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DIAGNOSTIC EFFICACY OF COMPUTED TOMOGRAPHY IN ASSESSMENT OF MEDIASTINAL MASSES

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Abstract:
Aim: *The aim of the study was to assess the sensitivity and specificity of computed tomography in the assessment of mediastinal masses. Helical CT with I / V contrast was performed in all patients.*
Place and Duration: *In the Radiology Department of Jinnah Hospital Lahore for one-year duration from March 2019 to March 2020.*
Methods: *Out of 100 patients, 31 had metastases with sensitivity and specificity 67.0% and 84.0%, 24 patients had tuberculosis with sensitivity and specificity 66.0% and 86.0%, 19 patients had lymphoma with sensitivity and specificity 47.0% and 90.0%, respectively. 26 patients had other weights. Overall sensitivity and specificity were 60.0% and 86.0%, respectively.*
Conclusion: *It has been found that while CT is generally unable to distinguish between the different etiologies of mediastinal tumors, it cannot only support the diagnosis but can often lead to a specific diagnosis by some debilitating factors such as water, fat and calcium. It is therefore the examination of choice after a chest x-ray.*
Key words: *Helical CT, mediastinal masses, histopathology.*

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INTRODUCTION:

The mediastinum can be affected by tumors, cysts, vascular anomalies, and lymph node masses. These changes are a difficult problem often faced by the radiologist, and a simple chest X-ray is insufficient to answer the questions doctors ask. Previously, people used invasive procedures such as aortography2 or surgery (mediastinoscopy or thoracotomy). Currently, computed tomography (CT) has been described as a useful non-invasive method of assessing mediastinal dilation. Computed tomography accurately distinguishes vascular and extravascular causes of mediastinal dilation, and a specific and correct diagnosis can often be made, avoiding further and more invasive diagnostic procedures. Computed tomography reveals hidden pathology of the mediastinum when there are no obvious abnormalities in the outline of the mediastinum on a plain radiograph of the chest. CT shows the exact size, shape, location, extent, and contour of the mediastinal tumors. It distinguishes vascular lesions from neoplastic tumors and is particularly useful for assessing areas poorly visualized by conventional radiographs, such as exacerbated, retrosternal, or sub-winged areas. Moreover, contrast-enhanced dynamic spiral CT is an excellent method to show mediastinal vascular pathology, eg, aneurysm thrombosis, etc. CT, to show fat, calcium or water suppression in mediastinal tumors often suggests a specific diagnosis. A CT scan is very helpful for surgeons to find out about the extent of the lesion and whether it can be removed or not, which has a big impact on the patient's treatment. The present study examines the usefulness of computed tomography for the rapid diagnosis of disease in patients with dilated mediastinum and / or hilum pathology on a plain chest radiograph. In doing so, it would help the doctor shortlist other unnecessary tests and provide patients with early treatment. Calculation of the sensitivity and specificity of computed tomography in the assessment of mediastinal tumors using histopathology as the gold standard.

MATERIAL AND METHODS:

This study was held in the Radiology Department of Jinnah Hospital Lahore for one-year duration from March 2019 to March 2020. First 100 consecutive patients of all age groups, including men and women, with mediastinal dilatation and / or hilus pathology on a chest X-ray. Patients with congenital thoracic defects, postoperative and traumatic disorders were not included. Helical computed tomography of the chest was performed on each patient and 10 mm adjacent axial patches were taken from the chest inlet to the level of the adrenal glands, while the patient was lying on his back on a couch with the upper limbs above his head and along the head. In all cases, I / V contrast was administered to injections of urograffin at 1 ml / kg body weight. The images obtained were examined in both the mediastinal and lung windows. In complicated and problematic cases, three-dimensional sagittal and coronal reconstruction was performed. Mediastinal mass was defined as an abnormal soft tissue structure greater than 1 cm in the short axis, avoiding confusion with normal mediastinal lymph nodes. Based on the obtained CT images, the following information was recorded: location of the mass in the anterior, medial or posterior mediastinum, size, number, margins and mass density, then the enhancement pattern, mass calcification, surrounding structures involvement, associated lung lesions, bone involvement, pleural effusion or pericardial. All these results were interpreted as a CT diagnosis which was compared with histopathology (gold standard). The data was analyzed comparing the diagnosis of CT with the histopathological diagnosis. The data was also presented in the form of various tables and graphs. Finally, different percentages were calculated for the sensitivity, specificity and predictive values of the most common mediastinal weights, ie Metastases, Tuberculosis and Lymphomas, and no other weights, as the number was too small to give any statistically significant value. However, overall sensitivity and specificity predictive values for all weights were also calculated.

