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Pediatric Mediastinal Tumors and Tumor-Like Lesions

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This article reviews the imaging findings of pediatric mediastinal tumors and tumor-like lesions. The classification of the mediastinum is discussed with normal imaging appearance of the thymus in pediatric age group followed by a discussion on multiple mediastinal lesions in different compartments with emphasis on their imaging characteristics.
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Introduction

Mediastinal masses in children are uncommon and composed of a heterogeneous group of etiologies including congenital, infectious, and neoplastic lesions. These masses vary in size from small asymptomatic lesions to large lesions that may cause airway compression. Patients with large mediastinal mass typically present with respiratory symptoms.[1] Both benign and malignant tumors occur in the mediastinum and include neurogenic tumors, lymphoma, germ cell tumors, thymoma, lipoma, etc. Cystic lesions of the mediastinum include bronchogenic, thymic, and duplication cysts. Normal thymus or thymic hyperplasia may be confused with a tumor in the young children. Imaging plays a vital role in these cases by localizing the lesions in a mediastinal compartment (anterior, middle, or posterior) and providing the diagnosis based on the specific imaging features. Large mediastinal tumors are more likely to cause airway compression in children than adults because of the small size of the trachea and more compressibility. Hence, timely management of these lesions is critical to avoid respiratory compromise.

Anatomy

The mediastinum is located in the central thorax between pleural cavities laterally, thoracic inlet superiorly, and diaphragm inferiorly.[2] There is no anatomical boundary between the different mediastinal compartments. However, mediastinum is often divided into different compartments to assist in the diagnostic approach for mediastinal masses. Anatomical classification is as follows: superior and inferior mediastinum are divided by an imaginary line extending from the manubrium-sternal joint anteriorly and lower border of T4 vertebra posteriorly. The inferior mediastinum is further subdivided into 3 compartments: anterior mediastinum, which is between sternum and pericardium; posterior mediastinum, which is located between the posterior pericardium and vertebral column; and middle mediastinum, which contains pericardium and its contents with great vessels and trachea.[3]

Felson method of mediastinal division is based on a lateral chest radiograph.[4] There are 2 lines drawn: the anterior line extends from the anterior trachea and the posterior margin of the heart and divides the anterior and middle mediastinum, and the posterior line is drawn 1 cm behind the anterior margin of vertebral bodies and separates the middle and posterior mediastinum.

The International Thymic Malignancy Interest Group has proposed a new classification, which is based on routine cross-sectional imaging, principally computed tomography (CT), and surgery.[5] According to this classification, the mediastinum is divided into 3 compartments: prevascular (anterior), visceral (middle), and paravertebral (posterior) compartments. This classification is used in the article. The boundaries of the different mediastinal compartments and their contents are shown in Figure 1 and described in the Table.

Imaging Evaluation

Imaging is very helpful in the diagnosis and management of mediastinal masses. Posteroanterior and lateral chest radiographs are usually performed first and helpful in localizing the lesion in 1 of the 3 mediastinal compartments. Some of the

