



Multi Slice Computed Tomography in Assessment of Posterior Mediastinal Lesions

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Authors' contributions

This work was carried out in collaboration among all authors. Author NMMES designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SAR and AMT managed the analyses of the study. Author MFD managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Posterior Mediastinal lesions are relatively common and represent 23-30% of all mediastinal lesions; 40% of these lesions are an incidental finding. Multidetector CT (MDCT) has shorter imaging time and better spatial resolution than MRI, especially in mediastinum; it is more widely available & less expensive. The additional role of CT is in performing CT guided biopsies if needed. This study aimed to evaluate the role of MSCT in the diagnosis of mediastinal lesions based on the characteristic imaging appearances, which can lead to a correct diagnosis and optimal management. The post-processing technique further improves the diagnosis and surgical planning.

Patients and Methods: This study included 30 patients with posterior mediastinal lesions evaluated according to clinical data, diagnostic imaging procedure (MSCT), and histopathological evaluation. Most of the cases in this study had a lesion raised from the LN and vessels by 23.3%.

Results: Metastatic lymphadenopathy was the commonest lesion in our study, 13.3%, followed by lymphoma 10.3% and neurogenic tumors 10%. Benign lesions were 60%, while the malignant

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lesion represents 40% of all cases. Multiple CT features of each posterior mediastinal lesion were used to predict the nearest histological diagnosis. The accuracy of MSCT in our study was 93.3%.
Conclusion: MSCT has a practical and significant role in the assessment & evaluation of the posterior mediastinal lesions according to the anatomical origin, the CT feature of the lesion (solid or cystic), density, the effect on the surroundings, the distribution pattern, and extent of the lesion.

Keywords: Multi-slice computed tomography; posterior mediastinal lesions.

1. INTRODUCTION

The mediastinum is an anatomic region located in the center of the thorax, the simple and recent division is anterior, middle, and posterior compartments [1]. The posterior compartment occupies the space between the back of the heart and trachea and the front of the posterior ribs and anterior spinal ligament, including the paravertebral gutters. It extends from the diaphragm cranial to the first rib and contains the esophagus, descending aorta, azygos and hemiazygos veins, paravertebral lymph nodes, and thoracic duct. The lower portions of the vagus nerve and sympathetic chains also lie within the posterior mediastinum [2].

Posterior Mediastinal lesions are relatively common and represent 23-30% of all mediastinal lesions; 40% of these lesions are an incidental finding [3].

Posterior mediastinal lesions may arise from the nervous system (e.g., neurogenic tumors including schwannoma and neurofibroma, infectious spondylitis, extramedullary hematopoiesis, meningocele, neuroenteric cyst), vessels (e.g., thoracic aortic aneurysm, aortic dissection, esophageal varices), esophagus (e.g., esophageal neoplasms, esophageal duplication cyst), lymph nodes (e.g., lymphoma, lymphadenopathy), adipose tissue (e.g., lipoma, liposarcoma), diaphragm (e.g., bochdalek hernia, hiatal hernia), extrathoracic lesions extending into the mediastinum (e.g., pancreatic pseudocyst) [4]. Posterior mediastinal lesions include a variety of entities with overlapping radiologic manifestations and variable prognoses [5].

The chest x-ray is usually the first diagnostic imaging modality for the evaluation of mediastinal lesions [6]. But computed tomography (CT) has been described as a useful non-invasive modality in the evaluation of mediastinal widening [7].

The CT scan discloses the hidden mediastinal pathology when there is no obvious contour

abnormality of the mediastinum on plain chest X-ray. CT demonstrates the exact size, shape, site, extent, and contour of mediastinal lesions. It differentiates vascular from neoplastic lesions. Moreover, the dynamic contrast-enhanced spiral CT is an excellent method of demonstrating vascular pathology in the mediastinum, e.g., aneurysm thrombosis etc [8].

Multidetector CT (MDCT) offers many advantages in the evaluation of suspected mediastinal lesions and focal mediastinal widening [9], and accurately differentiates between different causes of mediastinal widening because of the improvement in anatomical and contrast resolution of the MDCT images [10].

MDCT also allows more detailed evaluation of the entire thorax in a breath-hold without any loss of resolution and more consistent contrast enhancement with a single bolus of contrast. Thus, MDCT decreases the cost of the examination. Moreover, it is rapid, more readily available, and inexpensive [11].

