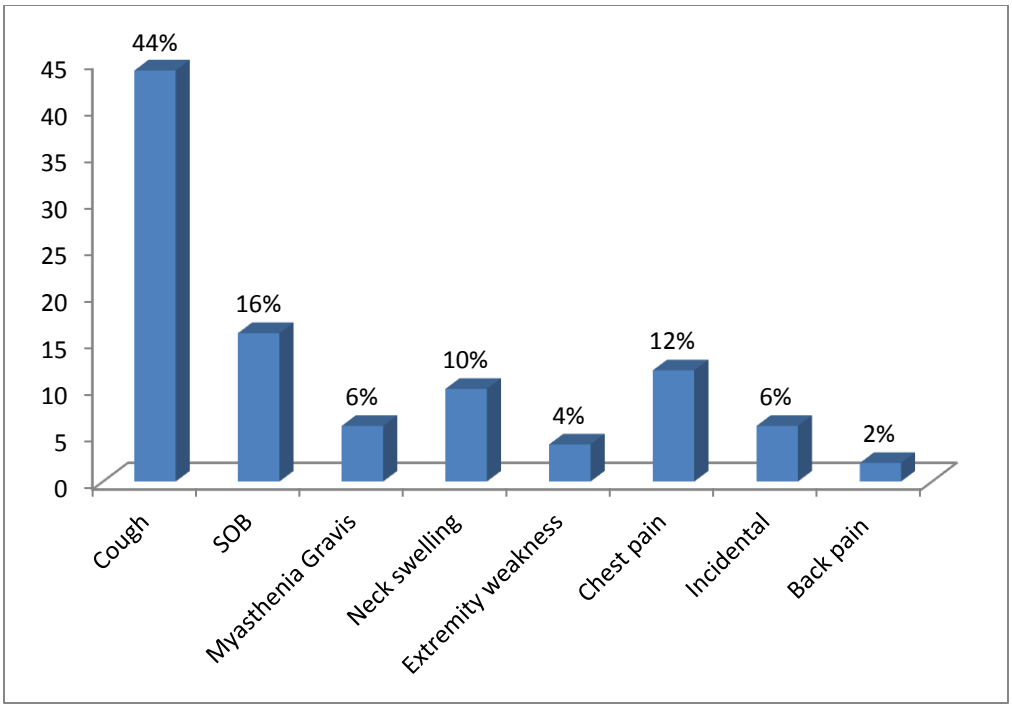

Figure 1: Clinical Presentation of study participants who are evaluated for Mediastinal mass at TASH, from January, 2015 to May, 2017 Addis Ababa, Ethiopia.

4.2 Compartmental distribution of mediastinal masses

This study showed that anterior mediastinum formed the majority of total masses, 28 (56.0%) followed by multiple compartments, 11 (22.0%), and posterior mediastinum , 8 (16.0%) (Figure2). Among the mediastinal masses 42 (84.0%) were solitary and the rest 8 (16.0%) were multiple.

