

RADIOLOGIC PATHOLOGIC CORRELATION FOR DISEASES OF THE LUNGS

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- I. "The Rules of Visibility"
 - A. "Rule Number 1" - The edge of any structure is only visible if it is bordered by a structure of a different fundamental density.
 1. On a chest radiograph, the only fundamental densities are air, soft tissues (including fat and blood) and calcium.
 2. Rule Number 1 is not altered by patient position, direction of x-ray beam, or by technique.
 - B. "Rule Number 2" - The lightness and darkness of any part of the image is the result of all structures through which the x-ray beam has passed.
 1. Lightness and darkness are easily changed by technique, but the whole film will be similarly affected.
- II. Computed Tomograms of the Chest
 - A. Computed Tomograms have two distinct advantages over plain films of the chest:
 1. Imaging cross-sections
 2. The "soft tissue density" is separated into fat, clear fluid, and all other soft tissues. Thus, rule number 1 can be used with increased specificity.
- III. Patterns of Pulmonary Diseases
 - A. Mass
 1. Represents localized destruction of lung parenchyma or infiltration resembling destruction.
 2. Radiologically defined as any localized opacity not completely bordered by fissures or pleura.
 3. Differential diagnosis
 - a. Malignancy
 - b. Granulomatous disease - infectious or noninfectious
 - c. Non-granulomatous inflammation
 - d. Benign neoplasm
 - e. Congenital abnormality

- B. Consolidative (alveolar) pattern
 - 1. Produced by filling of alveolar lumens with material of greater density than air.
 - 2. Radiologically consists of cloud-like opacities with complete air bronchograms.
 - 3. Differential diagnosis
 - a. Hemorrhage - blood
 - b. Exudate - pus
 - c. Transudate - water
 - d. Secretions - protein
 - e. Malignancy - cells

- C. Interstitial Patterns
 - 1. Represents thickening or destruction of pulmonary interstitium
 - 2. Pulmonary interstitium includes septa, subpleural space, perivascular and peribronchial spaces and alveolar walls
 - 3. Diseases principally involving alveolar walls, such as alveolitis, are therefore interstitial in appearance.
 - 4. Linear form - Diffuse interstitial disease producing extra linear opacities, specifically reticulations and septal lines (Kerley lines)
 - 5. Nodular form - Multifocal interstitial disease producing small, sharp, uniform shaped nodules.
 - 6. Differential diagnoses:
 - a. Linear form - LIFE lines
 - Lymphangitic spread of malignancy
 - Inflammation
 - Fibrosis
 - Edema
 - b. Nodular form
 - Granulomas
 - Hematogenous spread of malignancy
 - Pneumoconiosis
 - 7. Destructive interstitial disease - Although early stages are linear form, late stages show development of irregular cystic spaces in lung periphery, sometimes called "honeycomb lung" or "end stage lung". Most common example is fibrosing alveolitis.

D. Vascular Patterns

1. Produced by changes in perfusion of pulmonary vessels.
2. Radiological signs are changes in diameter of specific vessels.
3. Increased diameter vessels usually are veins and therefore represent pulmonary venous hypertension, such as caused by heart failure, renal failure, or fluid overload.
4. Decreased diameter vessels are usually caused by excessive air pressure around the vessels as in emphysema.

E. Airway (Bronchial) Patterns

1. Produced by complete or partial obstruction of airways or by thickening of airway walls.
2. Complete airway obstruction causes the lung distal to the obstruction to become smaller and denser, as in collapse of a lobe.
3. Partial airway obstruction causes air trapping in the lung distal, producing increased lucency and increased volume, as in centrilobular emphysema.
4. Differential Diagnosis of complete obstruction includes the five causes of visible pulmonary masses (above) plus mucous plugs and foreign bodies.
5. Airway wall thickening usually represents bronchitis or bronchiectasis and produces extra lines that sometimes resemble interstitial lines.