MDCT is very helpful for surgeons to know about the extent of the lesion and whether it can be resected or not, so greatly affecting the management of the patient and also it would help the clinician to shortlist the other unnecessary investigations and provide early treatment to the patient [8].

MDCT plays an essential role in the diagnosis, staging, and follow-up of the mediastinal disease. Complete resection is the mainstay of treatment in many mediastinal lesions, and the ability to accomplish a complete resection appears to be the most important prognostic factor. Currently, CT is the modality most commonly used for follow-up after treatment. The goal of follow-up is to detect recurrence as early as possible. CT findings may serve as predictors of lesion invasiveness and of postoperative recurrence or metastases [7].

This study aimed to evaluate the role of MSCT in the diagnosis of mediastinal lesions based on the characteristic imaging appearances, which can

lead to a correct diagnosis and optimal management. Post-processing technique further improves the diagnosis and surgical planning.

2. PATIENTS AND METHODS

Thirty patients were included in this study (13 females and 17 males). Their age ranged between 11 to 80 years, with a mean age of (47.37). The patients were referred to the Radio-diagnosis and Medical Imaging Department Faculty of Medicine Tanta University from the outpatient clinics or inpatient clinical departments for one year. The study included patients who presented with signs and symptoms suggestive of posterior mediastinal lesions.

2.1 Inclusion Criteria

- Patients of both genders of any age group clinically suspected to have mediastinal lesions.
- A suggestion of mediastinal widening/lesion on chest x-ray.

2.2 Exclusion Criteria

- Pregnant women.
- Patients with chronic renal impairment if contrast media is a must.
- Patients with previous allergy to contrast media.

2.3 All the Studied Patients Were Subjected to the Following

- History taking
- Clinical examination
- Laboratory investigation
- Radiological investigation

2.4 Final Diagnosis

The final diagnosis was made by the following:

- Operative data: in (12 patients).
- Histopathological examination of biopsy: in (9 patients).
- Histopathological examination: of the excised pathological lesions: in (9 patients).

2.5 Correlation

The correlation was done between the CT findings and the final diagnosis.

2.6 Statistical Analysis

Statistical data of the present study were analyzed using IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.

Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR). The significance of the obtained results was judged at the 5% level.

3. RESULTS

In our study, the most common lesions in the posterior mediastinum were metastatic lesion, lymphadenopathy, and hiatus hernia (4 cases), 13.3% for each, respectively.

The accuracy of MSCT to assess the posterior mediastinal lesions was 93.3% in correlation to histopathological reports.

Table 1. Distribution of mediastinal lesions in the studied cases (no=30) according to CT diagnosis

CT diagnosis	No.	%
Lymphoma	1	3.3
Soft tissue for pathology	2	6.7
Bochdalek hernia	1	3.3
Neurogenic tumor for pathology	3	10.0
Metastatic lesions	4	13.3
Lymphadenopathy	4	13.3
Aortic dissection	3	10.0
Pseudo aortic aneurysm with hematoma	2	6.7
Hiatus hernia	4	13.3
Cancer esophagus	3	10.0
Esophageal varices	2	6.7
Pericardial cyst	1	3.3

In our study, the most common lesion in posterior mediastinum arising from lymph node (7 cases) 23.3% and vascular structure (7cases) 23.3%.

3.1 Case (1): Neurofibroma

58-year-old male patient with chest pain and shortness of breath for two months (Fig. 1).

3.2 Case (2): Metastatic Lesion

29-year-old male patient with chest pain, dyspnea, and +ve history of metastatic synovial carcinoma (Fig. 2).