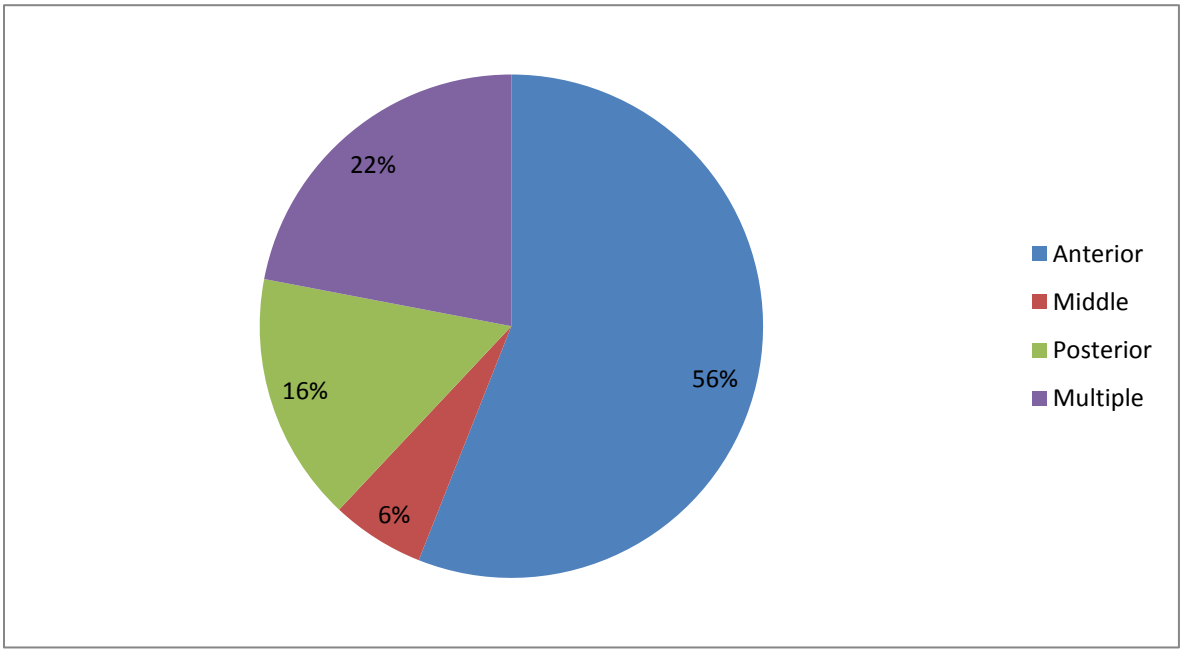

Figure 2: Compartment distribution of mediastinal mass of study participants who are evaluated at TASH, from January, 2015 to May, 2017, Addis Ababa Ethiopia.

Based on CT diagnosis, among the anterior mediastinal masses thymic masses formed the majority constituting 11 (39.3%), followed by germ cell tumor and lymphoma, 6 (25%) each. The majority, 6 (75.0%), of the posterior mediastinal mass were neurogenic tumors. And among the mediastinal masses involving the multiple compartments Lymphoma constitutes the largest, 7 (63.6%) (Table 2).

Table 2: Mediastinal mass compartment distribution of study participants who are evaluated by CT at TASH, from January, 2015 to May, 2017, Addis Ababa, Ethiopia

Compartment	**Various mediastinal masses**	**Frequency**	**Percentage**
Anterior (28)	Thymic mass	**11**	**39.3**
	Germ cell tumor	**6**	**21.4**
	Thyroid mass	**3**	**10.7**
	Lymphoma	**6**	**21.4**
	Anterior Pericardial cyst	**1**	**3.6**
	Neurogenic Tumor	**1**	**3.6**
Middle (3)	Pericardial cyst	**1**	**33.3**
	Sarcoidosis	**1**	**33.3**
	Undifferentiated malignant tumor	**1**	**33.3**
Posterior (8)	Neurogenic tumor	**6**	**75**
	Hydatid cyst	**1**	**12.5**
	Lung cancer	**1**	**12.5**
Multiple (11)	Germ cell tumor	**2**	**18.2**
	Tuberculoses LAP	**1**	**9.1**
	Lymphoma	**7**	**63.6**
	Thymic mass	**1**	**9.1**

On pathology diagnosis among the anterior mediastinal masses thymic masses and lymphoma formed the majority constituting 10 (35.71%) each, followed by Thyroid mass 3 (10.71%). The majority, 5 (62.5%), of the posterior mediastinal mass were neurogenic tumors. And among the mediastinal masses involving the multiple compartments Lymphoma constitutes the largest, 6 (54.5%) (Table3).

Table 3: Mediastinal mass compartment distribution of study participants who are evaluated by Pathology at TASH, from January, 2015 to May, 2017, Addis Ababa, Ethiopia

Compartment	**Various mediastinal masses**	**Frequency**	**Percentage**
Anterior (28)	Thymic mass	**10**	**35.71**
	Germ cell tumor	**2**	**7.1**
	Thyroid mass	**3**	**10.71**
	Lymphoma	**10**	**35.71**
	Anterior Pericardial cyst	**1**	**3.6**
	Inconclusive	**2**	**7.1**
Middle (3)	Thymic mass	**1**	**33.3**
	Sarcoidosis	**1**	**33.3**
	Undifferentiated malignant tumor	**1**	**33.3**
Posterior (8)	Neurogenic tumor	**5**	**62.5**
	Inconclusive	**3**	**37.5**
Multiple (11)	Lung cancer	**1**	**9.1**
	Lymphoma	**6**	**54.5**
	Thymic mass	**1**	**9.1**
	Inconclusive	**2**	**18.2**
	Germ cell tumor	**1**	**9.1**

4.3 CT Characteristics

Of the 50 cases, 11(22%) showed calcification on the pre contrast study and 13(26%) showed cystic change /non enhancing necrotic component on the post contrast study. Mass effect/invasion on tracheobronchial tree and mediastinal great vessels was noted in 29 (58.0%) of study participants (Table 4).

