ORIGINAL RESEARCH PAPER

Volume-7 | Issue-2 | February-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ACCURACY OF MDCT IN DETECTING PRIMARY MEDIASTINAL TUMORS

Radiology

Dr. Maoulik Kumar P. Modi	Consultant Radiologist, Sterling Cancer Hospital, Vadodara
Dr. Sujata Patnaik*	Additional Professor, Department of Radiology, NIMS, Hyderabad *Corresponding Author
Dr. Abhishek J Arora	Associate Professor, Department of Radiology, NIMS, Hyderabad
Dr. Megha S Uppin	Associate Professor of Pathology, NIMS, Hyderabad
Dr. Amaresh Rao	Professor of Cardio-Thoracic surgery, NIMS, Hyderabad

ABSTRACT

This prospective study was taken up to delineate the profile of mediastinal masses and to study the role of MDCT in detection and characterisation of various mass lesions. The MDCT films of thirty patients presenting with mediastinal masses whose diagnosis was confirmed after surgery and histopathology, were analysed for tumour location, size, number, extent, margins, attenuation, presence of calcifications, enhancement pattern and invasion of adjacent structures. There were 17 males with a mean age of 43.3 years. Two-thirds were in anterior compartment. Benign masses were more common than malignant masses. Thymic masses, neurogenic tumor, germ cell tumours and lymphomas were the most common masses. Thymomas were the most common anterior mediastinal masses. Spindle cell sarcoma, pseudocyst and PNET/Ewing sarcoma are rare and likely to be mis-diagnosed. MDCT was accurate in characterising benign and malignant nature of mediastinal mass with the diagnostic accuracy 75.6%.

KEYWORDS

Mediastinal mass, thymoma, neurogenic tumour, germ cell tumor

INTRODUCTION

Wide variety of mediastinal masses may be encountered on imaging in both symptomatic and asymptomatic patients. The location of the tumour and the composition detected on MDCT is often sufficient to narrow down the differential diagnosis. Sometimes the age of presentation may give a clue to diagnosis. Neurogenic tumor, germ cell tumor and foregut cyst are common in childhood while, primary thymic neoplasm, thyroid mass, and lymphomas are more common in adults. For most of the cases the diagnosis is possible by MDCT, whereas in a few cases, additional imaging modalities like MRI, PET/CT, and HPE are required.

Radiological evaluation of mediastinal masses is an important challenge to the chest radiologist. Plain film gives limited results. Detecting the lesions, using certain signs like silhouette sign, hilum over-lay sign, cervico-thoracic sign the lesion localisation is possible to some extent (Fig 1). Computed tomography characterises the lesion and leads to a close differential diagnosis. The localisation, size, configuration of mass, attenuation enhancement pattern, presence of fat, fluid, soft tissue component, calcification, invasion to adjacent structures help to evaluate the tumour to a large extent (Fig 2). MRI plays an important role in evaluating mediastinum in patients with contraindication to contrast agents. It helps in differentiating thymic hyperplasia from thymoma. Role of FDG PET/CT is controversial. Several studies have stated that it can differentiate benign from malignant mass and help in grading the thymoma.

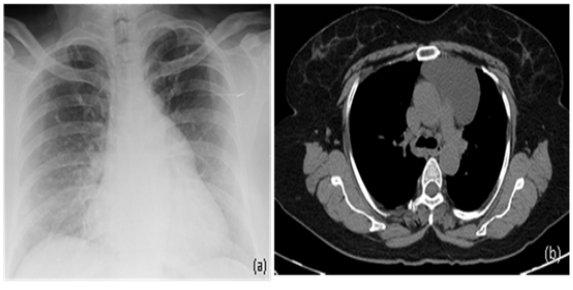


Fig 1 65F on cxr –there is mediastinal mass with hilum overlay sign along left hilum. On CT the mass is cystic in anterior mediastinum proven to be thymic cyst

