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Role of Computed Tomography in Mediastinal Masses

KEYWORDS: mediastinal mass, chest radiograph, CT.

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ABSTRACT *This prospective study was conducted on total 60 patients suspected to have mediastinal mass were evaluated with computed tomography (CT) and chest radiographs and subsequent surgical, histopathological correlation and histopathological confirmation with FNAC or Biopsy of the lesion.*

The accuracy of CT for diagnosing vascular, lymphatic, cystic and nerve sheath masses was 100%. The accuracy of Chest Radiographs for diagnosing vascular, lymphatic, cystic and nerve sheath masses was 91.5%, 50.66%,100% and 87.5% respectively.

CT was successful in a higher proportion of cases in detecting the cause of mediastinal widening and the nature of mediastinal masses, than Chest Radiographs. It also proved to be accurate in localizing and characterizing mediastinal masses. It is recommended that all patients with mediastinal masses should be subjected to Computed Tomography.

Mediastinal masses have often non-specific and varied clinical presentation. Before the advent of CT only chest radiographs were the mainstays in evaluation of mediastinal masses. But now CT has emerged as the imaging method of choice in the evaluation of mediastinal abnormalities. CT has the ability to distinguish density differences as well as provide a three dimensional cross sectional view of anatomic relations unobscured by overlapping shadows. While both CT and MR provide cross-sectional depiction of the mediastinum, CT has better spatial resolution and shorter imaging time than MR, besides being less expensive and more widely available. The objective of this study is to diagnose various mediastinal masses using CT, localise and characterize the mediastinal masses and correlate the CT findings with their chest radiograph and histopathological findings, wherever possible.

MATERIALS AND METHODS

The present study was conducted during the period from March 2014 to December 2014. Patients suspected to have mediastinal masses on chest radiographs were evaluated with computed tomography. Total 60 patients presented with Mediastinal masses on chest radiographs were studied. Patients who underwent Computed tomography and subsequent confirmation of mediastinal masses with Fine needle aspiration cytologies, biopsies and operative procedures were included in present study.

The Computed tomography examination was performed on SIEMENS Somatom spirit (Dual Slice Spiral CT). Patients were scanned in Supine and in suspended full inspiration phase. Serial sections were obtained before and after intravenous Non-ionic contrast administration using spiral CT technique. Scans were obtained from Thoracic inlet up to the adrenal glands. The spiral scans using 5mm thickness were taken, wherever necessary, reconstruction of images were done to obtain scans as thin as 1 to 2 mm in thickness. The nature of mass was predicted and the results of imaging were correlated with the patient's subsequent histopathological examination of tissues obtained by Fine Needle Aspiration Cytology and biopsy, operative findings and clinical course of disease.

RESULTS

In our study of 60 patients, the youngest patient was 7 years old, while the oldest was 70 years old. 35 patients were male and 25 were female. The pediatric patients were 11 cases in all.

Pathologies causing Mediastinal Masses :

Sr.No.	Pathologies Causing Mediastinal Mass	No. of Patients	Percentage
1	Non – Hodgkin's Lymphoma	13	21.6
2	Hodgkin's Lymphoma	8	13.3
3	Aortic aneurysm	8	13.3
4	Thymoma	6	10.0
5	Metastatic Lymphadenopathy	4	6.6
6	Tuberculous Lymphadenopathy	4	6.6
7	Neurofibroma	4	6.6
8	Schwannoma	2	3.3
9	Pericardial Cyst	2	3.3
10	Teratoma	2	3.3
11	Bronchogenic Cyst	2	3.3
12	Thymolipoma	2	3.3
13	Tuberculous Abscess	1	1.6
14	Hydatid cyst	1	1.6
15	Hiatus Hernia	1	1.6
	Total	60	100

Fig 1: Aneurysm of Ascending Aorta

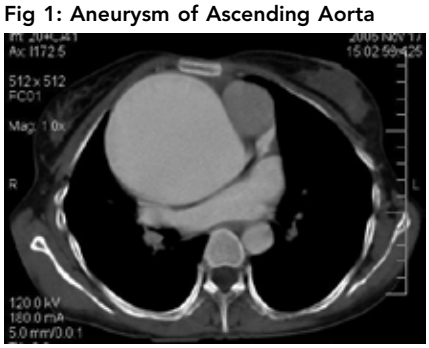

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Fig 2: Anterior Mediastinal Lymph Nodal Mass encasing the Major vessels of the Mediastinum in a case of Non-Hodgkin's Lymphoma.

