Original Article

Role of Computed Tomography Scan in Establishing a Presumptive Diagnosis in Mediastinal Pathology

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ABSTRACT

Aim: To monitor the role of CT scan in establishing presumptive diagnosis in mediastinal pathologies.
Study Settings: This descriptive study was undertaken in Department of Chest Surgery, King Edward Medical University/Mayo Hospital Lahore during January 2012 to March 2013.
Methods: A total of 135 patients of age 15 and above were registered in this study. Patients were evaluated clinically and history was taken on a pre defined questionnaire. Patients were then asked to have their CT scans done, after which biopsies using various modalities were taken. Findings of the CT scan were then matched with the final histological diagnosis on biopsies.
Results: A total 115 out of 135 cases had disease of the anterosuperior mediastinum, 2 out of 135 cases had disease of the middle mediastinum, whereas 18 out of 135 cases had disease of the posterior mediastinum of which 71.3%, 50% and 72.2% respectively showed CT scan picture highly suggestive of a definitive diagnosis as confirmed by the histopathology results.
Conclusion: Contrast enhanced CT scan thorax (with densitometry) serves as a valuable diagnostic tool in establishing a presumptive diagnosis in most mediastinal diseases.
Keywords: CT scan, mediastinal pathology, differential diagnosis, anterosuperior mediastinum,

INTRODUCTION

In the era of cross-sectional imaging, mediastinal abnormalities can easily be identified. However, these abnormalities often manifest initially at conventional radiography. Chest radiography is a very common examination, and radiographic identification of an unexpected mediastinal mass is important. Knowledge of the normal mediastinal reflections that can be appreciated at conventional radiography is crucial in identifying a mediastinal mass. These mediastinal reflections can also help identify the location of a mass, thereby aiding in differential diagnosis and possibly influencing the choice of modality for further assessment[1]. There are no physical boundaries between compartments that limit disease therefore mediastinum is more often divided into convenient compartments in an attempt to develop a differential diagnosis[1].

Various anatomists divide the mediastinum in different anatomical regions as explained by Williams, Zylak, Felson and Heitzman[2-5].

In any method used to divide the mediastinum, the divisions are theoretic rather than physical. Therefore, disease can spread from one compartment to another, and some diseases do not occur exclusively in any one compartment. It is often more instructive to determine precisely where an abnormality lies. However, for ease of classification and for practicality, modified anatomic method has been adopted for dividing the mediastinum (i.e, anterior, middle, and posterior compartments with no separate superior compartment)[1]. Mediastinal masses represent a vast group of tumours and pseudo-tumours which can involve the various compartments of the mediastinum. A number of mediastinal reflections are visible at conventional radiography that represents points of contact between the mediastinum and adjacent lung[1].

When a tumor mass is evident in the mediastinum; different non-invasive as well as invasive methods are used to establish adequate diagnosis. Non-invasive diagnostic methods in mediastinal tumors may be radiological, standard and profile radiography and tomography, esophagography, radioisotope imaging, angiological methods, computed tomography (CT) of the thorax, magnetic resonance (MR) and positron emission tomography (PET), transesophageal echocardiography, Doppler ultrasound of the neck (cervical blood vessels, thyroid gland), abdominal ultrasound, mediastinal tumor markers, cytological and bacteriological sputum analyses and standard laboratory tests[7]. Invasive diagnostic methods in mediastinal pathology are bronchoscopy, esophagoscopy, surgical endoscopic methods with biopsy – anterior and parasternal mediastinoscopy, video assisted thoracoscopic surgery (VATS), VATS anterior videomediastinoscopy, stereotactic fine needle aspiration cytology (FNAC), biopsies including