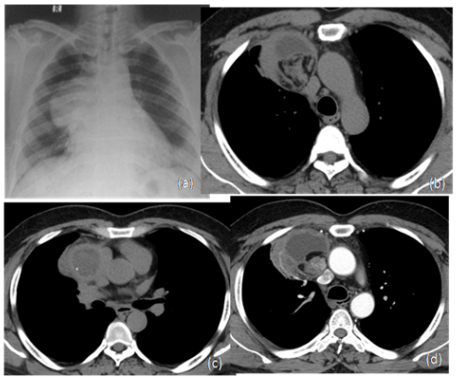


Fig 2 42/M well defined mediastinal mass on chest radiograph silhouetting right cardiac border . Axial CT contrast and non contrast study showing soft tissue, fat. cystic component,calcification within the lesion confirming matured cystic teratoma.

AIM OF STUDY

To evaluate the accuracy of MDCT in detecting various primary mediastinal masses.

MATERIAL and METHODS

This prospective observational study was conducted in the department of Radiology and Imaging in Nizam's Institute of medical Sciences, Hyderabad from June 2015 to May 2016. Approval from institutional Ethical and Scientific committee was obtained. Written consent was taken from the patients. There were 30 histologically proven cases of primary mediastinal masses that were subjected for analysis. Patients with infective, vascular masses and lymphadenopathy were excluded from the study. Patients with clinical diagnosis of tumor and tumor like condition in mediastinum had undergone MDCT, both plain, contrast study after obtaining the plain radiographs. These cases were correlated with HPE wherever mandatory. Accuracy of CT was determined comparing the CT diagnosis with final diagnosis of these tumors.

OBSERVATIONS

There were 30 Patients whose data was analysed. Of them 13 were females (43%), with the rest 17 (57%) being male (Male: Female ratio

was 1.3:1).Maximum was in age group of 40-60 years. There were only 2 cases (7%) in age group below 20 years. The masses which were detected by MDCT and included in this study were depicted in table-1.

TABLE 1-Frequency of various mediastinal masses

TYPE OF MASSES	NUMBER OF CASES	PERCENTAGE
THYMIC MASSES	7	23 .3
NEUROGENIC TUMORS	6	20
GERM CELL TUMORS	4	13 .3
LYMPHOMA	4	13 .3
THYROID MASSES	3	10
SPINDLE CELL SARCOMA	3	10
PSEUDOCYST	2	6.6
EWING/PNET*	1	3 .3

* PNET= PRIMITIVE NEUROECTODERMAL TUMOUR

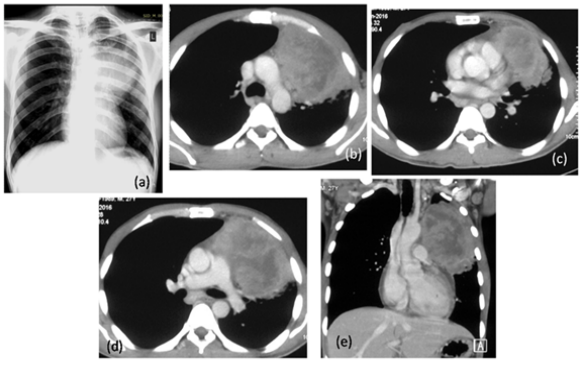
Thymic masses [n=7 (23%)] followed by neurogenic tumor [n=6 (20%)], lymphomas [n=4 (13%)] and germ cell tumors [n=4 (13%)] were the most common mediastinal masses. There were 3 cases of spindle cell sarcoma and 1 case of Ewing's /PNET. Among the 7 thymic masses thymomas were 6 and thymic cyst was 1. Nerve sheath tumors were the most commonly seen neurogenic tumors (n=3, 50%). There were 1 case each of ganglioneuroma, neuroblastoma and paragangliomas (each comprising approximately 16.7 % of neurogenic tumors). 66.7% of neurogenic tumors were showing well defined margins. Invasion of adjacent structures were present in 50% cases. Neuroblastoma was ill defined, with soft tissue attenuation, heterogeneously enhancing and showing calcification. Paraganglioma was ill defined, with soft tissue attenuation and showed intense post contrast enhancement.