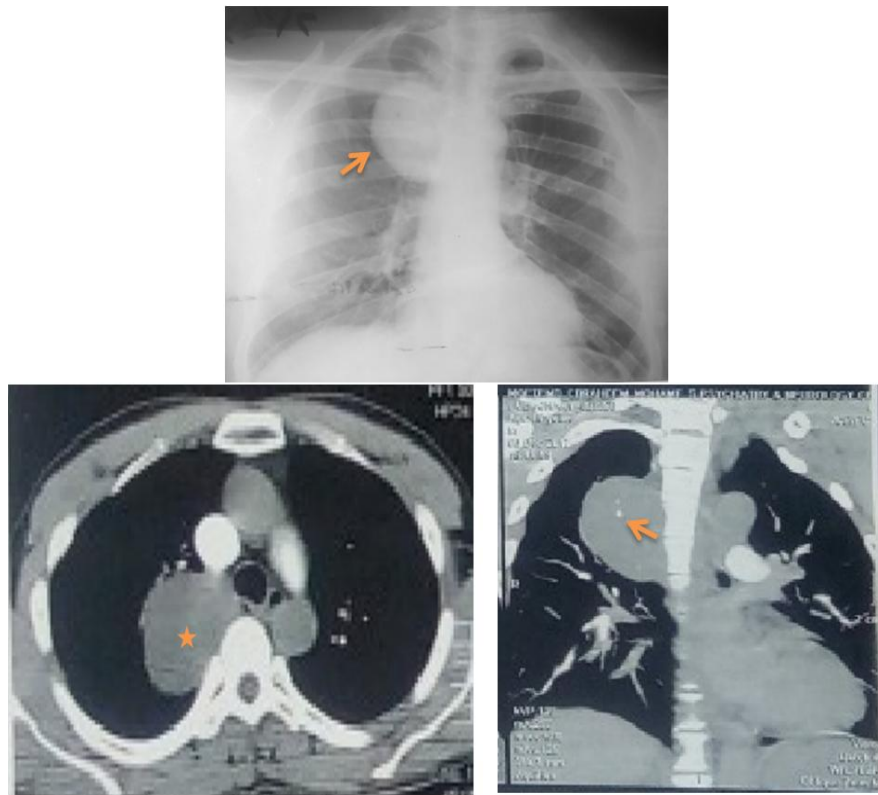


Fig. 1. A) Plain chest x-ray posteroanterior view show well-defined rounded opacity at the right side of upper mediastinum. B & C) Axial scan and coronal CT chest reconstructed image show Rt post. Mediastinal, paravertebral, rounded, well defined, soft tissue mass with an intralesional dot of calcification (orange arrow). The lesion causing widening of the posterior mediastinum with no invasion of the surrounding vascular structures, indenting the apical and posterior segments of the right upper lung lobe

Table 2. Pathological diagnosis of mediastinal lesions in our studied patients (no=15)

Pathology	No.	%
Hodgkin`s Lymphoma	3	10.0
Neuro fibroma	1	3.3
Metastatic	4	13.3
Schwannoma	1	3.3
Ganglioneuroma	1	3.3
Esophageal Squamous cell carcinoma	3	10.0
Lymphadenopathy(inflammatory)	2	6.7

3.3 Case (3): Hiatus Hernia

70-year-old female patient with abdominal discomfort and shortness of breath (Fig. 3).

3.4 Case (4): Aortic Dissection

60-year-old male patient with sudden severe chest pain and shortness of breath (Fig. 4).

4. DISCUSSION

The accuracy of MSCT to assess the posterior mediastinal lesions was 93.3% in correlation to histopathological reports, it can demonstrate and characterize the imaging features of the majority of cases (28 cases), and there were only 2 cases that need histopathology to characterize the lesion and confirm the final diagnosis.

CT was superior to other radiographic techniques in outlining the general anatomy of the lesion, determining the size, the contour, the extent, and separating mass from vessels. MSCT is more accurate when correlated with clinical data in determining the benign or the malignant nature of the lesion than other available diagnostic radiographic modalities. Regarding CT, in our study, the most common lesions in the posterior mediastinum were metastatic lesions, lymphadenopathy, and hiatus hernia (4 cases) 13.3% for each, respectively.

Table 3. Relation between histopathology and CT diagnosis in the studied patients (no=15)

CT diagnosis	Histopathology							Total
	Lymphoma	Neuro fibroma	Metastatic	Schwannoma	Ganglioneuroma	Squamous cell carcinoma	Lymphadenopathy	
Lymphoma	1(6.7%)	0	0	0	0	0	0	1(6.7%)
Soft tissue for pathology	2(13.3%)	0	0	0	0	0	0	2(13.3%)
Neurogenic tumor for pathology	0	1(6.7%)	0	1(6.7%)	1(6.7%)	0	0	3(20.0%)
Metastatic lesion	0	0	4(26.7%)	0	0	0	0	4(26.7%)
Lymphadenopathy	0	0	0	0	0	0	2(13.3%)	2(13.3%)
Cancer esophagus	0	0	0	0	0	3(20.0%)	0	3(20.0%)
Total	3(20.0%)	1(6.7%)	4(26.7%)	1(6.7%)	1(6.7%)	3(20.0%)	2(13.3%)	15

The percentage of the cases which need histopathology to confirm the diagnosis was 50.3% of all cases. The diagnosis of other cases representing 49.7% of all cases included in our study was confirmed by MSCT only as it was sufficient to characterize the lesion and confirm the diagnosis (e.g., hiatus hernia and aortic dissection).