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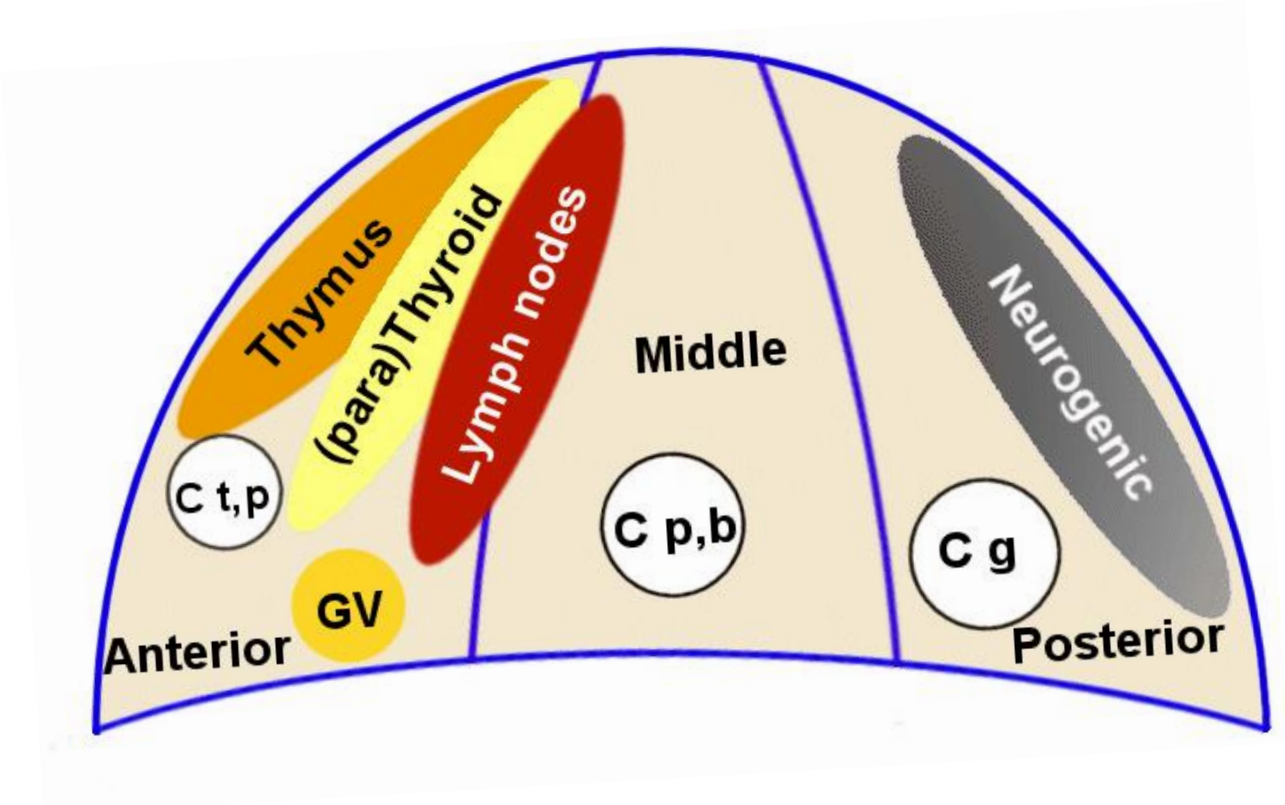
transthoracic, transbronchial and surgical biopsies, parasternal mediastinotomy and cervical lymph node biopsy, exploratory thoracotomy and sternotomy[7].

Figure 1: Anatomical distribution of mediastinal masses[6].



C t,p: cysts, thymic and parathyroid; C p,b: cysts, pericardical and bronchogenic; C g: cysts, gastroenteric; GV: germ cell and vasular tumors

Careful clinical examination and recognition of signs and symptoms that may be a part of clinical manifestations of the mediastinal process is important for planning of a diagnostic procedure. A large proportion of mediastinal tumors and masses produce no symptoms and are found incidentally during chest radiograph or imaging studies of the thorax performed for other reasons, while 97% can be detected on postero-anterior (PA) and lateral chest radiograph. Application of intravenous contrast enhanced CT scan enables differentiation between vascular and other pathological changes and determination of the relation of a lesion to the surrounding blood vessels. CT scan visualizes infiltration of the subpectoral region and axillae, which do not necessarily need to be palpable (which is important for planning of the therapy)[3]. Keeping in view; the aim of this study is to monitor the role of CT scan in establishing presumptive diagnosis of mediastinal pathologies.

PATIENTS AND METHODS

This descriptive study was undertaken in Department of Chest Surgery, King Edward Medical University/Mayo Hospital Lahore during January 2012 to March 2013. A total of 135 patients of age 15 and above were registered in this study. Patients were evaluated clinically and history was taken on a pre defined questionnaire.

Symptoms like compression of the surrounding structures in the mediastinum, dislocation, occlusion and fixation of the great vessels, thoracic pain and respiratory disorders (cough and dyspnea) caused by extramural compression or invasion of the airway walls, dysphagia (due to esophageal dislocation), syndrome of the superior vena caval obstruction, pain in the shoulder, paralysis of the recurrent laryngeal nerve and Horner syndrome, phrenic nerve paralysis, back pain and paraplegia etc were noted. Paediatric patients and patients having extra-mediastinal involvement and cardiac pathology were excluded from this study. Patients were then asked to have their CT scans done, after which biopsies using various modalities as described before were taken.

CT scan findings with densitometry were defined as highly suggestive, suggestive in differential diagnosis and inconclusive in antero-superior, middle and posterior regions of mediastinum. Findings of the CT scan were then matched with the final histological diagnosis on biopsies. Different frequencies were then analyzed and percentages were noted.

RESULTS

A total of 135 patients presenting with computed tomographic evidence of mediastinal pathology were thereafter subjected to different modalities ranging from stereotactic biopsies to open biopsies via mediastinotomy to obtain tissue diagnosis. Once histological diagnosis was obtained, it was matched in retrospect with the provisional diagnosis previously made on CT scan picture alone.

