Mediastinal Interfaces and Lines: Clinical Significance and Radiographic-CT Correlation

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Mediastinal interfaces on a chest radiograph result from contact between mediastinal structures and the adjacent lung, while mediastinal lines result from contact between the two lungs across the midline. A variation of mediastinal interface is mediastinal stripe, a narrow band produced by contact of both sides of a mediastinal structure with the lungs. Alterations in mediastinal interfaces and lines may be due to variations in normal anatomy, or may reflect the presence of abnormalities within the mediastinum. Familiarity with the various normal mediastinal interfaces and lines, and the changes that occur with disease is important for the interpretation of the chest radiograph and in the diagnosis of mediastinal abnormalities. The purpose of this pictorial essay is to illustrate the most important normal and abnormal interfaces and lines and also to correlate radiographic and CT findings.

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Contact of the lung with the various mediastinal structures provides many kinds of mediastinal interfaces and lines. A chest radiograph, by showing normal and abnormal mediastinal interfaces and lines, reflects the anatomic status of a patient mediastinum and gives information on further diagnostic work-up. By showing cross-sectional images of the mediastinum and lung, CT can visualize and explain the formation of normal and abnormal mediastinal interfaces and lines.

There are two true mediastinal lines: the anterior and posterior junction lines; many kinds of mediastinal interfaces can be shown on normal and abnormal chest radiographs. In this exhibit, we will first describe the mediastinal lines, then the mediastinal interfaces. Only those mediastinal interfaces that are clinically important will be addressed. They will be subdivided into those in the supraazygous, infraazygous, supraaortic and infraaortic areas, as described by Heitzman et al (1) and will be described in that order.

Mediastinal Lines

Anterior Junctional Line

The anteromedial right and left lungs approach the midline and forms the anterior junctional line. If the lungs do not meet each other closely to form a line, a bandlike stripe is formed (Fig. 1). Above and below the junctional line, the right and left lungs contact the retromanubrial anterior mediastinal fat rather than contralateral lung, thus forming an interface instead of forming a true line. This interface, above and below the true junctional line was called superior (V-shaped configuration) and inferior (inverted V-shaped configuration) recess of anterior junctional reflection by Proto (2, 3) (Fig. 1, 2). The interfaces of the superior and inferior recess usually shows medial convexity (Fig. 1, 2).

Effacement and distortion of the anterior junctional line or lateral convexity of the interface of the superior and inferior recess suggests the possibility of mediastinal abnormality (Fig. 3). Anterior junctional line may be displaced and visualized prominently when a lobe or lung is atelectatic and contralateral lobe or lung herniates through the anterior mediastinum (Fig. 4).
Posterior Junctional Line

The posteromedial upper right and left lungs approach the midline in front of the spine and behind the esophagus to form the posterior junctional line usually above the azygos and aortic arches (Fig. 2). As in the anterior junctional reflection, the interface, above and below the true junctional line is called superior and inferior recess of posterior junctional reflection. Posterior junctional line rarely forms below the azygos and aortic arch, usually anterior to the esophagus and posterior to the descending aorta when the posteromedial right and left lungs meet each other (2, 4). Air within the lumen of the esophagus along with air in the posteromedial lungs may delineate the esophageal walls such that a band-like density denoting esophageal wall may be observed.

Posterior junctional line may be distorted by mediastinal disease and especially by esophageal abnormality.

Mediastinal Interfaces

Supraazygous Area

Superior Vena Cava Interface

The superior vena cava (SVC) usually indents the lateral right lung and forms an interface on posterior-anterior (PA) radiograph. This interface merges with the border of the right atrium. The great vessels (right subclavian artery) of the aortic arch become ectatic and tortuous as the patients get old, further displacing the interface laterally. In this case, differentiation of SVC interface from atelectasis of the right upper lobe and

Fig. 1. Chest radiograph demonstrating anterior junctional line and recesses (arrows) and posterior junctional line and recesses (arrowheads). Anterior junctional line is oblique from right to left whereas posterior junctional line is vertical. Anterior junctional line is inferior to posterior junctional line which is most frequently seen in supraaortic area.

