Section: Radiodiagnosis

Original Research Article

INSIDE THE MEDIASTINUM: INSIGHTS INTO THE IMAGING SPECTRUM OF MEDIASTINAL MASSES—A RETROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Mediastinal masses comprise of a diverse group of benign and malignant lesions with overlapping clinical and radiological features, often posing a diagnostic challenge. Computed tomography (CT) remains the primary imaging modality for evaluating these lesions by accurately determining their location, internal composition, extent, and relationship to adjacent mediastinal structures. This study aimed to evaluate the imaging spectrum of mediastinal masses and correlate CT findings with histopathological diagnosis in a tertiary care center. **Materials and Methods:** A retrospective observational study was conducted in the Department of Radiodiagnosis, Jorhat Medical College and Hospital, Assam, from January to June 2026. Thirty patients with mediastinal masses who underwent plain and/or contrast-enhanced CT thorax were included. CT images were retrospectively reviewed for lesion location, mediastinal compartment, morphology, attenuation, enhancement characteristics, calcification, necrosis, adjacent organ involvement, and associated thoracic findings. Imaging findings were correlated with histopathological diagnosis. **Results:** Thirty patients with mediastinal masses were included in the study. Mediastinal lymphoma was the most common diagnosis (33.3%, n = 10), followed by pericardial cyst (20.0%, n = 6), teratoma (16.7%, n = 5), thymic cyst (16.7%, n = 5), and solitary fibrous tumor (13.3%, n = 4). The majority of lesions were located in the pre-vascular mediastinal compartment. Contrast-enhanced CT accurately delineated lesion morphology, internal composition, enhancement characteristics, and relationships with adjacent mediastinal structures, facilitating lesion characterization and narrowing the differential diagnosis. Histopathological correlation demonstrated excellent concordance with CT findings, underscoring the diagnostic utility of CT in the evaluation of mediastinal masses. **Conclusion:** Computed tomography is an indispensable modality for the evaluation of mediastinal masses, providing excellent anatomical localization and tissue characterization. Correlation with histopathology enhances diagnostic confidence and underscores the value of CT in guiding clinical decision-making, surgical planning, and patient management.

INTRODUCTION

Mediastinal masses comprise a heterogeneous group of congenital, inflammatory, benign, and malignant lesions arising from the various anatomical structures within the mediastinum. Although relatively uncommon, they represent a broad spectrum of pathological entities with diverse clinical presentations, ranging from incidental asymptomatic lesions to life-threatening conditions caused by compression or invasion of adjacent mediastinal structures. Accurate characterization of these lesions is essential for establishing an appropriate differential diagnosis, guiding tissue sampling, planning surgical intervention and determining prognosis.[1]

The International Thymic Malignancy Interest Group (ITMIG) has classified the mediastinum into

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three anatomical compartments—pre-vascular (anterior), visceral (middle), and paravertebral (posterior)—based on cross-sectional imaging. This compartment-based approach has significantly improved diagnostic accuracy by narrowing the differential diagnosis according to the site of origin. Thymic epithelial tumours, lymphoma, germ cell tumours, and ectopic thyroid lesions predominantly arise in the pre-vascular compartment, whereas bronchogenic and pericardial cysts commonly occur within the visceral compartment, while neurogenic tumours are typically located in the paravertebral compartment.[2]

Computed tomography (CT) remains the imaging modality of choice for the initial evaluation of mediastinal masses because of its widespread availability, rapid image acquisition, excellent spatial resolution and superior depiction of mediastinal anatomy. Plain and contrast-enhanced CT provide valuable information regarding lesion size, location, attenuation characteristics, enhancement pattern, calcification, fat content, cystic degeneration, vascular encasement, invasion of adjacent structures and associated lymphadenopathy. These imaging characteristics play a crucial role in lesion characterization and facilitate appropriate clinical and surgical decision-making.[3,4]

Despite advances in imaging technology, considerable overlap exists in the radiological appearance of various mediastinal lesions, making definitive diagnosis challenging in certain cases. Consequently, histopathological examination remains the gold standard for establishing the final diagnosis. Correlating CT findings with histopathological results not only improves diagnostic confidence but also enhances the understanding of characteristic imaging patterns associated with individual mediastinal pathologies.5

Several studies have described the imaging features of mediastinal masses; however, data from Northeast India remain limited. Regional variations in disease prevalence and referral patterns demand the importance of institution-specific studies. The present retrospective observational study was therefore undertaken to evaluate the computed tomography imaging spectrum of mediastinal masses in patients presenting to a tertiary care centre and to correlate CT findings with histopathological diagnosis.