The accuracy of MSCT to assess the posterior mediastinal lesion was 93.3% in correlation histopathological reports. This was in agreement with the study of Pulasani et al. [12] where the

accuracy of MSCT in the assessment of mediastinal lesions was 100%, also the study of Arumugan et al. [13] which was 88% in both pediatric age and adult age.

The accuracy of MSCT to assess the posterior mediastinal lesions was 93.3% in correlation to histopathological reports; it can demonstrate and characterize the imaging features of most cases (28 cases) and gave us a correct final diagnosis. There were only 2 cases need histopathology to characterize the lesion and confirm the correct final diagnosis.

Table 4. Distribution of mediastinal lesions in the studied cases (no=30) according to the anatomical origin

Anatomical origin	No.	%
L N:		
-Primary	7	23.3
-Metastatic	4	13.3
Diaphragm	5	16.7
Esophagus	3	10.0
Pericardium	1	3.3
Spine and nervous system	3	10.0
Vascular	7	23.3

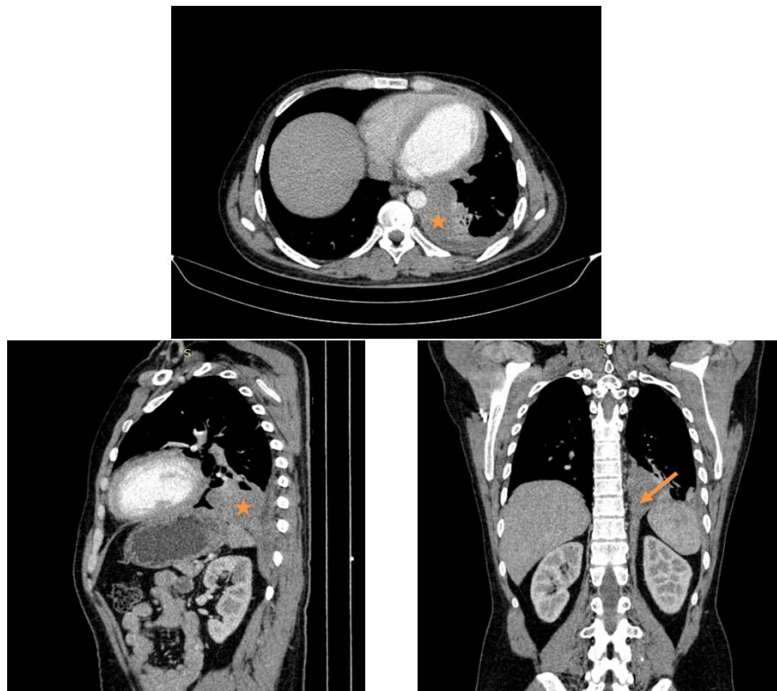


Fig. 2. A) Axial CT chest scan post-contrast demonstrates left paraspinal soft tissue mass; it is seen encasing the descending aorta and left diaphragmatic copula. A and B) Coronal and sagittal CT chest reconstructed images show the extension of the lesion to the left copula of the diaphragm (orange arrow)