RESULTS:

The results are tabulated as shown below.

Mediastinum	= n	% age
Anterior Mediastinum	31	31
Middle mediastinum	33	33
Posterior mediastinum	8	8
Anterior and middle	21	21
Middle and posterior	3	3
Anterior, middle and posterior mediastinum	4	4

Table 2: Distribution of disease by diagnosis.

Disease	= n	% age
Metastatic	31	31
T.B.	24	24
Lymphoma	19	19
Thyroid masses	9	9
Lung masses directly invading mediastinum	6	6
Ca-oesophagus	4	4
Thymoma	2	2
Lipomatosis	1	1
Anterior – chest wall Sarcoma	1	1
Teratoma	1	1
Right Atrial Myxoma	1	1
Fibrosacoma spine	1	1

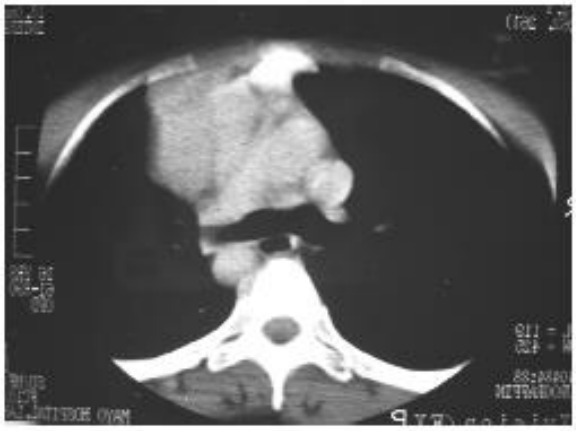

Fig. 1: Anterior Mediastinal Mass—Thymoma

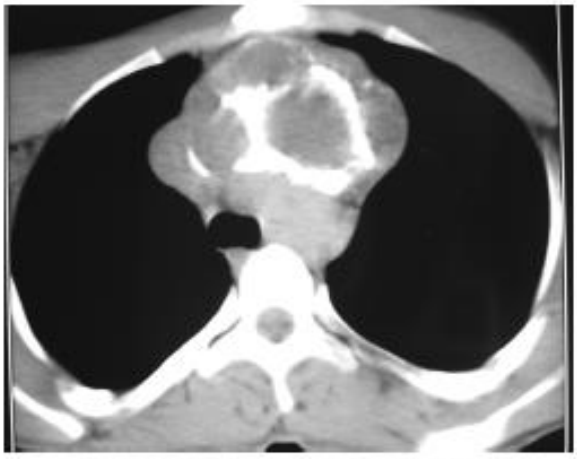

Fig. 3: Anterior Mediastinal Mass--Teratoma

Fig. 2: Anterior Mediastinal Mass—Lipomatosis

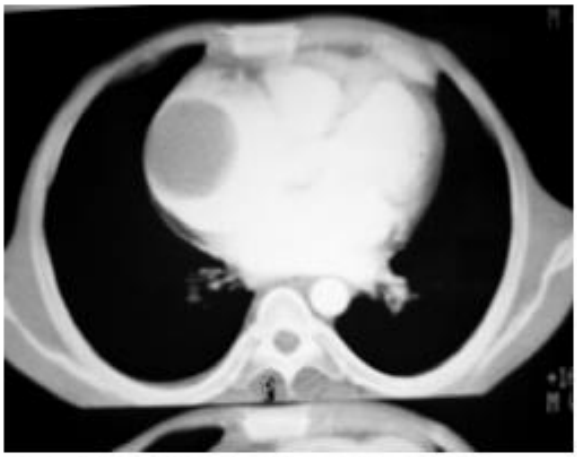

Fig. 4: Middle Mediastinal Mass—Right Atrial Myxoma

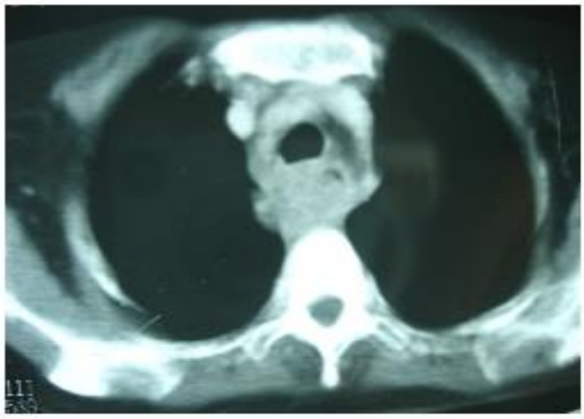

Fig. 5: Posterior Mediastinal Mass—CA Oesophagus

Disease	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Metastasis	67.0%	84.0%	63.6%	85.3%
Pulmonary TB	66.0%	86.0%	61.5%	89.2%
Lymphoma	47.0%	90.0%	52.9%	87.9%
Overall masses	60.0%	86.0%	59.4%	86.3%

Table 3: Net Results.

DISCUSSION:

There are many types of mediastinal tumors, but most of them are metastases, tuberculosis and lymphomas, which was also seen in our study, which shows 31/100 (31%) metastases, 24/100 tuberculous (24%), and 19/100 (19%) lymphomas. %). Plain chest radiography is a typical screening tool for the detection of mediastinal masses, but an abnormal chest radiograph can provide limited differential diagnosis as it has limited contrast resolution. In a study by Fon GT, Bein ME and Mancuso showed a CT thymoma in 14 of 16 patients with myasthenia gravis, while conventional radiographs found a lesion in only 9 of 16. CT provides better contrast resolution reflecting the exact size, shape, number and outline of the mass's mediastinum, thanks to which it has greater sensitivity