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted in the Department of Radiodiagnosis, Jorhat Medical College and Hospital, Jorhat, Assam, over a period of six months from January 2026 to June 2026. A total of 30 patients with mediastinal masses who underwent plain and/or contrast-enhanced computed tomography (CT) of the thorax during the study period were included in the study. Patient records were identified from the Hospital Information System.

CT Imaging Protocol

CT examinations were performed using a 128-slice multidetector CT scanner (United Imaging Healthcare uCT 780). Plain CT thorax was performed in all patients, while contrast-enhanced CT was acquired whenever clinically indicated. Images were obtained in the supine position during suspended inspiration with thin-section axial acquisitions followed by multiplanar reconstructions in the coronal and sagittal planes.

Image Analysis

The CT examinations were retrospectively reviewed on the workstation by a senior radiologist with experience of 20 years. The following imaging parameters were evaluated: mediastinal compartment of origin (pre-vascular, visceral, or paravertebral), lesion size and extent, shape and margins, attenuation characteristics, presence of calcification, fat attenuation, cystic degeneration or necrosis, contrast enhancement pattern (where available), involvement of adjacent mediastinal structures, vascular encasement or invasion, associated mediastinal lymphadenopathy, pleural or pericardial effusion. The final diagnosis was established by correlation with histopathological examination, which served as the reference standard.

Inclusion Criteria

Patients of any age and gender with mediastinal mass, patients who underwent plain and/or contrast-enhanced CT thorax during the study period and complete clinical, imaging, and histopathological records available for review.

Exclusion Criteria

Inadequate or poor-quality CT examinations, incomplete clinical or imaging records and previously treated or recurrent mediastinal masses without pretreatment imaging.

RESULTS

A total of 30 patients with mediastinal masses were included in the study. The study population comprised 18 males (60%) and 12 females (40%), with an age range of 5–75 years. The highest proportion of patients belonged to the 21–40 years age group (33.3%, n = 10), followed by the 41–60 years age group (26.7%, n = 8), patients aged >60 years (23.3%, n = 7), and the 0–20 years age group (16.7%, n = 5). Histopathological evaluation revealed a diverse spectrum of mediastinal lesions. Mediastinal lymphoma was the most common diagnosis (33.3%, n = 10), followed by pericardial cyst (20.0%, n = 6), teratoma (16.7%, n = 5), thymic cyst (16.7%, n = 5), and solitary fibrous tumour (13.3%, n = 4). According to the International Thymic Malignancy Interest Group (ITMIG) compartment classification, 20 lesions (66.7%)

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involved the pre-vascular mediastinum, comprising mediastinal lymphoma (n = 6), teratoma (n = 5), thymic cyst (n = 5), and solitary fibrous tumour (n = 4).10 lesions (33.3%) involved the visceral mediastinum, including pericardial cysts (n = 6) and mediastinal lymphoma with contiguous visceral extension (n = 4). Of the 30 patients, 20 (66.7%) underwent contrast-enhanced CT thorax, while 10 (33.3%) underwent plain CT thorax. Contrast-enhanced imaging was not performed in selected patients to minimize radiation exposure and avoid unnecessary additional imaging, in accordance with the ALARA (As Low As Reasonably Achievable) principle. CT accurately demonstrated lesion morphology, internal composition, compartmental involvement, and relationships with adjacent mediastinal structures. Imaging findings showed excellent concordance with the final histopathological diagnosis in all patients.