Table 4: CT characteristics of mediastinal masses with pathology diagnosis among study participants who are evaluated at TASH, from January, 2015 to May, 2017, Addis Ababa, Ethiopia

Variable	Frequency	Percentage
Calcification		
Yes	11	22.0
No	39	78.0
CT detected calcification of mediastinal masses with pathology diagnosis (n=11)		
Thyroid mass	1	9.09
Thymic mass	4	36.36
Lymphoma	2	18.18
Neurogenic tumour	1	9.09
Inconclusive	3	27.27
Cystic Change		
Yes	13	26.0
No	37	74.0
CT detected cystic change of mediastinal masses with pathology diagnosis (n=13)		
Germ cell tumor	1	7.69
Thymic mass	3	23.08
Lymphoma	3	23.08
Neurogenic tumour	3	23.08
Undiferenciated malignant tumor	1	7.69
Inconclusive	2	15.38
Invasion of tracheobronchial tree and mediastinal great vessels		
Yes	29	58.0
No	21	42.0

Among the total cases of lymphoma and thymic mass, the pre-contrast density was solid which constitutes 14 (87.5%) and 8 (66.67%) respectively. Regarding the dominant post contrast enhancement pattern of lymphoma was homogeneous, 8 (50%) where as for thymoma was heterogeneous, 7 (58.33%). Four (33.33%) and 3 (18.75) of the cases of

thymoma and 2 (12.5%) and 3 (25%) of the cases of Lymphoma showed calcification and cystic change respectively. (Table 5)

Table 5: CT characteristics of the common mediastinal masses with pathology diagnosis among study participants who are evaluated at TASH, from January, 2015 to May, 2017, Addis Ababa, Ethiopia

Variable	**Mediastinal mass**	
	Lymphoma n (%)	**Thymic mass n (%)**
Pre-contrast Density		
Solid	14 (87.5)	8 (66.67)
Solid + cystic	2 (12.5)	2 (16.67)
Cystic	0	2 (16.67)
Total	16 (100)	12 (100)
Post- contrast enhancement		
Homogenous	8 (50.0)	2 (16.67)
Heterogeneous	4 (25.0)	7 (58.33)
Rim enhancing	2 (12.5)	0
Non enhancing	2 (12.5)	3 (25.0)
Total	16 (100)	12(100)
Calcification		
Yes	2 (12.5)	4 (33.33)
No	14 (87.5)	8 (66.67)
Total	16 (100)	12 (100)
Presence of Cystic change		
Yes	3 (18.75)	3 (25)
No	13 (81.25)	9 (75)
Total	16 (100)	12 (100)

4.4 CT diagnosis and correlation with pathology diagnosis of mediastinal mass

From the 50 study participants 43 cases were pathologically verified out of which 33 showed finding consistent with CT findings .From the 7 pathologically inconclusive cases, 3 cases (two neurogenic tumors and one GCT) were confirmed by operative findings.

Among 16 cases of lymphoma diagnosed by pathology, 11 cases were correctly diagnosed by CT and from the rest 5 cases; 3 were diagnosed as germ cell tumor,1 as thymoma and 1 as TB LAP. From the 2 pathologically proven thymic cysts; CT reported as thyroid cyst and pericardial cyst. Among 10 pathologically proven thymic masses, 7 were correctly diagnosed by CT and the rest 3 were reported as; GCT, lymphoma and neurogenic tumor. From 3 pathologically proven GCT two were correctly diagnosed by CT and one diagnosed as thymolipoma. Pathologically reported thyroid ectopic mass was diagnosed as thymoma on CT.

From the 5 cases of neurogenic tumors 4 cases were correctly diagnosed by CT and one case was reported as hydatid cyst. Among pathologically reported 1 case of Lung cancer CT reported as advanced lymphoma. Among the four pathologically inconclusive cases CT diagnosis made 2 cases as thymic masses,1 as GCT and 1 neurogenic tumor.

The study showed that the sensitivity of CT in detecting neurogenic tumors was 80% and from the 4 neurogenic tumor cases 2 were histologicaly benign schawanoma and one was ganglineuroma and one was neuroblastoma. The sensitivity CT in detecting lymphoma, Thymoma and thymic carcinama were 68.75%, 60.0% and 80.0% respectively. Overall CT appears 76.74% sensitive for diagnosing mediastinal masses (Table 6).

