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REVIEW

Thymoma: A Comprehensive Review of this Indolent Anterior Mediastinal Tumor

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Abstract

Thymic tumors, including thymoma and thymic carcinoma, represent a diverse group of malignancies with variable clinical presentations. Despite their rarity, thymoma remains a significant clinical entity due to its potential for local invasion and recurrence. Approximately 50% of thymomas are diagnosed incidentally during chest radiography. This review provided a comprehensive overview of thymoma, encompassing its classification, clinical features, diagnosis, treatment, and prognosis. Various staging systems and their impact on management decisions were also discussed. Thymectomy, the primary treatment for thymoma, was explored in detail, along with the role of adjuvant therapies. Furthermore, a case study of a 20-year-old male who presented with shortness of breath, cough, chest pain, and fever was focused. Imaging revealed mediastinal widening and right-sided pleural effusion, leading to a diagnosis of lymphocytic-rich type B thymoma following fine needle aspiration and biopsy. This case highlighted the clinical presentation and diagnostic approach to thymoma.

Keywords: Thymoma- anterior mediastinal mass- pleural effusion- thymus tumors

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Introduction

The thymus is a small gland that's part of our Lymphatic system. It is composed of epithelial cells in the outer cortex, myeloid cells and lymphocytes in the germinal centre. The thymus is an encapsulated bilobed gland. Each lobe of the thymus has a superior and inferior horn and extends laterally to each respective phrenic nerve. It originates in the embryo from the ventral ring of 3rd and 4th pharyngeal pouchs and ectoderm endoderm of the cervical sinus [1]. It is situated in the upper anterior mediastinum, active during childhood, involutes during puberty and persist as an atrophic state in old age but never disappears completely [2]. It helps defend against infection and disease. The primary function of the thymus gland is to train special white blood cells called T-lymphocytes or T-cells. White blood cells (lymphocytes) travel from bone marrow to thymus. The lymphocytes mature and become specialized T-cells in thymus. After the T-cells have matured, they enter bloodstream. They travel to lymph nodes (groups of cells) and other organs in lymphatic system, where they help our immune system to fight disease and infection. Thymus gland is also part of endocrine system [3].

Thymomas and thymic carcinomas originate from the epithelial cells of the thymus within the anterior mediastinum. Thymomas are rare tumors of the thymic epithelium [4]. A thymoma is a malignant epithelial tumor most commonly found in the prevascular mediastinum. It also can be found in the neck, pulmonary hilum, thyroid, lung, pleura, or pericardium. In gross examination; it is a well-circumscribed, tan, firm mass that ranges in size from microscopic to over 30 cm in diameter. It is lobulated with bands of fibrous stroma and, at times, cystic changes. Histologic heterogeneity is common among thymomas meaning many thymomas will possess multiple subtypes of these WHO classifications and can be divided into ten percent increments. Thymomas have a lobulated architecture. The cellular lobules consist of neoplastic epithelial cells and reactive thymocytes that are intersected with fibrous bands. They are at least partially surrounded by fibrous capsules. There are various manifestations with

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which a patient with thymoma may present. Patients may have thoracic manifestations. These symptoms are related to the size and effect of the thymoma on adjacent organs, including chest pain, cough, and phrenic nerve palsy.

The most common paraneoplastic syndromes associated with thymoma is myasthenia gravis and other are pure red cell aplasia (PRCA), hypogammaglobulinemia (Good syndrome), pancytopenia, collagen vascular disease [5]. Thymoma annual incidence is only 0.15 cases per 1000000 person years, yet representing the most frequently diagnosed tumor of the anterior mediastinusm. Aproximately half of mediastinal masses are located in anterior mediastinum. Thymoma is accounting for 20-25% of all mediastinal tumors and 50% of anterior mediastinal masses. Its peak incidence occurs in the fourth and fifth decades of life; the mean age of patients is 52 years [6]. No sexual predilection exists. Thymoma are indolent tumors which show local recurrence rather than metastasis. Mostly it is found incidentally on chest radiograph during routine examination. The treatment of thymoma may involve surgery, radiation, and chemotherapy. These modalities may be combined; the combination largely being determined by the stage of the disease. The curative treatment, surgery remains the base line attempt in thymoma therapy. Complete or partial median sternotomy with complete thymectomy is the operative approach of choice.