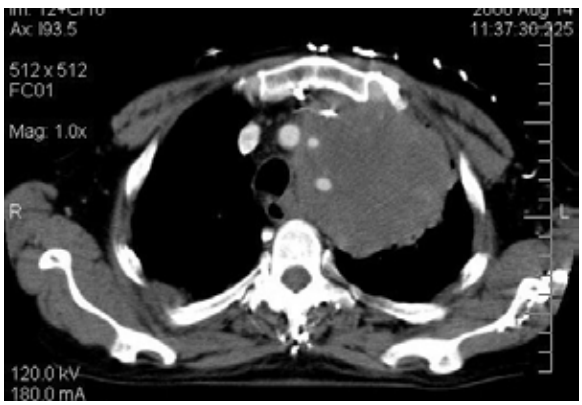
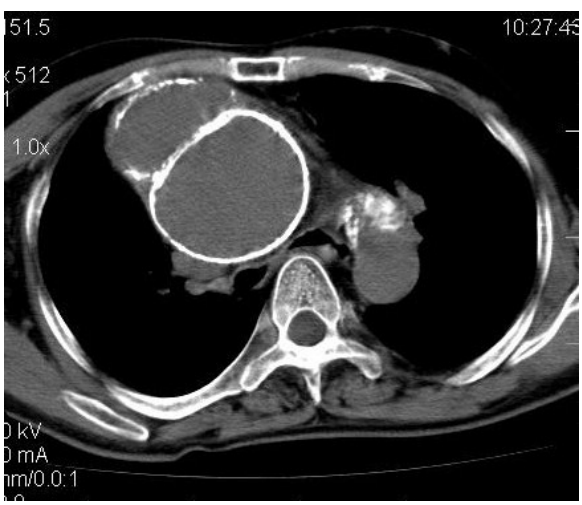


Fig3: Hydatid Cyst in Anterior mediastinum



DISCUSSION

The distribution of mediastinal masses in paediatric patients was 11 cases in all. Of which 5 masses were in anterior mediastinum, 1 in middle mediastinum and 5 in posterior mediastinum. CT helped in providing additional information regarding calcifications, lymph nodal involvement, extension and about attenuation values, contrast enhancement and helped in characterising the lesion in these patients. The definitive diagnosis and modified staging was made in 9 (81.8%) paediatric patients, in general, as compared to chest radiograph findings. Our study was similar to that of Siegel MJ et al.[1]

The diagnostic accuracy of CT was 100% for vascular, lymphatic, cystic and nerve sheath masses. Our study was similar to that of Graber GM et al[2] in this respect. CT proved to be extremely useful in evaluation of mediastinal cysts, aortic aneurysms and fat containing lesions like thymolipoma and teratomas in this study.

Also we found that mediastinal lesions not seen on routine radiographs can be visualized by CT, allowing for earlier detection of disease. Kawashima A et al[3] described the various causes of posterior mediastinal masses. From the CT appearance of the lesion, one can often distinguish among the various masses and identify their origin and cause.

Aortic aneurysm

In all, 8 patients were diagnosed to have aortic aneurysm. Aortic aneurysm can present as a mass in any of the mediastinal compartments depending on the location of aneurysm. The majority, i.e. 6 aneurysms (75%) were located in the descending aorta and only 2 the arch of aorta (25%).

Hannuksela M et al[4] found that the normal aortic diameter varies with age, sex and body weight and height. For this study the cut-off value for normal aortic diameter was taken as 33mm and the descending aorta 22 mm in their maximum short axis diameters. Five patients showed thrombosis, on CT scans, out of which 4 patients had peripheral thrombus and 1 central thrombosis of the aortic lumen. Thrombosis in the lumen of aneurysmal vessel cannot be demonstrated by chest radiographs by any method. So this is a real advantage of CT scan. Chest radiographs also failed to diagnose aortic aneurysm in two patients.

Our study was similar to that done by Miller GA Jr et al[5] in this regards as CT was able to correctly differentiate between a mediastinal neoplasm and an aneurysm in all the cases (100% sensitivity and specificity). The CT examination also accurately visualized the point of communication of the aneurysm with the aorta, defined the relationship of the aneurysm to vital mediastinal structures, and studied focal obliteration of the descending aortic interface on normal frontal chest radiographs and its correlation with CT findings.

