Pulmonary aspergillosis

- Used to refer to a number of conditions caused by infection with a fungus of the *Aspergillus* species
- Usually *Aspergillus fumigatus*

Pulmonary aspergillosis

- Aspergilloma - most common
- Allergic bronchopulmonary aspergillosis (ABPA)
- Invasive aspergillosis
  - chronic necrotizing aspergillosis (CNA) (or semi-invasive aspergillosis)
  - airway invasive aspergillosis (or bronchopneumonic aspergillosis)
  - Angioinvasive aspergillosis
- Obstructive bronchopulmonary aspergillosis

Invasive aspergillosis

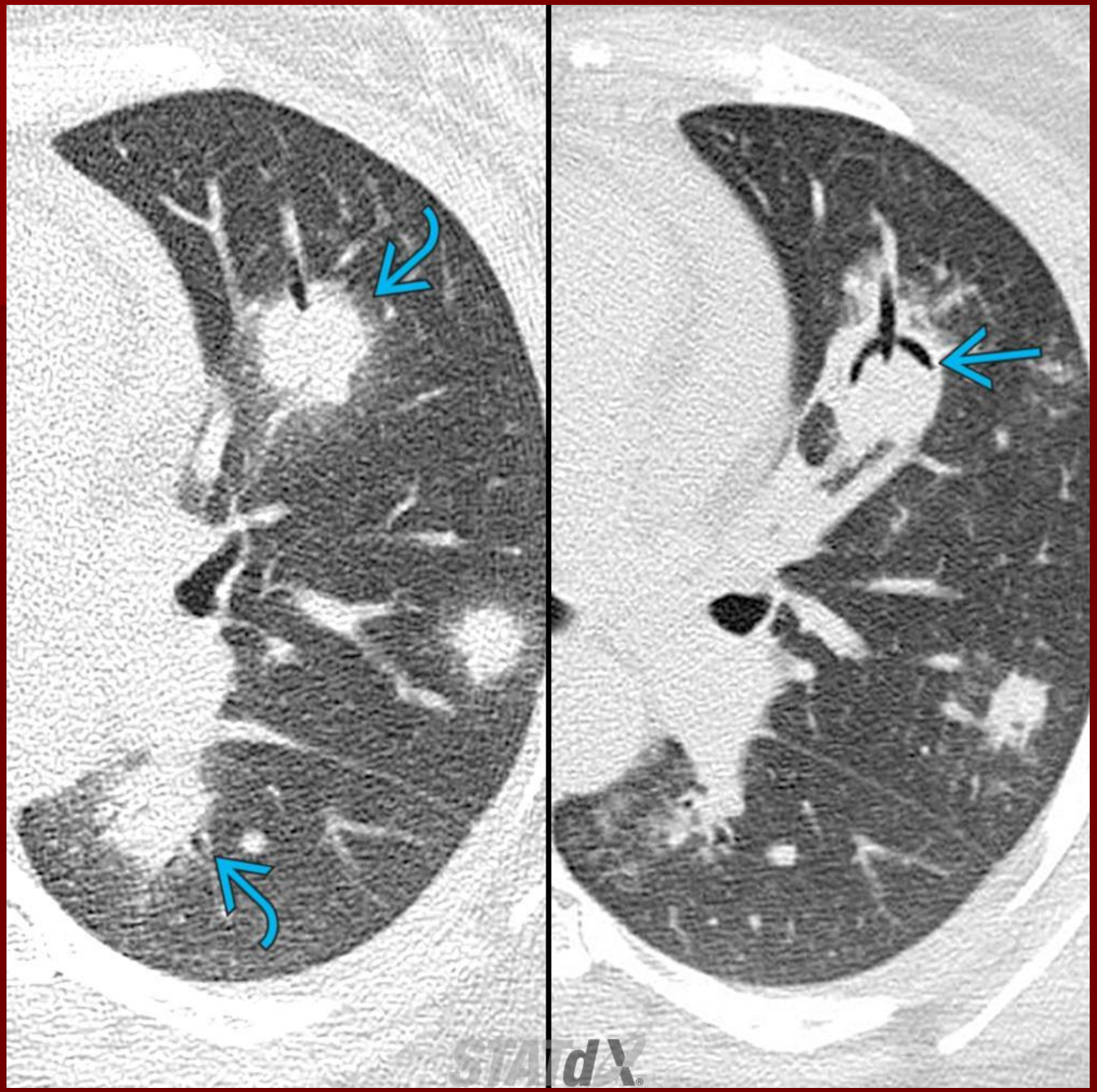
- Seen in patients with decreased immunity
  - Severe/prolonged neutropenia (most important risk factor)
- Treatment: Voriconazole; surgery for massive hemoptysis.
- Consider invasive aspergillosis in febrile neutropenic patient with pulmonary nodules, masses, or consolidations