TABLE 2-Correlating CT diagnosis with histopathological diagnosis for mediastinal masses

	CT Diagnosis	HP Diagnosis	Correlating	Discordant
Thymic Mass	11	7	7	4
Germ Cell Tumor	6	4	4	2
Thyroid Masses	3	3	3	-
Sarcoma	1	3	1	*
Nerve Sheath Tumor	5	3	3	2
Neuroblastoma	1	1	1	-
Paraganglioma	1	1	1	-

*2 cases of HPE proven sarcoma thought to be thymoma and germ cell tumor

CT diagnosis of thymic mass was given in 11 cases; however out of these, 3 turned to be lymphoma (Fig 3) and 1 turned out to be spindle cell sarcoma on histopathology (Fig 4).



24 Y/M,Chest radiograph (a) showing well defined mediastinal mass with ill defined medial margin silhouetting upper left cardiac border,Contrast enhanced axial (b,c,d) and coronal (e) section chest showing ill defined heterogenously enhancing soft tissue attenuation mass lesion with vascular , pleural,pericardial invasion and pericaridal effusion. CT diagnosis was thymic malignancy and histopathological diagnosis was diffuse large B cell lymphoma.

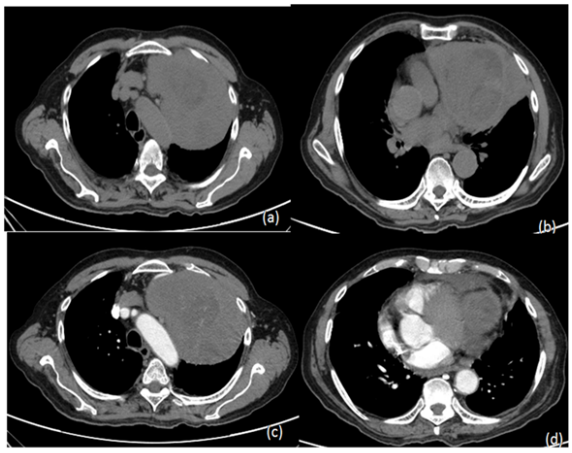


Fig 4 80 M NECT,CECT axial images reveal enhancing mediastinal mass infiltrating pericardium suggestive of Thymic mass and HPE proven to be synovial sarcoma

CT diagnosis of germ cell tumor was given in 6 cases, out of these 1 was proven to be lymphoma (Fig 5) and 1 proved to be spindle cell sarcoma on histopathology (Fig 6).

In 5 cases, CT diagnosis of nerve sheath tumor was given but out of these, 1 case turned out to be Ewing/PNET (Fig 7) and 1 case was proved to be ganglioneuroma on histopathology. CT was able to accurately diagnose neuroblastoma and paraganglioma based on characteristic CT features (Fig 8,9).

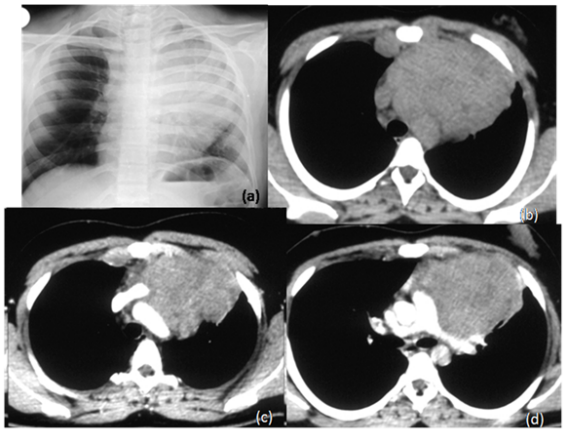


Fig 5 19 M imaging diagnosis was malignant germ cell tumor and HPE proven to be nodular sclerosing Hodgkins lymphoma