Table 1: Demographic Characteristics of the study population

Characteristic	Number (n)	Percentage (%)
Gender		
Male	18	60.0
Female	12	40.0
Age Group (years)		
0–20	5	16.7
21–40	10	33.3
41–60	8	26.7
>60	7	23.3
Age Range	**5–75 years**	

Table 2: Histopathological Distribution of Mediastinal Masses

Histopathological Diagnosis	Number of Patients (n)	Percentage (%)
Mediastinal lymphoma	10	33.3
Pericardial cyst	6	20.0
Teratoma	5	16.7
Thymic cyst	5	16.7
Solitary fibrous tumour	4	13.3
Total	**30**	**100**

Table 3: Compartment-wise Distribution of Mediastinal Masses

Mediastinal Mass	Pre-vascular Mediastinum, n (%)	Visceral Mediastinum, n (%)	Total, n (%)
Mediastinal lymphoma	6 (20.0)	4* (13.3)	10 (33.3)
Pericardial cyst	0	6 (20.0)	6 (20.0)
Teratoma	5 (16.7)	0	5 (16.7)
Thymic cyst	5 (16.7)	0	5 (16.7)
Solitary fibrous tumour	4 (13.3)	0	4 (13.3)
Total	**20 (66.7)**	**10 (33.3)**	**30 (100)**

**Four cases of mediastinal lymphoma demonstrated contiguous extension from the pre-vascular into the visceral mediastinum.*