Invasive aspergillosis

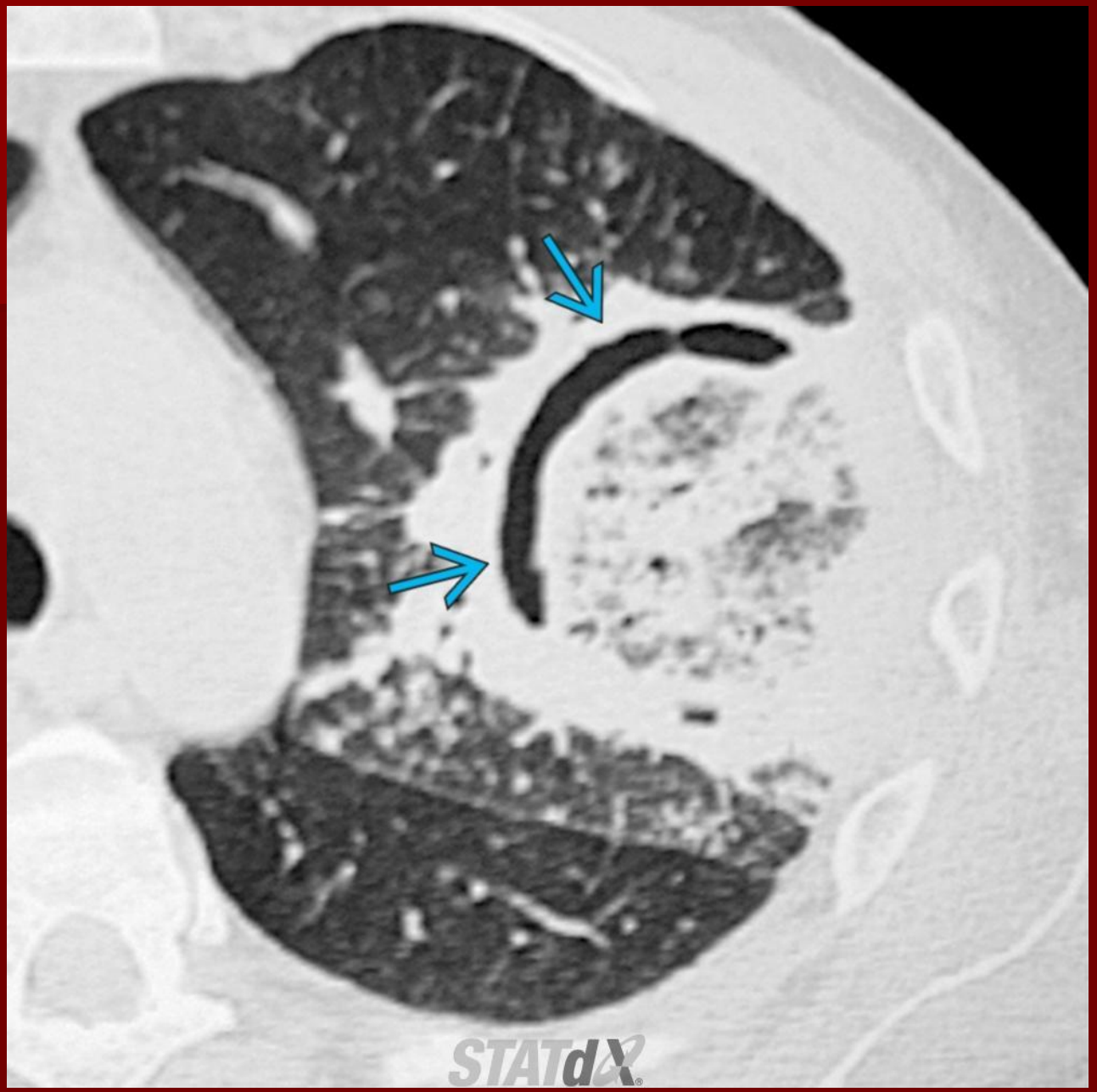
- Angioinvasive aspergillosis
  - Most common form of invasive aspergillosis
  - Occlusion of small to medium-sized pulmonary arteries by fungal hyphae
  - Wedge-shaped subpleural consolidation corresponding to hemorrhagic infarct
- Airway-invasive aspergillosis
  - Rare form of invasive aspergillosis
  - Fungal hyphae beyond airway basement membrane

CT

- Nodule, mass, or consolidation
- Solitary or multiple nodule(s)/mass(es)
- CT halo sign (early sign)
  - Ground-glass opacity surrounding nodule or mass
  - Highly suggestive of angioinvasive aspergillosis in appropriate clinical setting
  - Warrants antifungal therapy before confirmation with other tests
  - Pathologically represents hemorrhage around foci of invasive aspergillosis
- Occluded vessel sign
  - Visible with CT pulmonary angiography (CTPA)
  - Occlusion of peripheral segmental artery at lesion edge)
  - Absence of enhancing vessels within lesion (absence of angiogram sign)
  - Best demonstrated on MIP reformations
- Hypodense sign (early sign)
  - Central hypodensity in nodule, mass, or consolidation due to infarction; low sensitivity, high specificity
  - 1st CT finding to raise suspicion of angioinvasive aspergillosis; often recognizable on unenhanced CT
  - Usually affects > 50% of lesion
  - Occurs prior to cavitation and development of air-crescent sign
- Air-crescent sign (late sign)
  - Crescentic air collection in nodule, mass, or consolidation: Separates cavity wall from inner mass (necrotic lung); subsequent retraction of infarcted lung
  - Limited utility for diagnosis: Seen in up to 50% of affected patients during convalescence and recovery of neutrophil count; typically 2-3 weeks after therapy initiation