Case Presentation

A 20 years old male presented with shortness of breath, cough without expectoration, chest pain and fever for past 15 days. Shortness of breath was acute in onset and gradually progressive. Orthopnea was not present. Cough was present without expectoration and hemoptysis. Patient presented with history of chest pain which was diffuse in nature, non progeressive and relived by medication. There was history of fever which was mild grade and did not present with diurnal variation. Fever was relived on medication. There was no history of loss of apetite and weight. Negative history was present for tuberculosis .

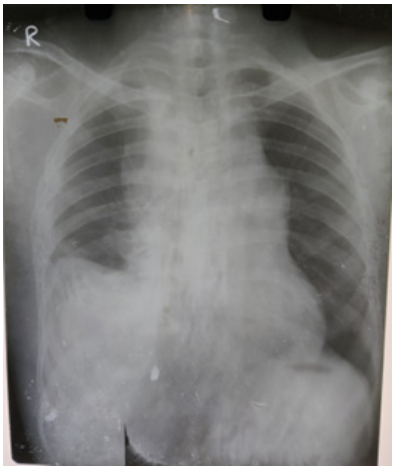

Figure 1. Chest xray pa view

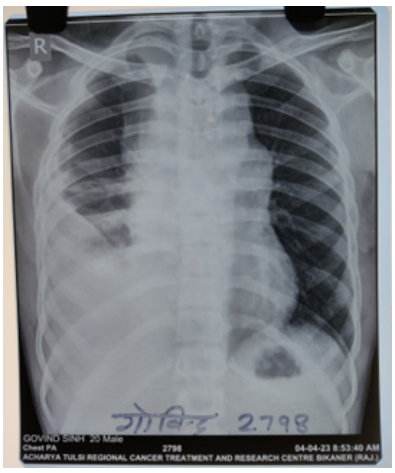

Figure 2. Chest xray pa view

During vital examination BP was 120 / 70, respiratory rate was 21 per minute, pulse 73 /min, spo2 = 98% with air and febrile (100°F). On general physical examination pallor present, no icterus, clubbing, cyanosis, lymphadenopathy and edema seen. On respiratory system examination, on inspection, chest is normal in shape and bilaterally symmetrical, no dilated or engorged veins, no visible pulsations. On palpation, trachea was slightly shifted to left side and deceased tactile fremitus chest expansion on right side chest (Figure 1, 2). No palpable swelling or pulsation. On percussion, resonant note present on left side chest and dull note present on right side. On auscultation vesicular breath sound present on left side and breath sound and voice sound decreased on right side of chest.coarse crepts present on right side.

On blood routine examination TLC was raised and urine routine examination was within normal limits. Pbf showed neutrophilic leucocytosis. For acid fast bacilli sputum was negative. Chest x ary showed mediastinal widening and fluid level on right side. CECT chest showed lobulated heterogenicity enhancing soft tissue density mass in anterior superior mediastinum of size 10.7 x

Table 1. Masaoka-Koga Staging System

Stage	Defination
I	Grossly and microscopically completely encapsulated tumor
IIA	Microscopic transcapsular invasion
IIB	Macroscopic invasion into thymic or surrounding fatty tissue, or grossly adherent to but not breaking through mediastinal pleura or pericardium
III	Macroscopic invasion into neighboring organ (i.e., pericardium, great vessel, or lung)
IVA	Pleural or pericardial metastases
IVB	Lymphogenous or hematogenous metastasis

Table 2. WHO Classification of Thymoma

Type	Histologic Discription
A	Medullary thymoma
AB	Mixed thymoma
B1	Predominantly cortical thymoma
B2	Cortical thymoma
B3	Well differentiated thymoma
C	Thymic carcinoma

4.8 cm and significant free fluid seen on right pleural space. On fnac soft tissue density mass showed feature in favour of thymoma and biopsy confirmed the diagnosis. After diagnosis and symptomatic relif refered for surgical reference but surgeon not found feasible for surgery. So at our center we started CVP chemotherpy.

