THE PATIENT

18-year-old woman

SIGNS & SYMPTOMS

- Chest pain
- Shortness of breath
- Electrocardiogram abnormality

Cassie Tran, MD; William Haas, MD; William Terrill, MD; Don Nguyen, MD
Allegheny Health Network, Pittsburgh, PA (Drs. Tran, Terrill, and Nguyen); Lake Erie College of Osteopathic Medicine, Erie, PA (Dr. Haas)

tran.cassie@gmail.com

The authors reported no potential conflict of interest relevant to this article.

doi: 10.12788/jfp.0190

THE CASE

An 18-year-old woman with no significant past medical history presented to the emergency department complaining of midsternal chest pain and mild shortness of breath, which had been intermittent for the past several months. She denied any history of deep vein thrombosis or pulmonary embolism risk factors, such as oral contraceptive use.

Laboratory values were within normal limits. An electrocardiogram (EKG), however, showed T-wave inversions in leads V_1 and V_2, and physical examination revealed decreased breath sounds in the right lung base. A chest radiograph and subsequent chest computed tomography (CT) were ordered.

The initial radiograph (**FIGURE 1**) showed a large right anterior mediastinal mass; the CT revealed fat, fluid, soft tissue, and ossification within the mass (**FIGURE 2**). The CT also showed evidence of local mass effect on the right atrium, as well as compressive atelectasis in the adjacent right lung, contributing to the patient's EKG abnormality and physical exam findings.

THE DIAGNOSIS

Based on the patient's clinical history and imaging findings, which were consistent with a benign well-differentiated teratoma, she was given a diagnosis of anterior mediastinal teratoma.

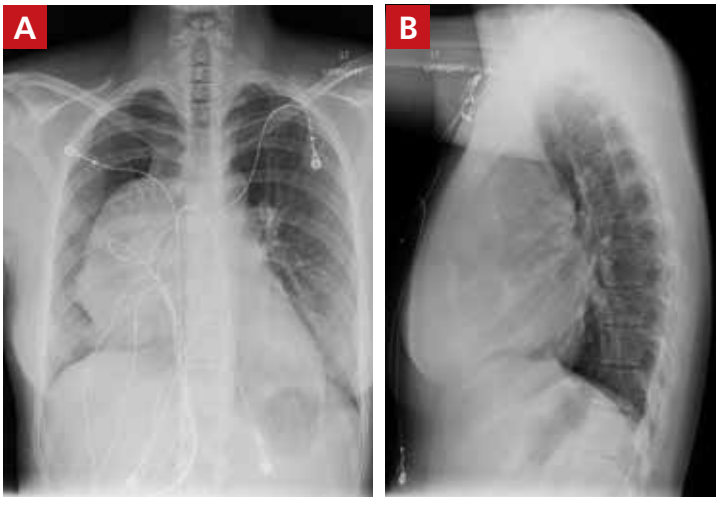
DISCUSSION

Teratomas are tumors composed of pluripotent stem cells that carry elements from all 3 of the embryologic layers (ectoderm, mesoderm, and endoderm).[1] There are 3 classifications of teratomas: mature (well-differentiated), immature (poorly differentiated), and malignant.

Tumors of germ cell origin are rare within the anterior mediastinum, accounting for 1% to 3% of total reported cases.[2] Among anterior mediastinal masses, germ cell tumors such as teratomas, seminomas, and nonseminomatous tumors comprise approximately 15% of adult and 24% of

FIGURE 1

Radiography shows a large mass in the mediastinum

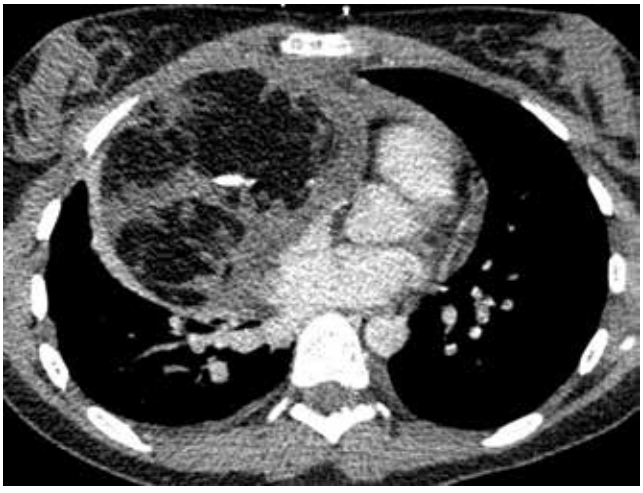


IMAGES COURTESY OF ALLEGHENY HEALTH NETWORK

The frontal view (**A**) showed a large right paracardiac mass with preserved visualization of the right hilar vessels (hilum overlay sign). In addition, there was obliteration of the normal retrosternal fat on the lateral projection (**B**). These findings confirmed the anterior mediastinal location of the mass.