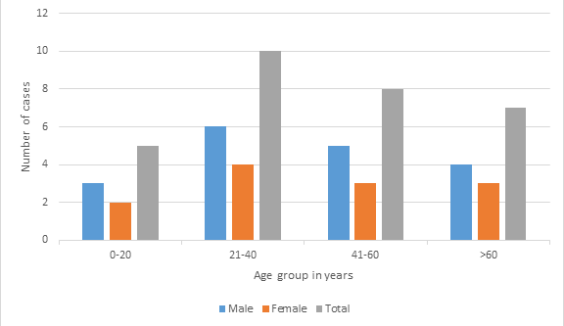

Figure 1: Age and Gender distribution of study population

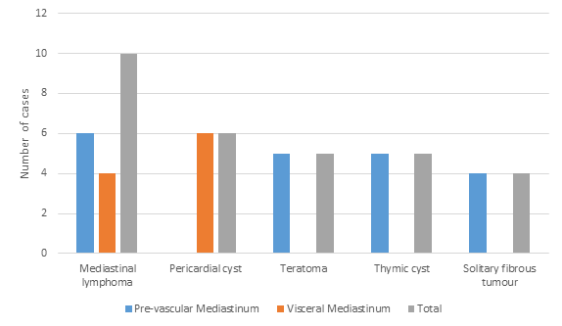

Figure 2: Compartment-wise distribution of mediastinal masses

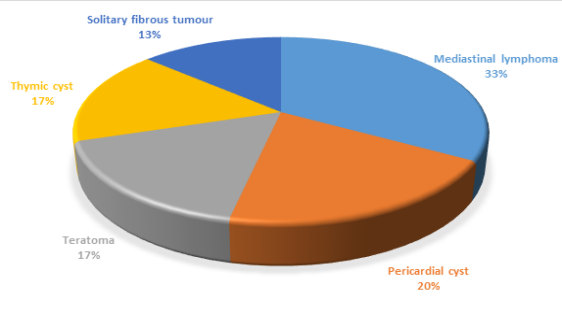

Figure 3: Pie-chart showing distribution of cases

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Representative cases

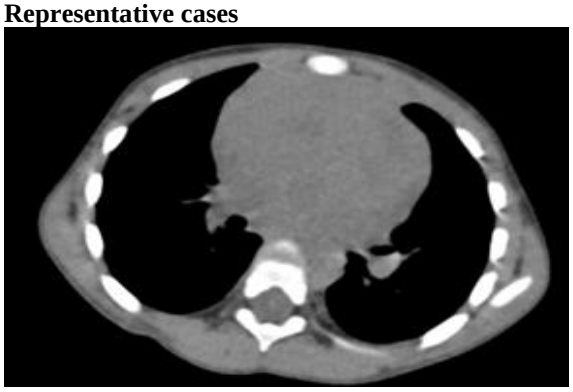

Figure 4a: Non-contrast Axial

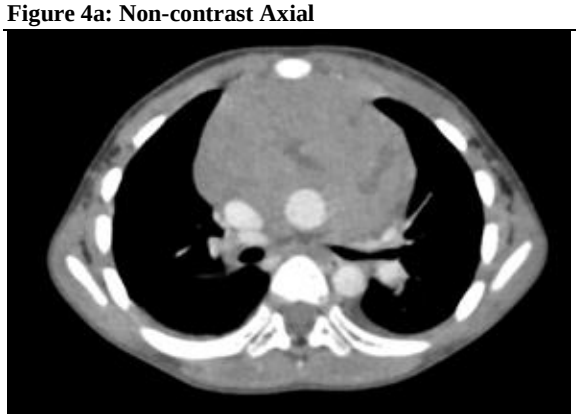

Figure 4b: CECT Thorax– Axial

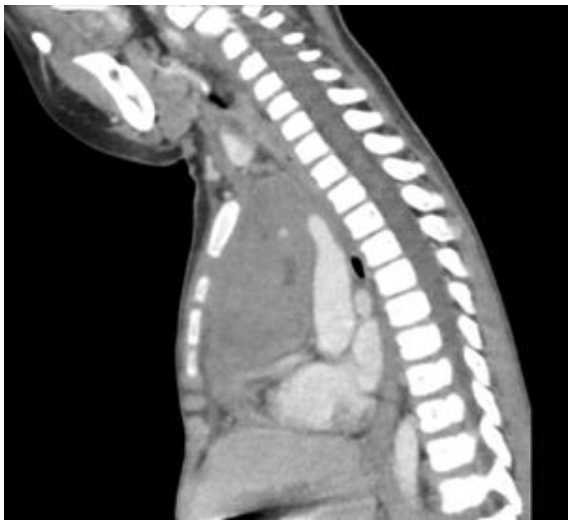

Figure 4c: CECT Thorax – Sagittal

Figures 4a, 4b and 4c: A 5-year-old female child presented with history of fever, night sweats, loss of appetite for one month, underwent CECT Thorax (figures 4a, 4b and 4c: Origin - Department of Radiodiagnosis, Jorhat Medical College and Hospital, Jorhat, Assam, India) as a part of evaluation and the study revealed an ill-defined homogeneous soft-tissue mass, involving the bilateral supraclavicular regions and the superior, pre-vascular and visceral mediastinum, showing homogeneous enhancement with a few non-enhancing areas, encasing the ascending aorta, aortic arch, brachiocephalic trunk, bilateral common carotid and subclavian arteries, with compression and splaying of the superior vena cava with associated cervical lymphadenopathy. Histopathological examination confirmed the diagnosis of lymphoma.

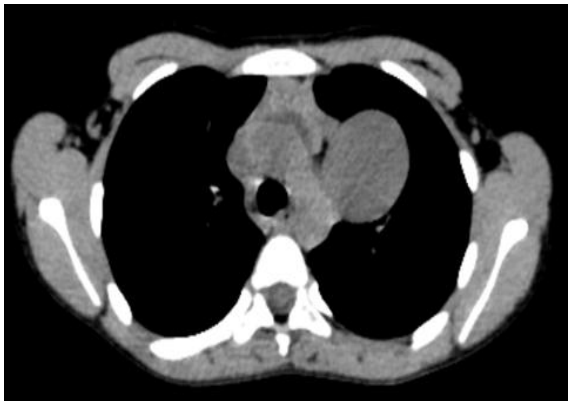

Figure 5a: Non-contrast Axial

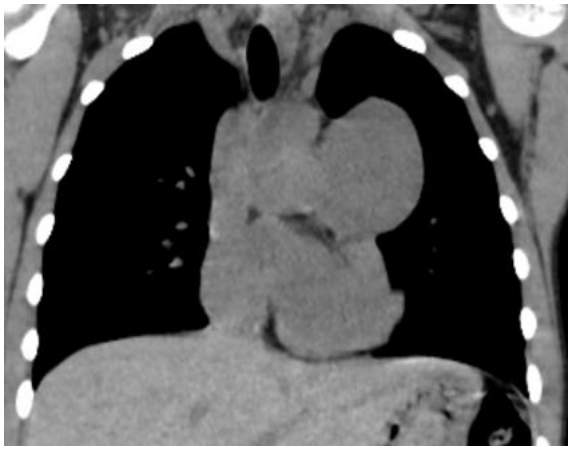

Figure 5b: Non-contrast Coronal

Figures 5a and b: An 8-year-old female presented with respiratory symptoms and underwent plain CT thorax (figures 5a and 5b: Origin - Department of Radiodiagnosis, Jorhat Medical College and Hospital, Jorhat, Assam, India) for evaluation of a suspected mediastinal lesion, which revealed a well-defined, thin-walled, unilocular homogeneous hypodense cystic lesion in the left visceral mediastinum, adjacent to the main and left pulmonary arteries. No mediastinal lymphadenopathy or pericardial effusion was identified. Histopathological examination confirmed the diagnosis of a pericardial cyst.

