Diffuse Mediastinal Widening on the Chest Radiograph: How to Narrow the Differential Diagnosis

Ian Russell, Pierre Maldjian
Rutgers – New Jersey Medical School
Department of Radiology

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Even the most experienced radiologist may find it challenging to formulate a pertinent differential diagnosis when confronted with a case of diffuse mediastinal widening on a chest radiograph.

The purpose of this presentation is to:

1. Illustrate various causes of diffuse mediastinal widening on chest radiography
2. Correlate the radiographic appearance with findings on CT
3. Describe the key radiographic features and clinical information (when relevant) that suggest the correct diagnosis.
40 year-old man with a “mediastinal mass” on chest radiograph.

Chest radiograph shows smooth mediastinal widening. Axial images and volume rendered view from CT show a right aortic arch (green arrow) with a large diverticulum of Kommerell (white arrow) which gives rise to an aberrant left subclavian artery (blue arrow). Descending thoracic aorta is left-sided.

Key Radiographic Findings: Indentation on right side of trachea due to right aortic arch (yellow arrow), smooth anterior bowing of trachea on lateral view (green arrow) due to aortic arch passing posterior to the esophagus indicate an aberrant left subclavian artery.
64 year-old man with hepatitis C, cirrhosis and hepatocellular carcinoma. Bulging mediastinal mass on chest radiograph.

Chest radiograph demonstrates a retrocardiac mass (green arrows). CT demonstrates paraesophageal varices.

Key Radiographic Findings: In a cirrhotic patient, a posterior mediastinal mass can be an indication of paraesophageal varices. Typically the “mass” surrounds the esophageal hiatus resembling a hiatal hernia. The dilated azygos vein (yellow arrow) is also a clue indicating portal shunting towards the systemic venous circulation.
A 47-year-old man presents to ER with chest pain. Patient had trauma to chest two years prior from motor vehicle collision.

Chest radiograph demonstrates a large anterior mediastinal mass (red arrow). CT shows a large pseudoaneurysm with peripheral thrombus (yellow arrow) projecting from the ascending aorta.

Key Radiographic Findings:
Clinical history is important in this case, as the history of trauma in a patient with a mediastinal mass in contact with the aorta should raise suspicion for the possibility of vascular injury.
A 27-year-old woman, pedestrian struck by a motor vehicle.

Chest radiograph demonstrates a rounded opacity in the right paratracheal region (blue arrow) typical of an enlarged azygos vein.

Key Radiographic Findings: Azygos continuation of the IVC is a common cause of azygos vein enlargement. On CT, this can be identified by absence of an intrahepatic IVC (yellow arrow) with an enlarged azygos vein (red arrow) in the upper abdomen that drains to the superior vena cava in the chest via an enlarged azygos arch (green arrow).

44 year-old woman with substernal chest pain, nausea and vomiting.

Chest radiographs demonstrate an elongated mass overlying the right mediastinum. CT shows a massively dilated esophagus with an air-fluid level (orange arrow) due to achalasia.

Key Radiographic Findings: Elongated mass extending nearly the entire length of the thorax producing a double density over the right heart border (green arrow), mass situated behind the trachea on the lateral view corresponding to the location of the esophagus, air-fluid level (orange arrows) due to distal esophageal obstruction.

51 year-old man with history of alcohol dependence. Presented with chest and abdominal pain radiating to back after multiple episodes of vomiting bright red blood.

Key Radiographic Findings: A patient with a history of vomiting, a left sided pleural effusion, a widened mediastinum, and pneumomediastinum is strongly suspicious for Boerhaave Syndrome. CT can confirm the presence extraluminal air adjacent to the esophagus (green arrow) and pneumomediastinum (yellow arrow).

37 year-old woman with air filled mediastinal mass on chest radiograph. No current complaints. History of lye ingestion.

Key Radiographic Findings: On the lateral view, haustral markings (red arrow) indicate the presence of a colonic interposition which was placed to bypass an esophageal stricture (a complication of lye ingestion). The colonic folds are well demonstrated on CT.

57 year-old man. History of esophageal neoplasm.

Radiograph of the chest demonstrates a widened mediastinum, with an elongated, rounded opacity, which extends to the upper abdomen (green arrow).

Key Radiographic Findings:
A saccular mediastinal opacity extending below the diaphragm can be a clue that the patient has undergone a gastric pull-up procedure. Surgical clips or rib abnormalities can be signs that the patient has had a prior thoracotomy. (Note old fracture of the right posterior fourth rib (yellow arrow)). CT demonstrates contrast material within the intrathoracic stomach (blue arrow).
Key Radiographic Findings: Smooth mediastinal widening without mass effect and a large amount of subcutaneous fat are typical findings associated with mediastinal lipomatosis.

42 year-old woman status post motorcycle collision. No complaints at time of examination.

Chest radiograph demonstrates enlarged paratracheal and hilar opacities.

**Key Radiographic Findings:** Chest radiograph shows the classic “1-2-3” sign of Sarcoidosis: right and left hilar lymph nodes (blue arrows) and right paratracheal lymphadenopathy (red arrow). The hilar lymphadenopathy is bulky (“potato nodes”), symmetric bilaterally and does not abut the cardiac border, distinguishing it from lymphoma. CT confirms bulky hilar, mediastinal and subcarinal lymphadenopathy.

38 year-old woman with cough

Chest radiograph demonstrates non-specific widening of the mediastinum.

Key Radiographic Findings: Mediastinal fibrosis can be difficult to diagnose solely on the basis of radiography. Obliteration of the normal anatomic planes of the mediastinum can be one feature. Fibrosing mediastinitis can also demonstrate calcification in some cases. On CT, soft tissue density encasing mediastinal structures is typical (red arrows).