Discussion

Thymomas are rare tumors of the thymic epithelium. It represents only 0.2–1.5% of all malignancies and has an estimated incidence of between 0.13 and 0.32/100,000/ year. Thymoma accounts for 20% of mediastinal tumors and is the most common tumor of the anterior mediastinum [7]. And approximately 50% of all mediastinal tumors in adults. About 70% of thymomas occur in patients over the age of 40 years, and nearly all thymomas occur over the 20 years of age. Thymoma is a rare malignant process with a variety of presentations, often limited to the anterior mediastinum, with a wide spectrum of morphological, pathologic characteristics, and clinical presentations.

Thymoma are the most frequent tumours in adults followed by mediastinal lymphomas. Thymoma represents <1% of all mediastinal tumors in children. Thymomas are considered to be highly aggressive in pediatric patients, especially when age is <10 years; most common are non-Hodgkin lymphomas, while thymomas are extremely rare. The presenting symptoms may vary widely in paediatric patients from vague chest discomfort, to florid compressive symptoms like dyspnea and superior vena cava syndrome [8]. But Thymoma in adult often do not cause symptoms and are picked up incidentally by imaging studies performed for other reasons like when patients present with vague symptoms such as chest pain, difficulty in breathing or cough.

Chest radiographs are the most commonly performed imaging examination and can be the first modality to suggest a thymic mass. Radiographically, thickening of the anterior junction line can signal a thymic tumor in the prevascular space. Additionally, the "silhouette sign" is another useful radiographic sign Thymoma typically presents on CT as a smooth or lobular mass involving one lobe of the thymus, with bilateral involvement more rarely occurring. The majority of thymomas demonstrate homogeneous contrast enhancement, however, approximately one third are more heterogeneous due to areas of hemorrhage, necrosis, or cystic change with punctate, linear capsular, or coarse intratumoral calcifications possible. CT characteristics of thymoma can vary according to lesion grade, with vascular invasion, pleural and pericardial involvement more common with higher-grade lesions. While imaging overlap is present, higher grade tumors tend to be larger, have lobular or irregular contour, areas of cystic or necrotic change, areas of calcification, and evidence of infiltration of surrounding fat [9].

Thymoma-associated para-neoplastic neurological diseases are myasthenia gravis, acquired neuromyotonia (Isaacs' syndrome), encephalitis, Morvan's syndrome, and myositis. Myasthenia gravis (MG) is by far the most common of these diseases, as 15 to 20% of MG patients have a thymoma, while 24.5-40% of thymoma patients develop MG [10].

When Thymoma is suspected the mainstay of diagnosis is a CECT scan and is performed to evaluate the size and local spread of the tumor. However, FNAC and biopsy is required to confirm diagnosis [11].

The great morphologic variability and heterogeneity of neoplastic epithelial cells in thymus epithelial tumors has rendered the histologic classification a difficult and highly controversial field in pathology. It is widely accepted that stage is the most important prognostic factor. but the role of histology as an independent prognostic factor has been controversial. Therefore, Masaoka-Koga Staging System (Table 1) and World Health Organization (Table 2) developed a classification system according to the histologic type of thymoma based on cytological features of normal thymic epithelial cells and neoplastic cells [12]. The present case of thymoma was biopsy confirmed lymphocyte rich type B. The primary treatment for patients with thymoma or thymic carcinoma is surgical resection with en bloc resection for invasive tumors, if possible. Depending on tumor stage, multimodality treatment options including the use of radiation therapy and chemotherapy with or without surgery may be used. The optimal strategy for induction therapy, which minimizes operative morbidity and mortality and optimizes resectability rates and ultimately survival [13-15].

In conclusion, thymoma and thymic carcinoma are frequently present at advanced stages. Thymomas and thymic carcinomas are rare cancers thymus originate fron epithelium and lymphocytes. Patients with thymomas usually present in one of three ways, with symptoms consistent with an anterior mediastinal mass (30%), with Myasthenia Gravis (40%), or as incidental findings in asymptomatic individuals (30%). Late Masaoka-Koga staging and histology types are significantly associated with extended overall survival. The prognosis of thymoma or thymic carcinoma depends upon the stage of disease and the histologic type of the tumour. Thymectomy is the initial treatment for all patients with a thymoma.

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