Society of Thoracic Radiology
Annual Meeting and Postgraduate Course

Back to Basics: Lateral Chest Radiograph

March 11, 2012
Huntington Beach, California

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Disclosures

• None

Acknowledgements

• Robert Suh, M.D. (UCLA Medical Center)

Introduction

• Education and clinical importance of the lateral chest radiograph have diminished as CT has become more popular
  – Ease of requesting (and recommending) a chest CT when questionable abnormality seen on frontal CXR

• Radiology trainees, in particular, have considerable difficulty in recognizing and interpreting the subtleties of the lateral

Learning objectives

• Review fundamental anatomy, variations, and spaces routinely revealed on the lateral CXR

• Correlate the perspective the lateral view provides with that provided by multiplanar CT

• Reinforce an appreciation of the value of the lateral chest radiograph

Outline

• Trachea
• Retrotracheal space (Raider triangle)
• Large airways
• Arteries and veins
• “Three clear spaces”
• Inferior hilar window
Trachea

- Easily recognizable

- Anterior tracheal stripe
  - Appreciated only on occasion
  - Mediastinal fat
  - Air/lung
  - May not be visibly altered even in the presence of extensive pretracheal pathology

- Posterior tracheal stripe
  - Outlined posteriorly by air in right lung or esophageal lumen and anteriorly by air in tracheal lumen
  - Variable appearance, 1-5 mm
    - Posterior tracheal wall only: thin line
    - Posterior tracheal wall, intervening tissue, collapsed esophagus: thicker stripe or band

Retrotracheal space

- Retrotracheal space (“Raider triangle”)
  - Boundaries
    - Anterior: posterior tracheal wall-right lung
    - Posterior: thoracic vertebral bodies
    - Superior: thoracic inlet
    - Inferior: aortic arch-left lung
  - Size varies with age, body habitus, and lung inflation
Retrotracheal space

- Retrotracheal space ("Raider triangle")
  - Boundaries
  - Contents
    - Esophagus
    - Left recurrent laryngeal nerve
    - Thoracic duct
    - Lymph nodes
    - Lungs

- Pathology
  - Congenital vascular lesions
  - Acquired vascular lesions
  - Esophageal abnormalities
  - Mediastinal masses
  - Infections

- Congenital vascular lesions
  - Left aortic arch with aberrant right subclavian artery
  - Right aortic arch with aberrant left subclavian artery
  - Double aortic arch

- Acquired vascular lesions
  - Aneurysm of aberrant subclavian artery
  - Aortic aneurysm

- Mediastinal masses
  - Intrathoracic goiter
  - Schwannoma/neurilemoma
  - Hemangioma
  - Lymphatic malformation
  - Hematoma

- Infections
  - Tuberculous/pyogenic mediastinitis
  - Abscess

Franquet et al. Radiographics 2002; 22:S231-246
Large airways

- Right upper lobe bronchus (RUL)
  - Anterior margin closely related to RUL artery
  - Superior margin closely related to azygous vein

- Inconsistently visualized
  - Increasing conspicuity → contiguous pathology
Large airways

- Left main-upper lobe continuum (LULC)
  - Consistently visualized distinct landmark
  - Projects below left pulmonary artery

Large airways

- Left main-upper lobe continuum (LULC)
  - Continuum along left mainstem into LUL bronchus
    - Variable in size and shape
    - Occasionally, round lucency within round lucency

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Large airways

- Posterior wall of bronchus intermedius
  - Intermediate stem line
  - Continuous with right mainstem bronchus, terminating at origin of RLL superior segmental bronchus
  - Approximated posteriorly by azygosesophageal recess
  - Typically projects over LULC
    - Foretells rotation
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  - Abnormal > 3 mm

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Arteries and veins

- Left pulmonary artery (LPA)
  - Short posterosuperior and lateral mediastinal course
  - When outlined superiorly by air, resembles “miniature aortic arch”

Arteries and veins

- Left pulmonary artery (LPA)
  - Obscured superior border
    - AP window lymphadenopathy
  - Lobulated posterior border
    - Hilar lymphadenopathy
Arteries and veins

- Right pulmonary artery (RPA)
  - In actuality, “right hilar vascular opacity”
  - Conglomerate of pulmonary arteries and veins

- Right pulmonary artery (RPA)
  - Longer lateral mediastinal course than LPA
  - Divides at the edge of the mediastinum
  - RPA = upper aspect of right hilar vascular opacity
  - Interlobar artery = lower aspect of rt hilar vasc opacity
  - Poorly marginated secondary to branching and lack of adjacent lung

- Right pulmonary artery (RPA)
  - Enlargement of right hilar vascular opacity with lobulated contour
  - Hilary lymphadenopathy

- Right ventricular outflow tract
- Ascending thoracic aorta

- Variable visibility
  - Approximation of lung and fat to anterior borders
  - Alignment with path of x-ray beam
Arteries and veins
- Right ventricular outflow tract
- Ascending thoracic aorta

Arteries and veins
- Inferior vena cava (IVC)
  - Occasionally, anterior wall also outlined by lung

Arteries and veins
- Left brachiocephalic vein
  - Retromanubrial opacity

Arteries and veins
- Superior vena cava
- Right brachiocephalic vein
- Innominate artery
- Right subclavian artery
- Composite S-shaped opacity on lateral radiograph
Arteries and veins

- Superior vena cava
- Right brachiocephalic vein
- Innominate artery
- Right subclavian artery

Three clear spaces

- "Spine sign"
  - Increasing lucency as progress down thoracic vertebral bodies
  - Less soft tissue attenuation in lower chest wall compared to upper chest wall/shoulders

Three clear spaces

- Two types of abnormalities
  - Localized opacity with discrete edge
    - Lung mass or consolidation
    - Mediastinal mass
  - Increased density without edge
    - Pleural thickening/disease
    - Lower lobe collapse

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  - Localized opacity with discrete edge
    - Lung mass or consolidation
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    - Pleural thickening/disease
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Three clear spaces

- Anterior clear space
  - Increasing lucency as progress superiorly from the densest portion of the heart
  - Decreasing width of anterior mediastinum, beginning at PA/ascending aorta level to SVC/brachiocephalic veins
  - Variable degree of lucency
    - Amount of lung protruding behind manubrium
    - Women have decreased retrosternal lucency
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- Retrocardiac clear space
  - Increasing lucency as progress inferiorly from between the posterior border of heart and anterior vertebral bodies (infrahilar)
  - Decreasing width of mediastinum
    - Esophagus and azygous vein
    - Air-filled right lower lobe (azygoesophageal recess)

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- Anterior clear space
  - Opacification with or without discrete edge
  - Anterior mediastinal mass
  - Lung mass or consolidation

- Retrocardiac clear space
  - Opacification with or without discrete edge
  - Lung or mediastinal mass (m. common hiatal hernia)
  - Lung consolidation (edge represents major fissure)
**Inferior hilar window**

- Sub-area of retrocardiac clear space
  - Avascular area along anteroinferior hilar composite
- Boundaries
  - Right middle lobe bronchus
  - Left lower lobe bronchus
- Devoid of nodular opacities > 1 cm
Conclusions

- The lateral chest radiograph provides a perspective that significantly enhances the evaluation for thoracic disease.
- Awareness of routinely visualized anatomic structures and spaces should facilitate improved interpretation of conventional chest radiographs.

Posttest question

- On a properly positioned (i.e. non-rotated) lateral radiograph, the posterior wall of the bronchus intermedius projects over which structure?
  a) Right upper lobe bronchus
  b) Right hilar vascular opacity
  c) Left main-upper lobe continuum
  d) Left pulmonary artery

References