Table 6: CT diagnosis and correlation with pathology diagnosis of mediastinal mass among study participants who are evaluated at TASH, from January, 2015 to May, 2017, Addis Ababa, Ethiopia

Case	**Pathologically confirmed (TP+FN)**	**CT Correct Diagnosis (TP)**	**Sensitivity**
Thyroid malignant mass	2	2	100
Thyroid cyst	-	1	-
Ectopic thyroid tissue mass (NCG)	1	-	-
Thymoma	5	3	60.0
Thymic carcinoma	5	4	80.0
Thymolipoma	-	1	-
Thymic cyst	2	-	-
Lymphoma	16	11	68.75
Pericardial cyst	1	1	100
Benign GCT	2	1	50.0
Malignant GCT	1	1	100
TB LAP	-	1	-
Sarcoidosis	1	1	100
Lung Cancer	1	-	-
Hydatid cyst	-	1	-
Neurogenic tumor	5	4	80
Undifferentiated malignant tumor	1	1	100
Total	43	33	**76.74 95% CI (64.11, 89.37)**

5. Discussion

The mediastinum is the site for a vast range of diseases varying considerably *i.e*. tumors both benign and malignant, cysts, vascular lesions, lymph node masses and mediastinitis. Advent of CT has helped the clinicians and radiologists in identifying the precise location, extent and characterization of these masses.

In our study of 50 cases, patients which showed abnormal mediastinal shadow on radiographs or clinically suspected of involvement of the mediastinum were evaluated with computed tomography and correlated with pathological findings where possible. The study showed commonest symptom with which patient presented was cough 44.0% followed by shortness of breath 16%, and chest pain 12.0%. Anterior mediastinal masses formed the majority, 56.0% of total masses, followed by multiple compartments which constitute 22.0% and posterior mediastinum masses 16.0%. Based on CT findings among the anterior mediastinal masses thymic masses formed the majority constituting 39.3%, followed by germ cell tumor and lymphoma 21.4% each whereas the pathology finding showed among the anterior mediastinal masses thymic masses and lymphoma formed the majority constituting 35.71% each, followed by Thyroid mass 10.71%. Based on CT and pathology findings the majority, 75.0% and 62.5%, of the posterior mediastinal mass were neurogenic tumors respectively. And based on CT and pathology findings among the mediastinal masses involving the multiple compartments Lymphoma constitutes the largest, 63.6 % and 54.5% respectively. The sensitivity of CT in detecting neurogenic tumors, lymphoma, Thymoma and thymic carcinoma were 80.0%, 68.75%, 60% and 80.0% respectively. The overall CT sensitivity for diagnosis of mediastinal masses were appears 76.74% with 95% CI (64.11, 89.37).

In our study, the commonest symptom with which patient presented was cough 44.0% followed by shortness of breath 16.0% and chest pain 12.0% which is similar to the study of Harmeet Kaur *et al*. (2012) comprising of 120 patients with mediastinal masses, cough constituted the most common symptom *i.e.* in 53% followed by Shortness of breath in 50% and chest pain in 20% [25]. The findings of our study are also consistent with study done by

Kireet Pulasani et al. (2013) comprising of 50 cases in the age group 6-76 years with clinical or radiological suspicion of mediastinal lesions [24].

Anterior mediastinal lesions were the commonest accounting for 56.0%. Which is similar to the study conducted by Varsha V Jadhav *et al*. [27] which depicted that in all age group anterior mediastinum constituted 52% of the masses followed by posterior and then middle which constituted 30% and 18% respectively. This is also consistent with study done by Harmeet Kaur *et al*. (2012), Venkateshwaran Arumugam *et al*. (2014) and study done in Ethiopia by Bekele A et al (2011). [25,26,28]. In our study multiple compartment lesions were the second accounted for 22.0% of the cases followed by posterior lesions accounting for 16.0%.

The prevalence of tumors varies with respect to the mediastinal compartments. Thymic mass and lymphoma were the most prevalent tumor of the anterior mediastinum constituting 35.71% each while neurogenic tumors are frequent in the posterior mediastinum , 62.5%. This findings of our study were consistent with study by Marom EM *et al (2010) and* Duwe BV *et al*. (2005). [17,29].

Overall, lymphoma is the most prevailing tumor 16 (37.21%) of the mediastinum. This finding was consistent with study by Takahashi K et al. (2010) [10].

Figures 5,6 and 7 shows the Thymoma, Lymphoma and Neurogenic tumor.