FIGURE 2

Computed tomography differentiates the mass



Axial contrast-enhanced chest computed tomography showed a large, well-circumscribed mass measuring 12.5 x 8.3 x 13.1 cm with soft tissue, fat, fluid, and calcification in the right anterior mediastinum.

pediatric anterior mediastinal tumors.[3]

It is reported that up to 60% of patients with mediastinal teratomas present with no signs or symptoms upon diagnosis.[4] When the mass is large, patients can develop chest pain or shortness of breath relating to tumor mass effect. In rare instances, there can be hemoptysis or trichoptysis, pathognomonic for teratomas with bronchial communication.[5] Physical exam findings are also nonspecific and may include decreased breath sounds secondary to compressive atelectasis with large tumor burden.

Radiographic imaging is essential to elucidate the diagnosis. Chest radiograph can show an intrathoracic mass, and CT can provide further characterization, such as density and precise location.

Location of mass guides differential

Localizing an intrathoracic mass in the anterior, middle, or posterior mediastinum allows for narrowing of the differential diagnosis (**TABLE**[6]). The main diagnostic consideration for a middle mediastinal or hilar mass is primary carcinoma. Posterior mediastinal masses, on the other hand, are generally of benign etiology and may include neurogenic tumors, foregut duplication cysts, or, in rare cases, extramedullary hematopoiesis.

The differential diagnosis of anterior mediastinal masses can be separated into 4 main categories of disease, colloquially known as the "4 Ts":

Teratoma. Mixed tissue densities seen on CT relate to the multiple tissue types originating from the embryologic germ cell layers. Frequently, there will be fat, fluid, and calcifications.

Thyroid pathology. A goiter or thyroid cancer can manifest with endocrine dysfunction, such as thyroid-stimulating hormone and T3/T4 abnormalities. A thyroid mass tends to sit more superiorly than do other anterior mediastinal masses and may be confirmed using a nuclear scan looking for increased radioactive iodine uptake.

Thymoma. The diagnostic features include parathymic syndromes such as myasthenia gravis (30%-50% of thymoma cases[7,8]) and pure red cell aplasia (5% of thymoma cases[9]).

"Terrible" lymphoma. The most effective way to differentiate an anterior mediastinal mass due to lymphadenopathy (secondary to lymphoma) is to perform a tissue sample biopsy.

Also consider, as part of the differential for anterior mediastinal masses, such things as mesenchymal tumors, Morgagni hernia (anterior diaphragmatic defect), and pericardial cysts (fluid attenuating and usually located at the right cardiophrenic angle).

Surgical resection is effective

The treatment for anterior mediastinal teratoma is surgical resection.[10] A complete surgical resection is typically curative and provides adequate therapy for symptom resolution.

The standard surgical approach involves gaining access to the anterior mediastinum via a median sternotomy. When there is extensive tumor involvement of the hemithorax, clamshell thoracotomy is preferred, requiring incisions in both the left and right hemithoraxes.[11]

Our patient underwent resection of the tumor; the subsequent pathology report for the specimen (**FIGURE 3**) confirmed the diag-

TABLE

Using the mass's location to guide the differential[6]

Location	Anatomical boundaries	Physiological content	Differential diagnosis
Anterior mediastinum	Anterior border: Sternal body Posterior border: Pericardium and great vessels	Thymus gland Retrosternal thyroid Internal thoracic artery Lymph nodes and lymphatics	"The 4 *T*s": • **T**eratoma • **T**hyroid pathology • **T**hymoma • **T**errible lymphoma Morgagni hernia Mesenchymal tumors Pericardial cyst
Middle mediastinum	Anterior border: Pericardium Posterior border: Anterior aspect of thoracic spine	Heart Great vessels Trachea Phrenic nerve	Lymphadenopathy Benign cystic tumors Cardiovascular aneurysm
Posterior mediastinum	Anterior border: Anterior aspect of thoracic spine Posterior border: Tip of spinous processes	Esophagus Intercostal muscles Sympathetic chain Thoracic duct Descending thoracic aorta Azygous/hemiazygos vein Vagus nerve	Neurogenic tumors Foregut duplication cysts Meningocele Spinal lesions Extramedullary hematopoiesis Esophageal tumor

nosis. There was no abnormal enhancement or vascular invasion to suggest aggressive or malignant potential.