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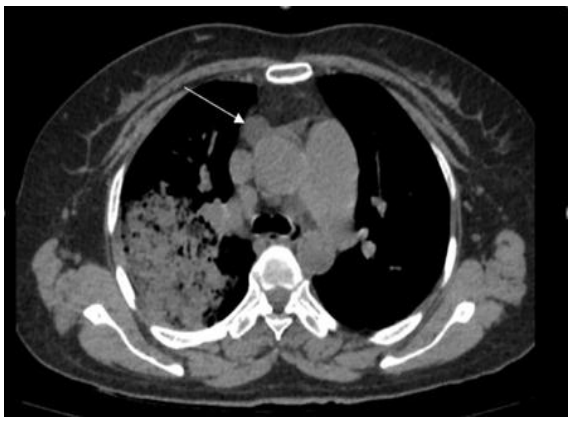

Figure 6a: Non-contrast Axial

Figure 6b: Non-contrast Coronal

Figures 6a and 6b: A 35year-old female underwent HRCT thorax (figures 6a and 6b: Origin - Department of Radiodiagnosis, Jorhat Medical College and Hospital, Jorhat, Assam, India) for evaluation of respiratory symptoms. Incidentally, a small pre-vascular mediastinal lesion was identified during imaging which was a well-defined hypodense lesion in the right paramedian pre-vascular mediastinal compartment, closely abutting the ascending aorta. The lesion showed a smooth margin without evidence of invasion or associated mediastinal lymphadenopathy. Histopathological examination confirmed the diagnosis of a thymic cyst.

Figure 7a: Non-contrast Axial

Figure 7b: CECT Thorax– Axial

Figures 7a and 7b: A 39-year-old male presented with chest discomfort and cough for 20 days underwent contrast-enhanced CT (CECT) thorax (figures 7a and 7b: Origin - Department of Radiodiagnosis, Jorhat Medical College and Hospital, Jorhat, Assam, India), which demonstrated a large lobulated heterogeneous mediastinal mass involving the pre-vascular mediastinum. The lesion contained multiple foci of calcification and showed mild heterogeneous post-contrast enhancement showing abutment with that of ascending aorta and arch of aorta. Histopathological examination confirmed the diagnosis of a teratoma.

Figure 8a: Non-contrast Axial

Figure 8b: CECT Thorax – Arterial phase: Axial

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Figure 8c: CECT Thorax – Delayed phase: Axial

Figures 8a. 8b and 8c: A 50-year-old male presented with respiratory complaints underwent contrast-enhanced CT (CECT) thorax (figures 8a, 8b and 8c: Origin - Department of Radiodiagnosis, Jorhat Medical College and Hospital, Jorhat, Assam, India) which revealed a solitary, well-defined, lobulated soft-tissue lesion in the right paramedian pre-vascular mediastinum. The lesion contained multiple eccentric calcific foci and demonstrated heterogeneous and delayed enhancement with focal non-enhancing areas. It indented the right atrium while preserving the fat plane and showed close approximation to the ascending aorta and superior vena cava without definite invasion. No mediastinal lymphadenopathy or pericardial effusion was identified. Histopathological examination confirmed the diagnosis of a solitary fibrous tumour.

DISCUSSION

Mediastinal masses comprise a heterogeneous group of lesions with diverse embryological origins, histopathological characteristics and clinical presentations. Accurate localization within the mediastinum, combined with characterization of lesion morphology and internal composition, plays a pivotal role in narrowing the differential diagnosis and guiding subsequent management. Multidetector computed tomography (CT) remains the primary imaging modality for evaluating mediastinal masses owing to its excellent spatial resolution, rapid acquisition, and ability to delineate adjacent vascular and mediastinal structures.[6,7]

In the present study, the majority of patients were males (60%), with a male-to-female ratio of 1.5:1. Similar observations have been reported by Davis et al. and Shrivastava et al., who demonstrated a slight male predominance among patients with mediastinal masses, particularly in those with lymphoproliferative disorders.[8,9] The peak incidence in our study was observed in the 21–40-year age group, which is consistent with the age distribution reported for lymphoma and germ-cell tumours in previous studies.[3,8]

Mediastinal lymphoma was the most frequent diagnosis on histopathological examination, accounting for 33.3% of all lesions. This finding is comparable to previous studies, which have identified lymphoma as one of the commonest malignant anterior mediastinal masses, particularly among young adults.[5,6] Lymphoma typically presents as a large homogeneous soft-tissue mass and may demonstrate encasement of adjacent mediastinal structures without significant vascular invasion. In our series, 40% of lymphoma cases extended into the visceral mediastinum, reflecting the infiltrative nature of this malignancy and emphasizing the importance of comprehensive CT evaluation.