in detecting the lesion. It can show a multiplicity of masses, thereby excluding diseases such as thymoma, teratoma, or thyroid masses. In addition, it can clearly cite the specific anatomical location of mediastinal tumors and may show associated thoracic abnormalities in the upper abdomen, such as focal lesions in the liver, adrenal glands, or spleen, thus assisting in diagnosis. But CT was generally unable to distinguish between lymphoma and metastasis. Histological examination of the lymph nodes is the only 100% accurate method of detecting metastases. Even a pathologist cannot predict tumor involvement of lymph nodes when examined macroscopically because enlarged lymph nodes may be tumor free and normal-sized nodes may have metastatic disease. In addition, the accuracy of CT in detecting tumor hilar involvement is limited. In 2003, Schillaci O and colleagues conducted a study of mediastinal lymph node involvement in non-small cell lung cancer, which showed the sensitivity and specificity of CT 68.6% and 75.0%, respectively, for metastatic lymph nodes. The sensitivity and specificity of node metastases in my study were 67.0% and 84.0%, respectively. In another study by Olivetti L et al investigating hilar and mediastinal lymph node metastases, the false-negative rate was higher with conventional radiology than with computed tomography; on the other hand, CT had a higher false-positive rate. We also saw this in our study. Studies by white PG and colleagues showed 61% sensitivity and 76% specificity for lymph node metastases. In yet another study by Man Fredi R et al, the sensitivity and specificity for node metastases were 82.0% and 88.0%, respectively. Schillaci et al. Conducted a comparative study of node metastasis. Lymph nodes were assessed with both 99mTc SPECT and CT tetrofosmin. In this case, CT showed a sensitivity and specificity of 68.6% and 75.0%. The sensitivity of CT to metastases in detecting tumor involvement of higher structures is