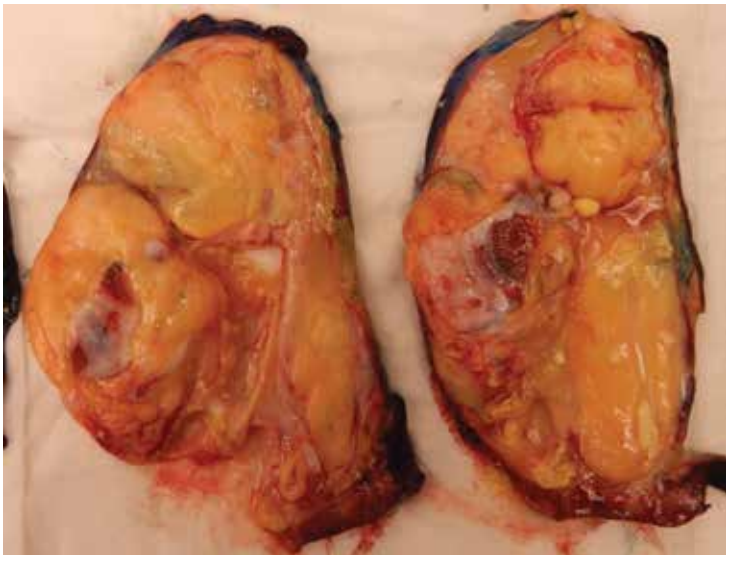
THE TAKEAWAY

Patients frequently present with nonspecific and vague chest complaints. This case points to the importance of obtaining a thorough clinical history and conducting a complete physical examination to guide additional work-up and radiographic imaging. **JFP**

CORRESPONDENCE
Cassie Tran, MD, 320 E North Avenue, Pittsburgh, PA 15212; tran.cassie@gmail.com

FIGURE 3

The resected tumor



The gross specimen of the sectioned teratoma showed mostly adipose tissue, with areas of bone and cartilage formation.

CONTINUED ON PAGE 203

REFERENCES

1. Chen C, Zheng H, Jiang S. An unusual case of giant mediastinal teratoma with malignant transformation. *Ann Thorac Surg.* 2008;86:302-304.
2. Nichols CR. Mediastinal germ cell tumors: clinical features and biologic correlates. *Chest.* 1991;99:472. doi: 10.1378/chest.99.2.472

CONTINUED FROM PAGE 199

3. Mulen B, Richardson JD. Primary anterior mediastinal tumors in children and adults. *Ann Thorac Surg*. 1986;42:338. doi: 10.1016/S0003-4975(10)62751-8
4. Carter B, Okumura M, Detterbeck F, et al. Approaching the patient with an anterior mediastinal mass: a guide for radiologists. *J Thorac Oncol*. 2014;9 (9 suppl 2):S100-S118.
5. Dar RA, Mushtaque M, Wani SH, et al. Giant intrapulmonary teratoma: a rare case. *Case Rep Pulmonol*. 2011;2011:298653.
6. Whitten C, Khan S, Munneke G, et al. A diagnostic approach to mediastinal abnormalities. *RadioGraphics*. 2007;27:657-672.
7. Osserman KE, Genkins G. Studies in myasthenia gravis: review of a 20-year experience in over 1200 patients. *Mt Sinai J Med*. 1971;38:497-537.
8. Marx A, Muller-Hermelink HK, Strobel P. The role of thymomas in the development of myasthenia gravis. *Ann NY Acad Sci*. 2003;998:223-236.
9. Rosai J, Levine GD. Tumors of the thymus. In: Firminger HI, ed. *Atlas of Tumor Pathology*. Washington, DC: Armed Forces Institute of Pathology; 1976: 34-212.
10. Yendamuri S. Resection of a giant mediastinal teratoma. *Ann Thorac Surg*. 2016;102:e401-e402.
11. Yokoyama Y, Chen F, Date H. Surgical resection of a giant mediastinal teratoma occupying the entire left hemithorax. *Gen Thorac Cardiovasc Surg*. 2014;62:255-257.