Fig. 2. Chest radiograph showing superior recesses of anterior junctional complex (arrowheads) rather than line. When two superior recesses meet together anteriorly, they form anterior junctional line (arrows).

Fig. 3. Lateral convexity of superior recess of anterior junctional complex due to anterior mediastinal mass.
A. Chest radiograph shows widening of superior mediastinum. Lateral convexity of superior recess of anterior junctional complex (arrow) is seen right lateral to sternal shadow (arrowhead).
B. Enhanced conventional (10-mm collimation) CT scan obtained at level of aortic arch demonstrates anterior mediastinal mass (tuberculous lymphadenitis), with lateral displacement of anterior lung.
mediastinal abnormality is difficult. Imperceptible tapering of the interface superior to the clavicle (due to horizontal course of the innominate vein rather than vertical at this level) and arcuate course of the interface on lateral view are useful signs favoring the diagnosis of SVC interface (Fig. 5) rather than abnormalities in the right upper lobe or the mediastinum (1).

Right Paratracheal Stripe
Contact of the tracheal wall (sometimes along with areolar tissue, fat and small lymph nodes) with air both in the right lung and in tracheal lumen produces right paratracheal stripe. The stripe is usually not more than 4 mm in thickness (1, 2).

Localized thickening of the stripe and change in its thickness on serial examinations are important signs that indicate abnormalities in paratracheal area (Fig. 6).

Azygos (Tracheobronchial angle) Node vs. Azygos Vein
A mass in the right tracheobronchial angle, extending cephalad from azygos arch, is usually due to lymph...
node enlargement (Fig. 6) whereas a mass beneath the arch is due to dilated azygos arch (Fig. 7) (1, 2). In addition, azygos arch is always situated lateral to the azygos node, thus deviating the SVC laterally (since azygos arch drains into the SVC) with extensive adenopathy in the right tracheobronchial angle (2).

Infraazygous Area
Azygoesophageal Recess Interface
The azygoesophageal recess refers to the posteromedial right lower lobe of the lung, which lies lateral and posterior to the esophagus and in front of the spine and the ascending portion of the azygos vein (5, 6). It is bounded cephalad by the azygos arch and caudad by the diaphragm. Contact of the lung in the azygoesophageal recess with the mediastinum produces azygoesophageal recess interface. The azygos vein usually borders the recess. The esophagus or mediastinal fat sometimes borders the recess especially in caudal level. On chest radiograph, the interface is usually straight in young adults. As age increases, it tends to be shown as a smooth arc with convexity to the left. Sigmoid shape
with midline cross may be noted in an aged person (5).

Right-sided and downward displacement of the interface beneath the carina may be observed with subcarinal adenopathy (usually more than 2.5 cm in diameter) (5, 7) and bronchogenic cyst in subcarinal area. Lymphadenopathy less than 2.5 cm in diameter usually does not displace the interface. With left atrial enlargement, obliteration of the interface at T8-10 level may be observed (5). Focal right-sided bulging of the interface is observed with abnormality in the esophagus (Fig. 8). Dilatation of the esophagus (due to achalasia, previous esophageal surgery, or distal esophageal obstruction) or azygos vein (congenital or acquired) (Fig. 7) and esophageal hial hernia may cause the interface to be displaced laterally. Posterior herniation of the right lung may occur when the left lung loses its volume extensively. The herniation usually occurs between the esophagus anteriorly and the azygos vein or the vertebral body posteriorly.

**Supraaortic Area**

**Aortopulmonary Interface**

Contact of the anteromedial left lung with left anterior mediastinum (main pulmonary artery and...
artery and aortic arch cephalad), behind the anterior junctional line and in front of the left subclavian artery interface. This interface extends cephalad from the main pulmonary artery along the aortic arch through the aortic knob. The interface may be convex or straight along the main pulmonary artery (lower portion of the interface) whereas it may appear straight or concave medially through the aortic knob (upper portion) [1].

