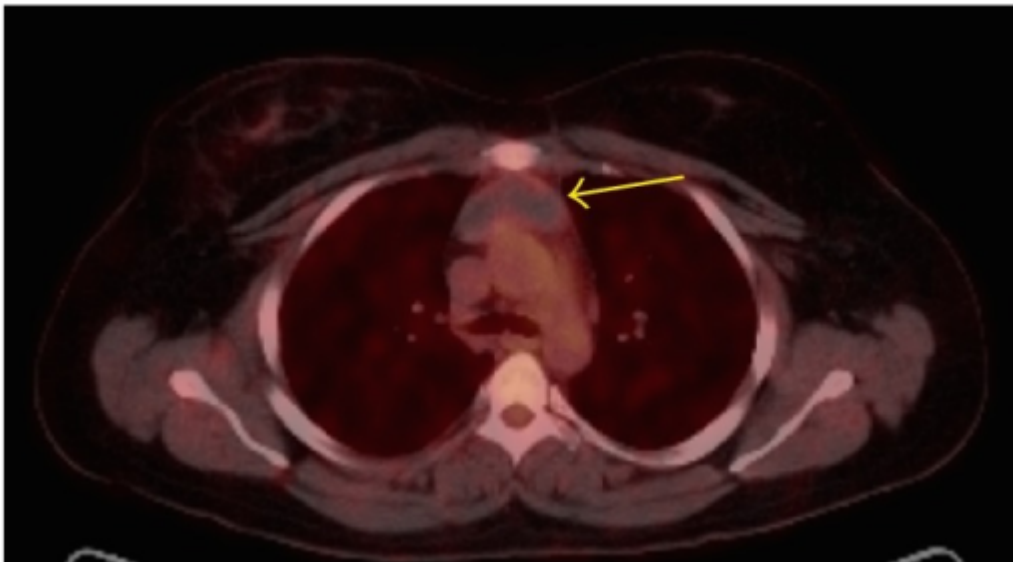


Imaging of the Mediastinum

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Mediastinal masses can be benign cysts, neurogenic tumors, germ cell neoplasms, thymomas or lymphomas. The mediastinum is demarcated by the pleural cavities laterally. Superior to the mediastinum, you find the thoracic inlet. The mediastinum is usually divided into three main compartments: anterior, middle and posterior. This anatomical classification of the mediastinum is useful for the radiologist as the differential diagnoses of a mediastinal mass are dependent on the anatomical location of the mass—among other factors.



Anatomy

The mediastinum is a part of the chest cavity bounded by the sternum anteriorly, the vertebrae posteriorly and the medial surfaces of the visceral pleura (mediastinal pleural reflection). **It is divided into:**

- Anterior mediastinum that lies anterior to the pericardium
- Middle mediastinum that houses the heart and the large vessels
- Posterior mediastinum that lies behind the pericardial surface

Differential Diagnosis of Mediastinal Mass

The anterior mediastinum houses masses from the thyroid, thymus and teratodermoid which may include pathologies such as:

1. Retrosternal thyroid
2. Thymic tumors

3. Enlarged mediastinal lymph nodes
4. Aortic aneurysm
5. Dermoid teratomas
6. Masses from the sternum, such as bone metastasis
7. Pericardial fat

The middle mediastinum is marked by pathologies such as:

1. Bronchogenic cysts
2. Lymphadenopathy
3. Aortic aneurysms

The posterior mediastinum is characterized by pathologies such as:

1. Paravertebral abscess
2. Hiatal hernia
3. Myeloma
4. Neurogenic tumor
5. Hematoma following trauma

Clinical Presentation of a Mediastinal Mass

An anterior mediastinal mass is most likely a thymoma, a teratoma or a lymphoma. Congenital cysts typically arise within the middle mediastinal compartment. Neurogenic tumors are usually found within the posterior compartment.

Mediastinal masses typically present with non-specific constitutional symptoms such as fever, fatigue, and malaise. **Mood changes are also common in thyroid tumors and cardiac tumors.** Chest pain and dyspnea have also been reported.

The invasion of adjacent structures within the pleural cavities or a nervous plexus can give more information about the location of the tumor.

Note: In some patients, the presenting symptoms are attributed to the invaded structures' compromise rather than the tumor itself. Systemic symptoms and paraneoplastic syndromes are also commonly seen with mediastinal tumors as a significant proportion of them can be functional.

Imaging Modalities for the Diagnostic Workup of a Mediastinal Mass

Radiography

A mediastinal mass is usually first seen on conventional radiography. However, the radiological features of a **mediastinal mass on a conventional chest x-ray are usually not specific enough** to point towards a diagnosis. Therefore, a follow-up computed tomography (CT) scan and magnetic resonance imaging (MRI) should be performed to better visualize and characterize the mass.

Computed tomography (CT)

Computed tomography scanning of the mediastinum, especially with multidetector CT, has been proven to be very accurate in the identification of the location of the mass. The

degree and variability of attenuation of the tumor on the CT scan are dependent on the air, fat, water and calcium content of the tumor. Therefore, characterization of the tumors according to the different patterns of attenuation on the CT scan is helpful in differentiating them.

Magnetic resonance imaging (MRI)

Conventional MRI is **usually used to visualize the tumors and sometimes characterize them**. Chemical-shift MRI has been found to be superior in the differentiation between malignant thymic neoplasia and thymic hyperplasia compared to other imaging modalities. Diffusion-weighted MRI has been also used for the evaluation of mediastinal masses.