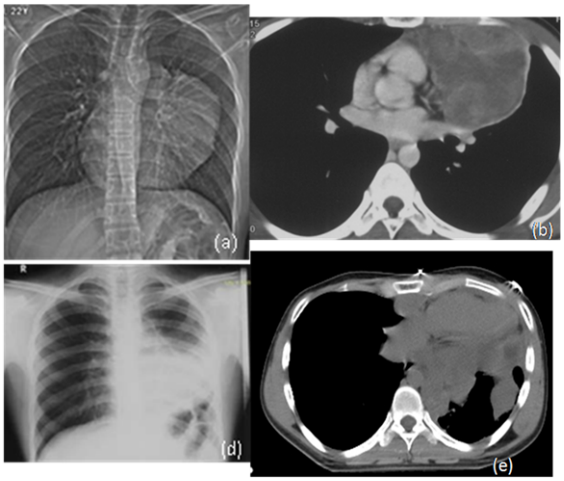


Fig 6 22M well defined lobulated mass along left cardiac border and CT confirms enhancing soft tissue mass infiltrating pericardium . CT diagnosis was germ cell tumor and HPE proven to be high grade synovial sarcoma

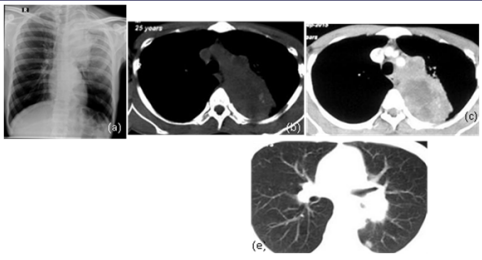


Fig 7 24M ill defined mediastinal mass silhouetting descending aorta and positive cervicothoracic sign on CXR . CT confirms it be posterior mediastinal mass infiltrating descending aorta and pulmonary nodules . Imaging diagnosis was malignant neurogenic tumor and HPE proven to be EWINGS/PNET.

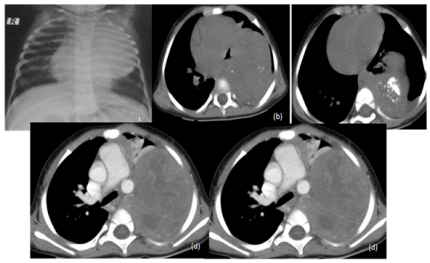


Fig 8 13M a chest x-ray and b,c,d CT chest reveals enhancing soft tissue mass with foci of calcifications in posterior mediastinum infiltrating vessel ,pleura in a case of Neuroblastoma

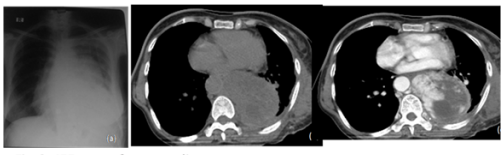
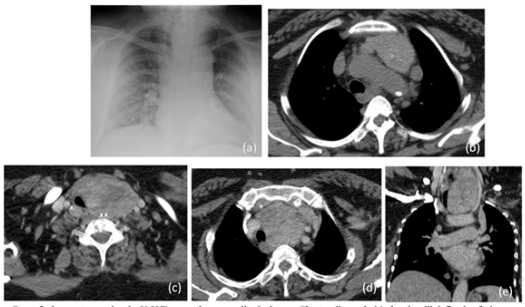


Fig 9 45F case of paraganglioma
CXR and CT reveal intensely enhancing posterior mediastinal mass infiltrating aorta,pleura

DISCUSSION

There were 30 HPE proven primary mediastinal masses with maximum in age group of 40-60 years with male predominance. This is because maximum cases were thymic masses as observed in many of the studies (1, 2).