Based on the location of the pathology, 115 out of 135 cases had disease of the anterosuperior mediastinum, 2 out of 135 cases had disease of the middle mediastinum, whereas 18 out of 135 cases had disease of the posterior mediastinum. As shown in table 1.

Out of 115 cases with anterosuprior mediastinal pathologies, 82(71.3%) cases had a CT scan picture highly suggestive of a definitive diagnosis as confirmed by the histopathology results, 13(11.3%) cases had CT scan pictures only suggestive in a differential diagnosis with the final diagnosis obtained after histopathology results, whereas in 20(17.4%) cases CT scan picture was inconclusive.

Table 1: CT Scan findings in association with final histological diagnosis

Location of Pathology	**Antero-superior**	**Middle**	**Posterior**	**Total**
CT findings (with densitometry)	N (%)	N (%)	N (%)	N (%)
Highly Suggestive ⇨	82 (71.3)	1 (50)	13 (72.2)	96 (71.1)
Suggestive in differential diagnosis ⇩	13 (11.3)	1 (50)	5 (27.8)	19 (14.1)
Inconclusive	20 (17.4)	0 (0.0)	0 (0.0)	20 (14.8)
Total	115 (100)	2 (100)	18 (100)	135 (100)

Out of 2 cases with middle mediastinal pathologies, 1(50%) case had a CT scan picture highly suggestive of a definitive diagnosis as confirmed later on histopathology result whereas in 1(50%) case CT scan was only suggestive in differential diagnosis with histopathology obtaining the final diagnosis.

Out of 18 cases with posterior mediastinal pathologies, 13(72.2%) cases had a highly suggestive CT scan picture of the finally diagnosed disease as confirmed by histopathology while in 5(27.8%) cases, CT scan could only give a picture suggestive in differential diagnosis, with the final diagnosis having been established on histopathology.

DISCUSSION

Mediastinum with its different anatomical compartments is a host of a variety of diseases. Contrast enhanced CT scan combined with densitometry is one of the commonest radiological modalities employed as a diagnostic tool in mediastinal diseases. This study was focused on establishing the role of this modality in establishing a presumptive diagnosis in such cases. The results of this study revealed that anterosuperior mediastinum harbors diseases more frequently than either the middle or the posterior mediastina. Contrast enhanced CT thorax with densitometry is more than a useful diagnostic tool as its overall ability in giving a picture highly suggestive of a presumptive diagnosis was confirmed in a total of 71.1% cases of this study, with this ability being 71.3%, 50% and 72.2% for anterosuperior, middle and posterior mediastina respectively.

CT scan has already been acclaimed as a better technique compared to the plain radiograph as plain chest radiograph[9] may show a soft tissue mass which may be associated with pressure erosions on adjacent bone, while CT scan shows a soft-tissue mass with heterogeneous levels of attenuation due to the fatty, fibrous, and vascular tissue elements of the mass[10], thus making this technique much better than a plain chest radiograph. The results of the present study are higher as compared to a recent study that revealed the sensitivity, specificity, and positive and negative predictive values of CT for identifying mediastinal lymph node involvement to be 51.0%, 76.1%, 49%, and 77.6%, respectively, with a diagnostic accuracy of 68.4%[11]. However the results are comparable with sensitivity, specificity, and positive and negative predictive values of positron emission tomographic-CT scan which were 83.7%, 89.0%, 77.4%, and 92.4%, respectively, with a diagnostic accuracy of 87.3%[11]. Another study that exposed the diagnostic value of CT scan in mediastinal pathology had sensitivity of 72% and specificity of 81% which is also in agreement with the present study[12].

Even in cases where CT scan failed to establish a presumptive diagnosis, it still helped establish a list of differential diagnosis in 14.1% of cases, while in the remaining 14.8% of cases, the CT scan findings were inconclusive. Although the results of CT scan requires confirmatory diagnosis by histopathology or may be inconclusive in some cases, CT scan provides exact anatomic location, extent of lesion, tissue invasion and tissue density[13] thus making it easy to perform corresponding invasive procedures like surgery, FNA biopsies or image-guided FNA biopsies and saves attempting preoperative unnecessary invasive studies which are potentially risky[13] ,as revealed by a study in which the diagnostic accuracy of CT scan[14] was 67%.

In view of all of the above findings, it is necessary to determine how accurate noninvasive diagnostic studies, including medical history, physical examination, laboratory tests, and CT scan are by studies of a broader spectrum which will further help distinguishing requirements of surgical biopsy and necessitate surgical resection.

CONCLUSION

Contrast enhanced CT scan thorax (with densitometry) serves as a valuable diagnostic tool in establishing a presumptive diagnosis in most mediastinal diseases. It has a well-defined place in the repertoire of diagnostic modalities used in mediastinal pathologies.

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