Mediastinal Lipoma

These benign tumors are typically found in the anterior mediastinum. A lipoma **typically shows homogenous attenuation on a computed tomography scan with an attenuation value of -100 HU** (fat attenuation). Malignant liposarcoma is usually heterogeneous on CT and MRI. A malignant liposarcoma is typically found in the posterior compartment of the mediastinum.

A lipoma might be confined to the thymus, known as a thymolipoma. These are benign tumors are **typically seen in young adults**. Thymolipomas have been linked to an increased risk of myasthenia gravis and Graves' disease. A computed tomography scan typically reveals a well-encapsulated tumor within the thymus that consists of 50 to 70 % fat. Fibrous septa within the mass might be appreciated on MRI.

Cystic Mediastinal Masses

Benign mediastinal cysts represent up to 20 % of all mediastinal tumors. These cysts **are usually benign and show a smooth regular border**. They are oval and show a homogenous attenuation on CT and a homogenous intensity on MRI. The intensity on T2-weighted MRI images is high which is caused by the fluid that is filling the cyst.

When a cystic lesion is recognized on a computed tomography scan or an MRI study, one should take caution as they **might represent degenerative cystic changes of a solid tumor**. Fortunately, the accuracy and quality of the images produced by high-resolution multidetector and multiplanar CT or MRI have made this error unlikely to happen in modern-day practice.

Bronchogenic cyst

Another mediastinal cyst is known as a bronchogenic cyst. These cysts arise from the tracheobronchial tree during embryogenesis and are considered as a congenital cyst rather than an acquired one. They might be symptomatic. The **main symptoms of a bronchogenic cyst include cough, shortness of breath and chest pain**. Secondary bacterial infection of a bronchogenic cyst is common and can present with fever and cough. These cysts are typically found near the carina or within the paratracheal region.

Duplication cyst

Duplication cysts are rare and they can be seen in the mediastinum. They might contain

gastric or pancreatic tissue, and hemorrhage within the cyst is a possible complication.

Note: CT and MRI cannot differentiate between bronchogenic and duplication cysts; however, the location of duplication cysts is quite different. Duplication cysts are usually found near the esophagus.

Neuroenteric cyst

Patients with neurofibromatosis might have a neuroenteric cyst. A neuroenteric cyst is a **protrusion of the leptomeninges through the intervertebral foramen**. Patients with congenital vertebral body defects might have a neuroenteric cyst protruding from the defect.

Pericardial cysts are simple unilocular cysts that have a homogenous appearance on CT and MRI. These cysts are typically found within the right cardiophrenic space.

Pancreatic pseudocyst

Patients who develop pancreatitis are at risk of developing a pancreatic pseudocyst. These pseudocysts **might protrude through the aortic hiatus into the mediastinum**. CT will reveal a cystic mass that is fluid-filled within the posterior mediastinum. The cyst is usually in continuity with peripancreatic fluid collections.

Solid Mediastinal Masses

A mediastinal goiter is an uncommon presentation of a huge thyroid goiter that has expanded to the anterior or superior mediastinum. **A computed tomography scan will reveal an encapsulated tumor that is cystic** and shows heterogeneity in attenuation. The continuity of the mass with the thyroid gland and the clinical presentation of the patient will help in the confirmation of the thyroid origin of the mass.

Thymic hyperplasia

Thymic hyperplasia is seen in patients who are recovering from corticosteroid therapy, those who have received chemotherapy, and those with autoimmune disease. A computed tomography scan typically reveals a normal thymus in 40 % of the patients. **Up to 35 % of the patients will have a homogenous enlarged thymus** while others might have a focal thymic lesion. To differentiate between thymic hyperplasia and thymic malignant neoplasia, chemical-shift MRI is used. The main CT features suggestive of malignancy are calcifications, the nodular appearance of the thymus and focality.

Thymomas are the most common malignant solid mediastinal tumor. Thymomas typically appear homogenous and well-demarcated on CT. Calcification is commonly seen.

Note: MRI typically reveals a heterogeneous hypointense mass on T1-weighted images and a homogenous hyperintense mass on T2-weighted images.

On the other hand, a thymic carcinoma typically has features suggestive of necrotic or cystic degeneration on CT. They usually have ill-defined borders and do not have a capsule.

Mediastinal lymphomas are usually found within the anterior mediastinum. They **appear as homogenous soft-tissue masses on CT** and can be iso-intense or hyperintense on T1 and T2 weighted MRI.

Teratomas are the most common type of germ cell tumors found within the

mediastinum. They are usually cystic with soft tissue and fat components. Calcifications are also common. Because of the variability of the contents of the teratoma, they appear as heterogeneous masses on MRI and CT.

Neurogenic tumors of the mediastinum are more common in children. They arise within the posterior compartment and include Schwannoma and paraganglioma. They can be well-defined or ill-defined small tumors with a homogenous appearance on CT. **Cystic, hemorrhagic or calcific changes can also be seen in neurogenic tumors on CT.** They typically appear as a heterogeneous mass on T2-weighted images and are hyperintense.

References

Juanpere S, Cañete N, Ortuño P, Martínez S, Sanchez G, Bernado L. A diagnostic approach to the mediastinal masses. Insights into Imaging. 2013;4(1):29-52. doi:10.1007/s13244-012-0201-0.

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