A

B

Figure 3 (A and B): Axial section-pre and post contrast CT of chest showing Thymoma

Figure 4: Axial section-non contrast CT of chest showing Lymphoma.

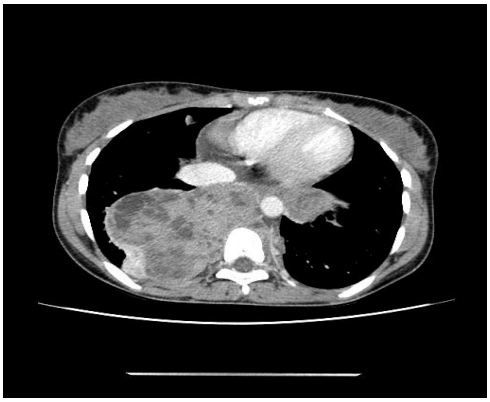

Figure 5: Axial section-post contrast CT of chest showing Neurogenic tumor/ Neuroblastoma.

In this study calcifications were found in 2 (12.5%) of patients with lymphoma before treatment. This finding were not consistent compared with study by Apter S. et al (2002) which states of 956 patients with lymphoma eight patients (0.84%) showed calcification and all patients with calcifications had the more aggressive types of the disease [30]. The reason for this inconsistency might be due to small sample size and this study was not focusing only lymphoma.

In our study the sensitivity of CT in detecting neurogenic tumors, lymphoma, Thymoma and thymic carcinoma were 80.0%, 68.75%, 60% and 80.0% respectively. The overall CT sensitivity for diagnosis of mediastinal masses were 76.74% with 95% CI (64.11, 89.37). The CT sensitivity to diagnose mediastinal masses with reference to pathology were low compared with study by Varsha V Jadhav *et al (2012)* which states sensitivity of CT in diagnosing mediastinal mass lesions is 94% [27] and also low compared to study by Kireet Pulasani et al.(2013) which depicted that CT plays a significant role in the assessment of various mediastinal pathology with an accuracy of 92% [24]. The reason for this might be due to observer bias for pathology and CT diagnosis, small sample size, and the set up.

Limitation of the study

1- Poor recording system of the patients chart that results small sample size.

2- Small number of included pediatrics patient to see variations on age

3- Observer bias for pathology and CT Diagnosis.

4- Unavailability of Biopsy needle that hinders image guided Biopsy in the hospital.

6. Conclusion and Recommendation

6.1 Conclusion

The most common location of mediastinal mass is anterior mediastinum. And the most common type of mass in anterior mediastinum is thymic mass and lymphoma. Also the most prevalent tumors of the posterior compartment are neurogenic tumors. Over all computed tomography has 76.74% sensitivity for diagnosing mediastinal masses in TASH.

6.2 Recommendation

Since anterior mediastinal masses are the commonest in our set up, we need to pay more attention to any abnormality that is detected accidentally in a routine chest X-ray

To increase the sensitivity and diagnostic accuracy; there need to be a feedback mechanism from pathology side for each mediastinal mass CT diagnosis through inter departmental joint sessions. .

The patient chart recording system need to be strengthened at all levels.

For researcher; need to conduct this study on large scale by focusing on a single type of mediastinal mass with prospective type of design.

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8. ANNEX

8.1 DATA EXTRACTION FORMAT

ADDIS ABEBA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF RADIOLOGY

MEDIASTINAL MASSES: RADIOLOGIC- PATHOLOGY CORRELATION

1, Age _____

2, Sex M ___ F___

3, Card No. _____

4, Clinical presentation

_____

_____

5, Year of radiologic intervention A,2015 B,2016 C,2017

6, Characterizations of the mediastinal mass

6.1 Multiplicity single_____ multiple_____

6.2 Location

Anterior_____

Middle_____

Posterior_____

Multiple compartment_____

Not described_____

7. Does the patient have documented CT scan? Yes___ No____

If yes fill the following:

7.1 pre contrast density

A, Fluid B, Soft tissue C, Fat

D, Mixed soft tissue and fluid E, Other specify_____

7.2 Post contrast enhancement_

A, Homogeneous B, Heterogeneous C, Avid enhancement

D, Rim enhancing E, Non enhancing

7.3 Cystic or necrotic changes

A, Yes B, No

7.4 Calcification A, yes B, No

8, Mass effect and invasion of adjacent structure

A,Yes B,No

9, Diagnosis of the mediastinal lesions on the basis of CT findings

_____

10. Histo pathology result

10.1 Histological diagnosis _____