Most common mediastinal mass were thymic mass (n=7) followed by neurogenic tumor (n=6), lymphoma (n=4) and germ cell tumor (n=4) comprising 23%, 20%, 13% and 13% respectively. This is in concordance with study by Cohen et al (3) where Thymic masses, neurogenic tumor, lymphoma, germ cell tumor were comprising of 24.3%, 16.9%, 15.7 % and 9.5 % respectively of all mediastinal masses. According to Priola AM most common mediastinal masses are thymoma, teratoma and lymphoma and Non-neoplastic conditions include thymic cyst, lymphangioma, and intra thoracic goitre (4). We had thyroid masses (10%), spindle cell sarcoma (10%), pseudocyst (7%) and Ewing's/PNET (3%) (Fig 10). This is comparable to study by Harmeet Kaur (5), spindle cell sarcoma comprising 10% of all mediastinal masses (Fig 4, 6). One case was a high-grade spindle cell sarcoma with cartilageneous differentiation. Other two were synovial sarcoma. Studies have reported sarcomas in 2% to 8% of primary malignant mediastinal tumors (6). Pseudocyst in posterior mediastinum is rare (Fig 11).



Case of adenomatous goitre in 50 Y/F presenting as mediastinal mass.Chest radiograph (a) showing ill defined soft tissue mass lesion in paratracheal location causing tracheal deviation to right.Non contrast (b) and contrast enhanced axial (c,d) sections and coronal(e)reconstructed contrast images showing well defined soft tissue mass lesion in continuity with left lobe of thyroid .Mass is showing calcification foci and causing compression and displacement of trachea and mediastinal structures to right

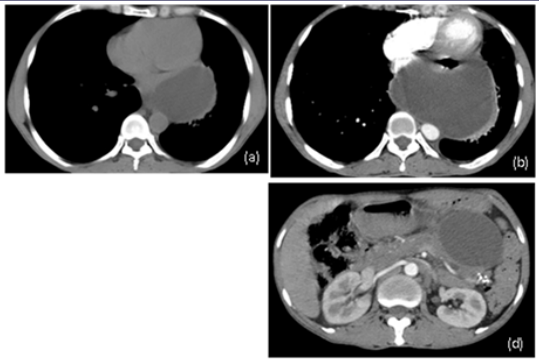


Fig 11 45M Case of pancreatitis .pseudocyst noted in posterior mediastinum and in lesser sac

Weidong Zhang et al, in their review suggested that EWS/PNET occur in anterior or middle mediastinum appearing as ill defined, heterogeneous masses indistinguishable from other more common mediastinal tumor (7) (Fig 7).

Out of 7 thymic masses, 6 were thymoma and one was thymic cyst (Fig 1). Thymic cyst comprised 1% of all mediastinal mass (8). Out of 6 thymoma, the most common WHO subtype was type AB (n=3, 50%) followed by type B2 (n=2, 33.3%) and type A (n=1, 16.7%) (Fig 12). Marx A et al (9) described that type A thymoma is a relatively uncommon type of thymoma and accounts for 4-19% of all thymomas. Type AB thymoma is either the most or the second most common type of thymoma and accounts for 15-43% of all thymomas. Type B2 thymoma accounts for 18-42% of all thymomas. In our study, all cases of thymoma had soft tissue attenuation and were heterogeneously enhancing (Fig 12). One case of type AB thymoma had ill-defined margin and showed vascular invasion. Rest all including type B2 had well defined margins.

Nerve sheath tumor were the most commonly seen neurogenic tumors (n=3, 50%) (Fig 13,14). There were 1 case each of ganglioneuroma, neuroblastoma (Fig 8, 15) and paragangliomas (Fig 9) each comprising approximately 16.7 % of neurogenic tumors. Nerve sheath tumors were well defined, showing soft tissue attenuation and heterogeneous enhancement. One case of neuroblastoma in 2-year-old patient was large, ill-defined heterogeneously enhancing with necrotic areas, foci of calcification within and showing vascular, pericardial, pleural and chest wall invasion. One case of paraganglioma was large, ill defined, intense heterogeneously enhancing with vascular, pericardial, pleural and chest wall invasion. Nerve sheath tumor, neuroblastoma and paraganglioma have typical CT features. Mediastinal paragangliomas are rare and only a few cases were reported in literature (10). CT accurately diagnosed all the 3 cases of germ cell tumors due to typical location, presence of fat, soft tissue density and calcification (Fig 2).