52 year-old woman with chest pain.

Chest radiograph shows a widened mediastinum, with rightward deviation of the trachea (blue arrows). CT shows a large thyroid goiter (yellow arrows).

Key Radiographic Findings: tracheal deviation (blue arrow) and the hilum overlay sign (green arrow) are indications that there is a mass extending down from the thoracic inlet into the anterior mediastinum.

Since the pulmonary hilum is visible through the mass, the mass is not in direct contact with the hilum, but could be anterior or posterior to the hilum (hilum overlay sign). The clear delineation of the descending thoracic aorta (a posterior structure) and obscuration of the upper left cardiac border (an anterior structure) localize the lesion to the anterior mediastinum.
29 year-old woman with cervical lymphadenopathy on physical examination.

The chest radiograph shows lobular mediastinal widening with involvement of the anterior mediastinum (pink arrow). CT confirms mediastinal adenopathy extending to the anterior mediastinum.

**Key Radiographic Findings:** Lobular mediastinal widening can indicate lymphadenopathy. Involvement of the anterior mediastinum is typical of lymphoma, especially Hodgkin’s lymphoma, as in this patient.
55 year-old man complaining of a 1-month history of chest pain and right shoulder pain

Chest radiograph demonstrates asymmetric right paratracheal mass (green arrow). There is also elevation of the right hemidiaphragm. CT shows mediastinal lymphadenopathy with obstruction of the SVC (pink arrow) in this patient with metastatic lung cancer.

Key Radiographic Findings: Asymmetric lymphadenopathy should raise concern for a localized neoplasm with metastases to regional nodes. There is also elevation of the right hemidiaphragm (red arrow) indicating involvement of the phrenic nerve.
57 year-old man presenting non-emergently with chest pain and shortness of breath.

On chest radiography, a widened mediastinum with a right paratracheal mass is identified (red arrow). CT shows mediastinal lymphadenopathy with obstruction of the SVC.

Key Radiographic Findings: This radiograph demonstrates a right paratracheal mass and destruction of a contralateral posterior rib (yellow arrow). This is highly suggestive of a metastatic neoplasm. Small cell lung neoplasm often presents with advanced mediastinal adenopathy and metastatic disease, as in this patient. It is also the most common malignancy associated with SVC syndrome.
23 year-old woman. Pedestrian struck by motor vehicle.

Chest radiograph demonstrates a superior/posterior mediastinal mass (green arrows). CT shows bilateral lobular posterior mediastinal masses extending from the paravertebral regions (blue arrows).

Key Radiographic Findings: Multiple “lumpy” posterior mediastinal masses are suggestive of neurofibromatosis as in this patient with NF1.

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Chest radiograph demonstrates paraspinal widening of the mediastinum with deformity of a lower thoracic vertebral body (yellow arrows). CT demonstrates a paraspinal hematoma (green arrows) surrounding the vertebral body fracture (red arrow).

Key Radiographic Findings: Clinical history of trauma is important. Widening of the paraspinal lines with loss of vertebral height is an indication of paraspinal hematoma from vertebral fracture.
70 year-old female presenting with chest pain and dizziness while working with cleaning products in her bathroom.

Mediastinal widening is demonstrated on chest radiograph. CT shows type A dissection, with dissection flap extending to the descending aorta (pink arrow).

Key Radiographic Findings: The chest radiograph demonstrates widening of the mediastinum with a displaced intimal calcification (yellow arrows) which should raise suspicion for aortic dissection.
28 year-old woman status post central line placement attempt.

Initial chest radiograph demonstrates a widened mediastinum. Follow up chest radiograph after a few hours demonstrates markedly increased widening of the mediastinum. CT confirms a large mediastinal hematoma (green arrows).

Key Radiographic Findings: Rapid interval change is a strong indication of active hemorrhage. This patient had undergone recent placement of a central catheter, which was initially attempted on the right and then placed on the left. Angiography demonstrates injury to the brachiocephalic artery (red arrow).
51-year-old woman with a history of HIV who presented with lymphadenopathy on physical examination

Chest radiograph demonstrates mediastinal lymphadenopathy (blue arrow).

Key Radiographic Findings: Low attenuation lymphadenopathy on CT with peripheral enhancement (yellow arrows) is typical of tuberculosis.
37 year-old woman presenting with back pain, history of intravenous drug abuse.

Chest radiographs show a widened mediastinum with collapsed thoracic vertebrae.

Key Radiographic Findings: In conjunction with the provided clinical history, the collapsed vertebral bodies (red arrow) with mediastinal widening strongly suggest vertebral osteomyelitis with paravertebral abscess. CT shows destruction of a vertebral body (green arrow) with surrounding soft tissue opacity. On the T2-weighted sagittal MR image, there is significant bone marrow edema arising from the intervertebral disc space with destruction of the adjacent vertebral bodies (pink arrow) and paravertebral abscess (yellow arrow).
45 year-old man status post CABG 3 weeks prior

Chest radiographs demonstrate a widened mediastinum with an anterior mediastinal opacity containing foci of air (pink arrow) in a patient who has had a sternotomy. An air-containing abscess is confirmed on the CT image (green arrow).

Key Radiographic Findings: The presence of air within a mediastinal collection greater than 2 weeks after sternotomy is suspicious for abscess formation.


Bone metastases in patients with small cell lung carcinoma: rate of development, early versus late onset, modality of treatment, and their impact on survival.

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Author’s Contact Information:

• Ian Russell – ir174@njms.Rutgers.edu