Pericardial cysts represented 20% of cases and were the second most common pathology. These lesions were confined to the visceral mediastinum and demonstrated characteristic CT features, including well-circumscribed, thin-walled, homogeneous fluid attenuation without post-contrast enhancement. These imaging findings are in agreement with previous reports describing CT as the investigation of choice for diagnosing congenital mediastinal cysts.[10]

Teratomas and thymic cysts each accounted for 16.7% of cases. Mature teratomas demonstrated characteristic mixed attenuation with variable proportions of fat, fluid, soft tissue, and calcification, allowing confident preoperative diagnosis in most patients.[11] Thymic cysts appeared as well-defined cystic lesions within the pre-vascular compartment and showed imaging characteristics similar to those described by Jeung et al.[12]

All solitary fibrous tumours in the present study were located within the pre-vascular mediastinum. Although uncommon, these lesions are well recognized as hypervascular soft-tissue tumours that demonstrate variable enhancement depending on collagen content and tumour vascularity; in our case showed delayed enhancement due to fibrotic content as confirmed by histopathology. Previous authors have emphasized the value of contrast-enhanced CT in defining lesion extent and planning surgical resection.[13]

According to the ITMIG compartment classification, 66.7% of lesions involved the pre-vascular mediastinum, highlighting this compartment as the most common site of mediastinal pathology. This observation is consistent with established literature, where thymic lesions, lymphomas, and germ-cell tumours predominantly arise in the pre-vascular compartment.[1,3]

Contrast-enhanced CT was performed in 66.7% of patients, whereas plain CT was performed in selected paediatric patients to minimize radiation exposure. Despite the absence of intravenous contrast in these cases, CT successfully localized the lesions and provided adequate information regarding lesion morphology and compartmental anatomy. This underscores the versatility of CT in the evaluation of mediastinal masses while adhering to radiation safety principles in children.[14]

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A major strength of the present study is that all cases were confirmed by histopathological examination, enabling direct radiological-pathological correlation and enhancing diagnostic reliability. Furthermore, all examinations were performed at a single tertiary care centre using standardized CT protocols, thereby ensuring consistency in image acquisition and interpretation.

The study has several limitations. It is a single-centre retrospective study with a relatively small sample size, which may limit the generalizability of the findings. MRI was not performed in the study population; therefore, comparison between CT and MRI characteristics could not be undertaken. Additionally, advanced quantitative imaging techniques and long-term follow-up data are unavailable.

Overall, the findings of this study reaffirm the pivotal role of multidetector CT in the evaluation of mediastinal masses. By accurately determining lesion location, compartmental involvement, internal composition, and relationship with adjacent structures, CT substantially contributes to narrowing the differential diagnosis, facilitating appropriate surgical planning, and correlating imaging findings with histopathological diagnosis.[15]

CONCLUSION

Computed tomography is an invaluable imaging modality for the evaluation of mediastinal masses, providing accurate assessment of the location of lesion, compartmental involvement, internal composition and relationship with adjacent mediastinal structures. In the present study, mediastinal lymphoma was the most common histopathological diagnosis, and the pre-vascular mediastinum was the predominant site of involvement according to the ITMIG compartment classification. Characteristic CT features facilitated confident lesion characterization and demonstrated excellent correlation with histopathological findings. The study highlights the importance of a systematic compartment-based approach to mediastinal imaging, which significantly narrows the differential diagnosis and aids in appropriate clinical decision-making. Contrast-enhanced CT remains the workhorse for evaluating mediastinal masses, although plain CT can provide valuable diagnostic information in selected patients, particularly when radiation exposure should be minimized. Overall, multidetector CT, in conjunction with histopathological correlation, offers a reliable and effective approach for the diagnosis and preoperative evaluation of mediastinal masses, thereby facilitating timely management and improving patient care.

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