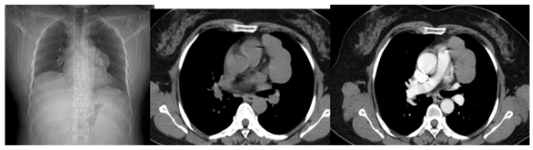


Fig 12case of Thymoma AB type. Lobulated homogenous enhancing mass in anterior mediastinum with no invasion to adjacent structures

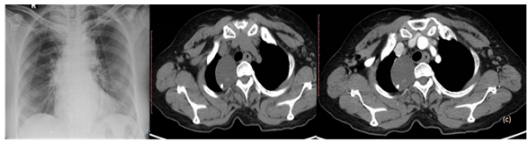


Fig 13 55F case of schwannoma presenting as minimally enhancing soft tissue dense mass with cacification in right paravertebral region

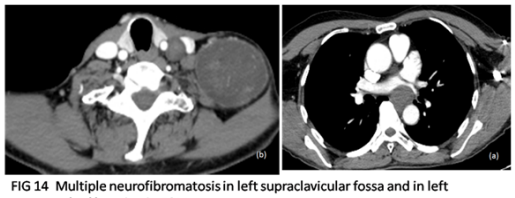


FIG 14 Multiple neurofibromatosis in left supraclavicular fossa and in left paravertebral location in 58M

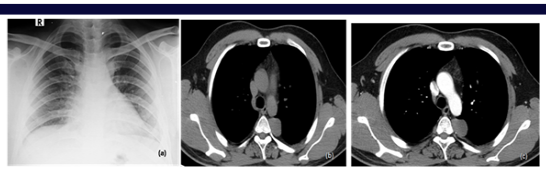


FIG 15 A case of ganglioneuroma confsed with neurofibroma in 45M

Other than 2 cases of pseudocyst, all 28 cases were confirmed histologically. Out of 28 cases, CT diagnosis of 22 cases correlated with histopathology findings. CT diagnosis of mass did not correlate in 8 cases.Thus overall CT had good accuracy of 76.5 % with sensitivity of 83.3 %, specificity of 70.37 % , positive predictive value of 71.43 % and negative predictive value of 82.61 %. With respect to individual mediastinal tumors, CT had accuracy of 63% for thymic mass and 66% for germ cell tumor. This correlated with a study by Tomiyama who reported a diagnostic accuracy of CT in diagnosing anterior mediastinal mass as 56% (11). For diagnosing thymoma the sensitivity, specificity, accuracy was 85%, 98.7%, 95.8% by Ellis et al (12). CT was able to accurately detect cases of thymic cyst, pseudocyst, neuroblastoma and paragangliomas. Considering the age of presentation, clinical features of myasthenia gravis and location of mass we were able to diagnose all 6 cases of thymoma accurately.

Three cases with CT diagnosis of thymic mass and one case with CT diagnosis of germ cell tumor, on histopathology turned out to be lymphomas. These cases of lymphoma presented as isolated anterior mediastinal mass without enlarged lymph nodes. Suzuki et al, in a case report described about case of isolated mediastinal Hodgkin's disease mimicking thymoma (13).

We were also able to diagnose all 3 cases of nerve sheath tumor on CT. One case of ganglioneuroma was misdiagnosed as nerve sheath tumor. Ganglioneuroma had variable imaging findings. Two cases of spindle cell sarcoma were misdiagnosed as thymic mass/germ cell tumor on CT (Fig 4,6). The mediastinum as a primary site of occurrence for synovial sarcoma is rare (7). Similarly, one case of Ewing/PNET was misdiagnosed as malignant neurogenic tumor on CT (Fig 7). It has been described that Ewing/PNET appear as ill-defined, heterogeneous masses that are not distinguishable from other causes of mediastinal masses, based on their CT features.