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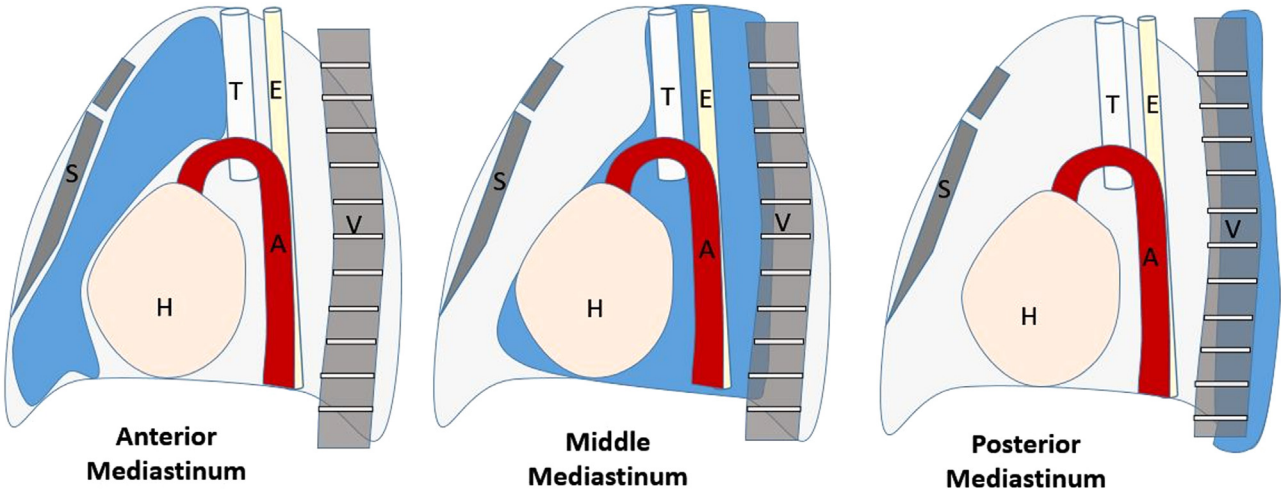

Figure 1 Sagittal line diagrams of the thorax showing boundaries and contents (shaded area) of the anterior, middle, and posterior mediastinum. (Color version of figure is available online.) S, sternum; T, trachea; E, esophagus; H, heart; A, aorta; V, vertebral column.

features are helpful in the characterization of mass on the radiographs, for example, calcification and fat suggest germ cell tumor. However, cross-sectional imaging (CT or magnetic resonance [MR]) is essential for further characterization. CT is usually the cross-sectional imaging modality of choice. MR is more useful to evaluate the extent of posterior mediastinal lesions in the spinal canal. Another important role of MR imaging (MRI) is in the differentiation of cystic from solid masses. Fluorodeoxyglucose-positron emission tomography (PET) is useful in patients with lymphoma.

Thymus

Thymus is a bilobed organ located in the anterior mediastinum and plays an important role in the maturation of T-lymphocytes. Imaging appearance of normal thymus gland varies depending on the age and imaging modality and is important to know to avoid confusion for a true mediastinal mass.

Radiographs

In infants and young children, the thymus is very large and abuts the cardiac silhouette. It is usually seen on radiographs up to 3 years of age.[6] There are 2 important signs of the normal thymus—thymic wave sign: wavy contour of the thymus due to the impression of the anterior ribs on the soft gland and sail sign: triangular projection of the right lobe of the thymus with sharply demarcated base caused by the minor fissure (Fig. 2).[7,8]

Computed Tomography

Thymus has quadrilateral shape with convex margins in children until 5 years of age (Fig. 3). After 5 years of age, thymus becomes triangular in shape with straightening of the margins. After puberty, the thymus has concave margins (Fig. 3).[9] The normal thymus should not cause any mass effect on the mediastinal structures irrespective of its size.

Table Anatomical boundaries with contents of different mediastinal compartments.

Compartment	Boundaries				Contents
	Superior	Inferior	Anterior	Posterior	
Anterior (prevascular)	Thoracic inlet	Diaphragm	Sternum	Anterior aspect of pericardium	Thymus, fat, and lymph nodes
Middle (visceral)	Thoracic inlet	Diaphragm	Anterior aspect of pericardium	Vertical line drawn 1 cm posterior to the anterior cortex of thoracic vertebral bodies	Heart, SVC, ascending or descending aorta and aortic arch, trachea, esophagus, pulmonary vessels, and lymph nodes
Posterior (paravertebral)	Thoracic inlet	Diaphragm	Vertical line drawn 1 cm posterior to the anterior cortex of thoracic vertebral bodies	Vertical line along the posterior chest wall margins at the lateral aspect of the transverse processes	Paravertebral soft tissue

SVC, superior vena cava.