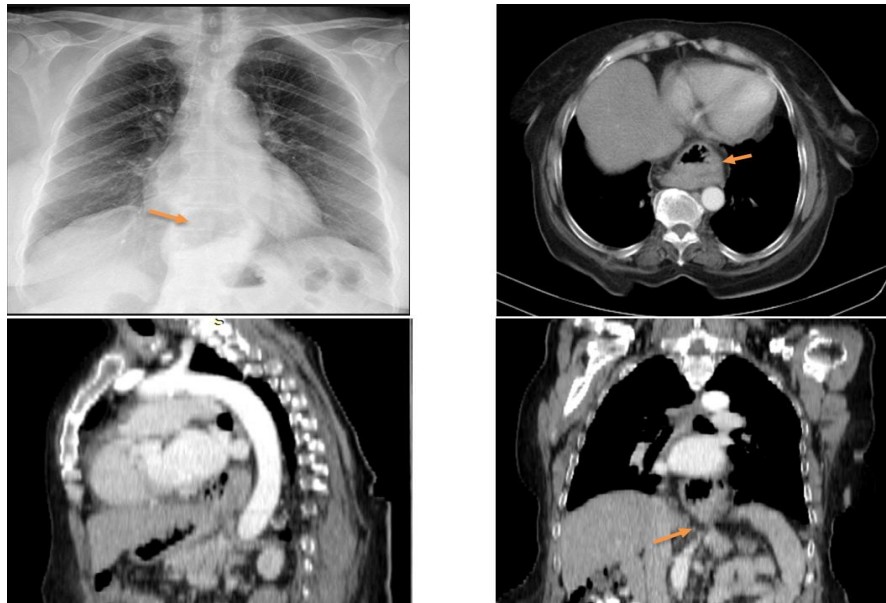


Fig. 3. (A) Plain chest x-ray frontal view rounded well defined opacity containing air at posterior mediastinum. (B) Axial CT image show part of the stomach is seen rolled up in the chest. C&D, sagittal & coronal CT chest reconstructed images show the defect through the esophageal hiatus

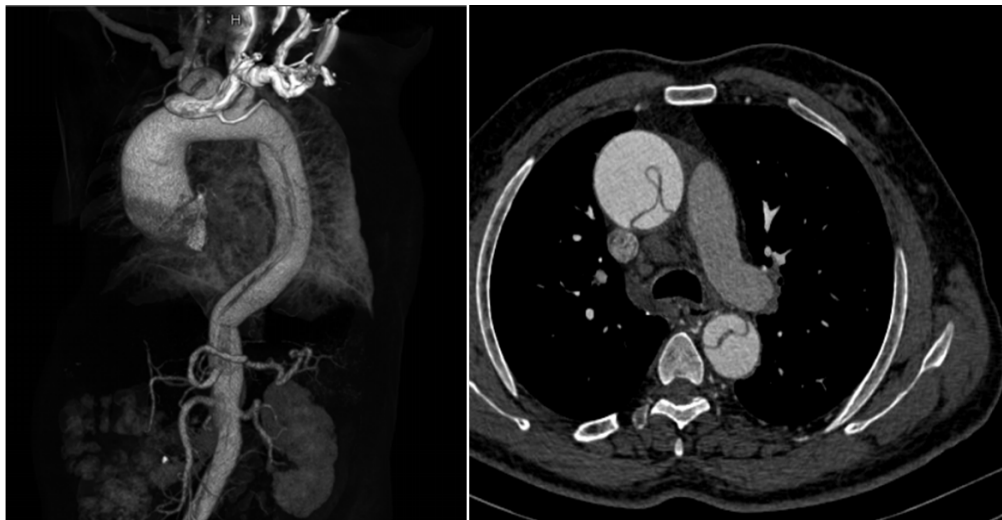


Fig. 4. (A) CT aortic angiography images showing fusiform dilatation of the aorta and aortic dissection evident by hypodense intimal flap seen separating the false and true lumens. (B) Axial CT scan of the chest demonstrates the intimal flap in the aorta, separating it into true and false lumen

The most common lesion in the posterior mediastinum is rising from lymph node (7 cases) 23.3% and vascular structure (7 cases) 23.3%. In comparison, lesions from the esophagus and lesions from the spine and nervous system represent (3 cases) 10.0 % for each, in contrary

with HattiHoli et al. [14] who found that the most common lesion in posterior mediastinum rising from the spine and nervous system (9 cases) 20% followed by esophageal lesions represent (6 cases) 13.33%, then vascular structure (5 cases) 11.11%.

Further studies are needed on a larger number of cases and to compare the sensitivity and specificity of the MSCT with other imaging modality as MRI.

5. CONCLUSION

MSCT has an effective and major role in the assessment & evaluation of the posterior mediastinal lesions according to the anatomical origin, the CT feature of the lesion (solid or cystic), density, the effect on the surroundings, the distribution pattern, and extent of the lesion.

CONSENT

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

The study protocol was approved by the research ethics committee of Faculty of Medicine, Tanta University.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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