Hodgkin's Lymphomas

Though CT demonstrated the Lymph Nodal enlargement in mediastinum in all the cases, it is difficult to determine the exact cause of Lymph node enlargement and it's exact histopathological diagnosis. In our study 8 cases were found to be that of Hodgkin's lymphoma on histopathology.

On chest radiographs mediastinal widening was present in 5 patients and by application of the silhouette's sign all the masses were localised to lie in the anterior mediastinum. The patients which were clinically suspected to have Hodgkin's lymphoma or who showed clinical signs of a mediastinal mass, but in whom mediastinal widening was not present and the lateral chest radiographs were interpreted as normal, were further evaluated by CT scans and subsequently 3 more patients were found to have mediastinal masses with characteristics suggestive of Hodgkin's lymphoma. Also chest radiographs failed to demonstrate middle mediastinal nodes in these patients. This is similar to that described by Hopper KD et al[6].

Non-Hodgkin's Lymphoma

Of the 60 patients with mediastinal masses in our study, 13 patients were found to have Non-Hodgkins lymphoma. It was found predominantly in elderly patients with 10 patients between the age of 41 to 65 years and only 2 patients in paediatric age group(7 & 9 years respectively).

On chest radiographs mediastinal widening was seen only in 7 (53.8%) of 13 cases and subsequent CT scans demonstrated mediastinal widening in all the 13 cases (100%).

Our study was similar to the study done by Romano M et al [7] in the pattern of involvement of the Hodgkin's and Non-Hodgkin's disease on CT and chest radiographs.

Thymoma and Thymolipoma

In our study we found 6 cases of thymoma, all the patients were in their 5th to 6th decade. None of them was associated with myasthenia gravis or pure red cell aplasia. In our

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study one case was diagnosed to be of invasive thymoma, as it showed irregular borders with encroachment along the adjacent vascular structures like the ascending aorta and brachiocephalic vessels. Tomiyama N et al [8] concluded that the presence of lobulated or irregular contour, areas of low attenuation, and multifocal calcification is suggestive of invasive thymoma. In our study the single case of invasive thymoma, displayed the above mentioned characteristics on CT.

CT is also useful in suggesting or excluding a diagnosis of thymoma and in distinguishing thymic hyperplasia from thymoma as shown by Baron RL et al[9].

Thymolipoma is generally recognized as a fat containing lesion. On CT it typically shows fat attenuation within (-10 to -30 H.U). There is no compression of adjacent mediastinal structures. Fibrous septae may be seen running through it. The sensitivity and specificity of CT for the above two thymic masses was 100%. Similar to that described by Chen JL et al [10].

Nerve sheath Tumors

Saenz N C et al [11] studied the incidence of solid mediastinal masses in children and observed that nerve sheath tumours are the commonest posterior mediastinal masses & neuroblastomas being the most common amongst them. In our study the commonest solid masses in posterior mediastinum were Nerve sheath tumours, instead of Neuroblastoma, Neurofibroma(4 cases) and schwannomas (2 cases) were found.

Radiologically, they present as well defined, round or oval mass in the posterior mediastinum in paravetrebral regions. Pressure deformity of adjacent ribs and vertebra are seen in 50% of cases. CT helps in delineation of the full extent of these tumours and contrast enhancement may provide some help in distinguishing these tumours.

FNAC

Percutaneous FNAC of the mediastinum is a diagnostically helpful, minimally invasive procedure that can be performed in patients of all ages as part of the evaluation of a mediastinal mass lesion. As described by the study done by Assaad MW et al[12]. No major complications were found, arising from the biopsy and FNAC procedures carried out in this study. Minor complications were pneumothorax, which resolved spontaneously.

CONCLUSION

Both CT and Chest Radiograph show good results in demonstration of mediastinal widening in a patient having a mediastinal mass. But CT scores better in depicting the exact cause of mediastinal widening and nature of the mediastinal mass. It also helps to demonstrate occult lesion, when chest radiographs are normal. Also it is helpful in staging of malignant lesions and demonstration of local invasion and distant metastases. More over depending on various factors as described above, CT has better diagnostic accuracy than Chest radiograph in detection of various Mediastinal masses.

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