If the interface projects lateral to the aortic knob, mediastinal abnormality should be considered (Fig. 9).

Presence of a left superior vena cava, left vertical vein or double aortic arch may distort the interface (Fig. 10).

Small projection from the left lateral aspect of the aortic knob, caused by the left superior intercostal vein, is called aortic nipple (Fig. 11). More than 4.5 mm in size of this nipple is abnormal (Fig. 12) and is caused by obstruction mostly of the superior vena cava and rarely of the inferior vena cava.

Left Subclavian Artery Interface
Contact between the ascending first part of the left

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Fig. 10. Lateral displacement of aortopulmonary interface due to left sided superior vena cava.
A. Chest radiograph shows lateral displacement of aortopulmonary interface (arrow). Also note cardiomegaly and redistribution of pulmonary vascularity due to pulmonary venous hypertension.
B. Enhanced conventional (10-mm collimation) CT scans obtained at thoracic inlet demonstrates left sided superior vena cava (arrow) with left lateral displacement of adjacent left lung.

Fig. 11. Normal sized aortic nipple in a 31-year-old man.
A. Chest radiograph shows small lateral projection (arrow) from aortic knob.
B. Mediastinal window of thin-section (1.0-mm collimation) CT scan obtained at level of aortic arch shows superior intercostal vein (arrow) directing anteriorly from accessory hemiazygos vein.
Fig. 12. Enlarged aortic nipple due to superior vena cava obstruction. 
A. Chest radiograph shows enlarged aortic nipple (arrow). 
B. Enhanced conventional (10-mm collimation) CT scan obtained at ventricular level demonstrates dilated hemiazygos vein (arrow) due to obstruction of superior vena cava caused by indwelling catheter. This dilated vein drains into left superior intercostal vein with resultant enlarged aortic nipple.

Fig. 13. Aberrant right subclavian artery in a 51-year-old woman. 
A. Chest radiograph shows unusual interface (arrows) arising from superior portion of aortic knob and directing right superiorly. Tubular density overlapped with tracheal air shadow may represent aberrant artery perse. 
B. Enhanced conventional (10-mm collimation) CT scan obtained at level of great vessels reveals aberrant right subclavian artery (arrow) in retroesophageal area. This vessel appears as retrotracheal rectangular density in chest radiograph.

subclavian artery and anteromedial portion of the left upper lobe produces an interface in supraaortic area. The interface extends upward in curved fashion from the aortic arch. Focal obliteration of the interface suggests the possibility of mediastinal abnormality.

Aberrant right subclavian artery may be identified in the supraaortic area. A linear interface extending from the aortic knob to the right can be observed on frontal radiograph (Fig 13). Additional findings are a stripe through the tracheal air column denoting the vessel per se and mass effect to the right lung in medial aspect of the clavicle on frontal radiograph. On lateral radiograph, the vessel may cause a retrotracheal opacity or indentation of the posterior wall of the trachea (8).

Left Paratracheal Interface
Left paratracheal interface represents contact of the lung with left paratracheal mediastinal fat (94%), proximal 1 – 2 cm of the lateral wall of the left common
Fig. 14. Lateral convexity of aortopulmonary window interface due to lymph node enlargement.
A. Chest radiograph shows lateral convexity of aortopulmonary window interface (arrows).
B. Enhanced conventional (10-mm collimation) CT scan obtained at carinal level shows enlarged lymph node (arrow) displacing left lung laterally.