CONCLUSION

Most common mediastinal mass were thymic masses, neurogenic tumors, lymphoma and germ cell tumors comprising 23%, 20%,13% and 13% respectively . Overall CT had good accuracy of 76.5 % with sensitivity of 83.3 %, specificity of 70.37 %, positive predictive value of 71.43 %, and negative predictive value of 82.61 %. in diagnosing the type of mediastinal tumour Lymphoma presenting as primary mediastinal mass mimicking thymoma/germ cell tumor was not uncommon. Diagnosis of sarcoma and EWINGS/PNET was difficult and they were rare.

REFERENCES

1. Kiran PS, Kalra VB. 2013." Computed tomographic evaluation of mediastinal lesions". Journal of Evolution of Medical and Dental Sciences 2:1714-24
2. Pulasani K, Narayanaswamy I, Ramprakash HV. 2015. "Evaluation of Mediastinal Mass Lesions Using Multi-Detector Row". Computed Tomography and Correlation with Histopathological Diagnosis. Int J Sci Stud 3:156-163
3. Cohen AJ, Thompson L, Edwards FH, Bellamy RF. 1991." Primary cysts and tumors of the mediastinum". Ann Thorac Surg 51:378-84
4. Priola AM, Priola SM, Cardinale L, Cataldi A, Fava C. 2006. "The anterior mediastinum: diseases". Radiol Med 111:312-42
5. Kaur H, Tiwari P, Dugg P, Ghuman J, Shivhare P, Mehmi RS. 2014. "Computed tomographic evaluation of mediastinal masses/lesions with contrast enhancement and correlation with pathological diagnosis-a study of 120 cases" J Biomed Graph Comput 4:28-35
6. Temes R, Chavez T, Mapel D, Ketal L, Crowell R, Key C, Follis F, Pett S, Wernly J. 1999." Primary mediastinal malignancies: findings in 219 patients". West J Med 170:161-6.
7. Zhang WD, Zhao LL, Huang XB, Cai PQ, Xu GX. 2010. "Computed tomography imaging of anterior and middle mediastinal Ewing sarcoma/primitive neuro-ectodermal tumors". J Thorac Imaging 25:168-72
8. Jeung MY, Gasser B, Gangi A, Bogorin A, Charneau D, Wihlm JM, Dietemann JL, Roy C. 2002." Imaging of Cystic Masses of the Mediastinum". Radiographics Spec No: S79-93.
9. Marx A, Ströbel P, Zettl A, Chan J.K.C, Müller-Hermelink H.K., Harris N.L, Kuo T.T, Shimosato Y, Engel P. Thymoma. In: Travis W.D., Brambilla E., Muller-Hermelink H.K., Harris C.C, Editors. World Health Organization Classification of Tumours. Pathology and Genetics of Tumours of the Lung, Pleura, Thymus and Heart. Lyon: IARC Press; 2004: p152-166
10. Fatureto MC, Santos JP, Marques EG, Evangelista TB, Costa WA. 2011. "Non-functional middle mediastinal paraganglioma: diagnostic and surgical management". J Bras Pneumol 37:700-2
11. Tomiyama N, Honda O, Tsubamoto M, Inoue A, Sumikawa H, Kuriyama K, Kusumoto M, Johkoh T, Nakamura H. 2009. "Anterior mediastinal tumors: diagnostic accuracy of CT and MRI". Eur J Radiol 69:280-8
12. Ellis K, Austin JH, Jaretzki A 3rd. 1988. "Radiologic detection of thymoma in patients with myasthenia gravis". AJR Am J Roentgenol 151:873-81
13. Suzuki K, Yoshida J, Takahashi K, Nishimura M, Kawasaki H, Yokose T, Nagai K. 1998." Isolated Mediastinal Hodgkin's Disease Mimicking Thymoma: Report of a Case". Surg Today 28: 213-6