only 54%. CT can help staging mediastinal tumors, which was also shown in a study by Rendin EA et al. In this case, the sensitivity and specificity were 46% and 85%, respectively, with positive and negative predictive values of 78% and 58%, respectively. In my study, the sensitivity and specificity for lymphomas were 47% and 90%, respectively. The accuracy of chest radiographs in detecting hilus involvement in lung cancer patients is estimated at 61–71%. Glazer et al. Reported a 94% accuracy of CT. The size of the lymph nodes suggests whether it is benign or malignant. According to the experience of Lee TKT and Korobkin, lymph nodes larger than 1.5 cm are usually malignant, those between 1.0 and 1.5 cm suggest malignancy, and those below 1.0 cm are benign. In addition, necrosis of the lymph nodes indicates that the disease is aggressive and has a high degree of malignancy. Overall, tuberculosis is the most common cause of lymphadenopathy in developing countries such as Pakistan. Also, in my study there were a large number of cases (24/100) with tuberculous lymphadenopathy of the mediastinum. Lymphadenopathy with or without a parenchymal lesion is a radiological hallmark of tuberculosis. It is sometimes difficult to detect hidden lymph nodes and parenchymal abnormalities even on high-quality plain chest radiographs, but CT is very sensitive to revealing these changes. In addition, tuberculosis is characterized by centrally located necrotic lymph nodes with a hoop strengthening. Obviously, it is very difficult to distinguish between different mediastinal tumors on CT, but some attenuating factors have shown relative specificity, such as calcification in teratoma, metastatic ossifying osteosarcoma and benign toxic nodular goiter. The diagnosis of mediastinal teratoma is usually established by the presence of a thick-walled cystic mass containing fat, soft tissues and calcification, which was also observed in this study. Calcification of the lesion focuses a very important diagnostic clue; e.g. calcified lymph nodes usually indicate PTB additionally supported by parenchymal damage. CT has shown to be more sensitive at detecting calcification than regular film. In my study, calcification was found in 17/100 cases (8 cases of thyroid gland - 7 benign and malignant, 5 cases of PTB and 4 cases of metastases and 1 case of teratoma). CT is highly specific for fat lesions. In this study, there was a single case of mediastinal lipomatosis with a pathognomy of pure adipose tissue density, later confirmed by histopathology. CT is very helpful in diagnosing water-relieving lesions, such as a bronchial cyst. CT can detect rare mediastinal masses such as cardiac myxomas and thrombotic masses. There was one case of right atrial myxoma in my study that was confirmed by histopathology. CT accurately identifies a tracheal and bronchial defect that can be overlooked on a normal chest radiograph. Compression on the trachea was seen in 16 out of 100 cases in my study. The significance of this finding is that you can tell the anesthesiologist the degree or percentage of tracheal compression; patency of over 50% is safe in endotracheal intubation. There is no doubt that CT is a good test for most mediastinal tumors, but for posterior mediastinal tumors, especially paraspinal tumors, MRI is the preferred method, which also clearly identifies intramedullary mass expansion. Currently, despite the increasing use of MR imaging, this technique plays a limited role in the evaluation of mediastinal tumors compared to CT due to limitations in spatial resolution, extended scanning times and relatively high costs. Thus, CT is the examination of choice after the usual chest radiograph.

CONCLUSION:

Obviously, computed tomography cannot distinguish between the different etiologies of mediastinal tumors, but it is more sensitive in revealing the exact size, shape, number, specific anatomical location and extent of the disease involving the surrounding structures. Certain related symptoms, such as focal lesions in the lungs, liver, spleen, and adrenal glands, followed by associated cervical, axillary, or intra-abdominal lymphadenopathy strongly support the diagnosis of CT. In addition, some debilitating factors such as fat, water, and calcium present in the bulk can often lead to a specific diagnosis. Thus, CT is still the examination of choice after the normal chest radiograph.

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