Fig. 15. Preaortic interface in a 57-year-old man.
A. Chest radiograph shows interface with white etching medial to left cardiac margin (arrows).
B. Enhanced conventional (10-mm collimation) CT scan obtained at subcarinal area demonstrates left lung (arrowhead) between descending aorta and left pulmonary artery forming preaortic interface.

carotid artery (5%), or the left tracheal wall per se (1%) (9). This interface is observed in 31% of the patients on chest radiographs. White (positive Mach band) left paratracheal interface can be distinguished from black (negative Mach band) left subclavian artery interface. In addition, the former is usually located medial to the latter. A variety of entities may alter the left paratracheal interface.

**Infraaortic Area**

**Aortopulmonary Window Interface**

Aortopulmonary window is the area of the medias-
tinum bounded superiorly by the aortic arch, inferiorly by the left pulmonary artery, medially by the trachea, left main bronchus, and esophagus, laterally by the mediastinal pleura, anteriorly by the ascending aorta and posteriorly by the descending aorta (1, 2). The aortopulmonary window contains fat, ductus ligament, left recurrent laryngeal nerve, nodes and left bronchial arteries.

Contact between the left lung and lateral closure of the aortopulmonary window (the mediastinal pleura) produce aortopulmonary window interface. This interface connects the aortic know with the left pul-
monary artery. It is normally convex medially. Lateral convexity of the interface suggests abnormality in the aortopulmonary window (Fig. 14). Since the left recurrent laryngeal nerve is located in the aortopulmonary window, careful observation should be given for alteration of the interface in a patient with left vocal cord palsy.

Preaortic Interface
Contact of the posteromedial portion of the left lower lobe with the mediastinum anterior to the descending thoracic aorta produces preaortic interface. This interface is analogous to the azygosophageal recess interface in the right side. Cephalad, the interface deviates laterally to be continuous with the aortic arch or ends vertically under the aortic knob. Caudal, it merges into the descending aorta smoothly at T10 level (Fig. 15).

Descending Aortic Interface
Contact of the posteromedial left lower lobe with descending thoracic aorta produces descending aortic interface. The interface is usually seen along its entire course. However, in about 9% of subjects it may be

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**Fig. 16.** Obliteration of descending aortic interface due to contact between descending aorta and pulmonary artery.  
A. Chest radiograph shows obliteration of descending aortic interface just inferior to aortic knob (arrow).  
B. Enhanced conventional (10-mm collimation) CT scan obtained at level of carina shows close contract between descending aorta and pulmonary artery.

**Fig. 17.** Focal obliteration of descending aortic interface due to paraesophageal varices due to liver cirrhosis.  
A. Chest radiograph shows focal areas (arrows) of obliteration of descending aortic interface.  
B. Enhanced conventional (10-mm collimation) CT scans obtained at levels of inferior vena cava and celiac axis area reveal extensive collaterals with obliteration of descending aortic interface (arrow). Note small liver and enlarged spleen.
Fig. 18. Obliteration of left paraspinal interface (arrows) due to plexiform neurofibromatosis in a 25-year-old man. Also note multiple areas of mass lesion in right paratracheal and bilateral intercostal regions.

Obliteration of left paraspinal interface (arrows) due to plexiform neurofibromatosis in a 25-year-old man. Also note multiple areas of mass lesion in right paratracheal and bilateral intercostal regions.

Obliteration of descending aortic interface, along with obliteration of lung markings in the adjacent lung and opacity due to abnormality per se, suggests mediastinal abnormalities including mediastinal adenopathy or mass, vascular disease, pleural lesion, esophageal lesions or lung cancer (Fig. 17).

Left Paraspinal Interface

Contact of the posteromedial left lower lobe of the lung with left paraspinal soft tissue results in the left paraspinal interface. Usually the interface begins at the level of the aortic knob and descends downward to the left hemidiaphragm. Although the interface projects medial to the descending aortic interface, this relationship may be reversed occasionally. Left paraspinal interface appears as white (positive Mach band) whereas the descending aortic interface as black (negative Mach band). If the interface maintains white line appearance parallel to the lateral margin of the vertebral bodies, it indicates normal. Focal bulging accompanied by loss of the white appearance suggests paraspinal mass lesion (Fig. 18).

References