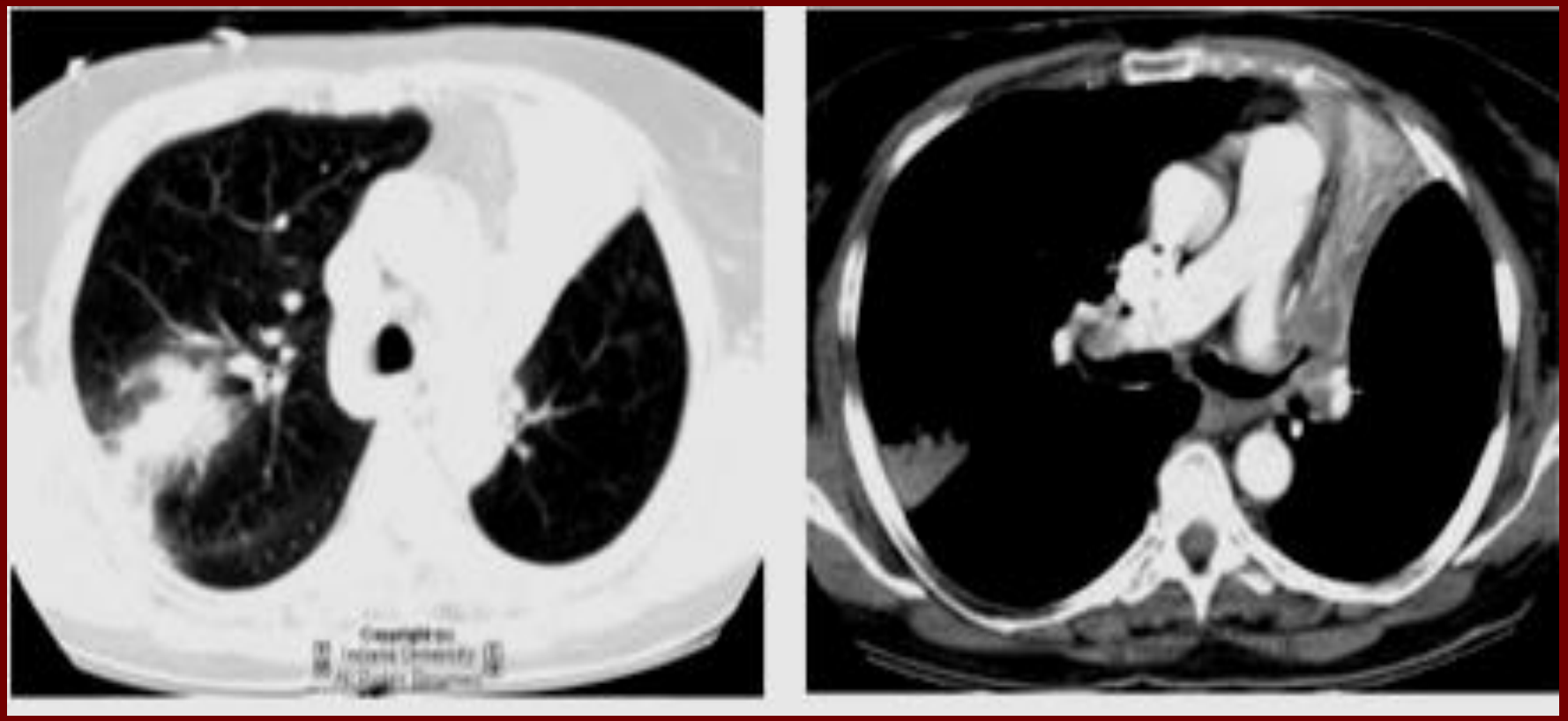


Composite image with NECT before (left) and after (right) treatment shows invasive aspergillosis manifesting with multiple nodules that exhibit the halo sign (cyan curved arrow) and develop the air-crescent sign (cyan solid arrow) after therapy. The latter is associated with neutrophil recovery



Axial HRCT of a patient with invasive aspergillosis shows a left upper lobe mass with cavitation that exhibits the air-crescent sign (cyan solid arrow). The lesion exhibits mass-like central ground-glass opacity (representing necrotic lung) and peripheral consolidation. This typically occurs after treatment and improvement of immune function.

Invasive aspergillosis



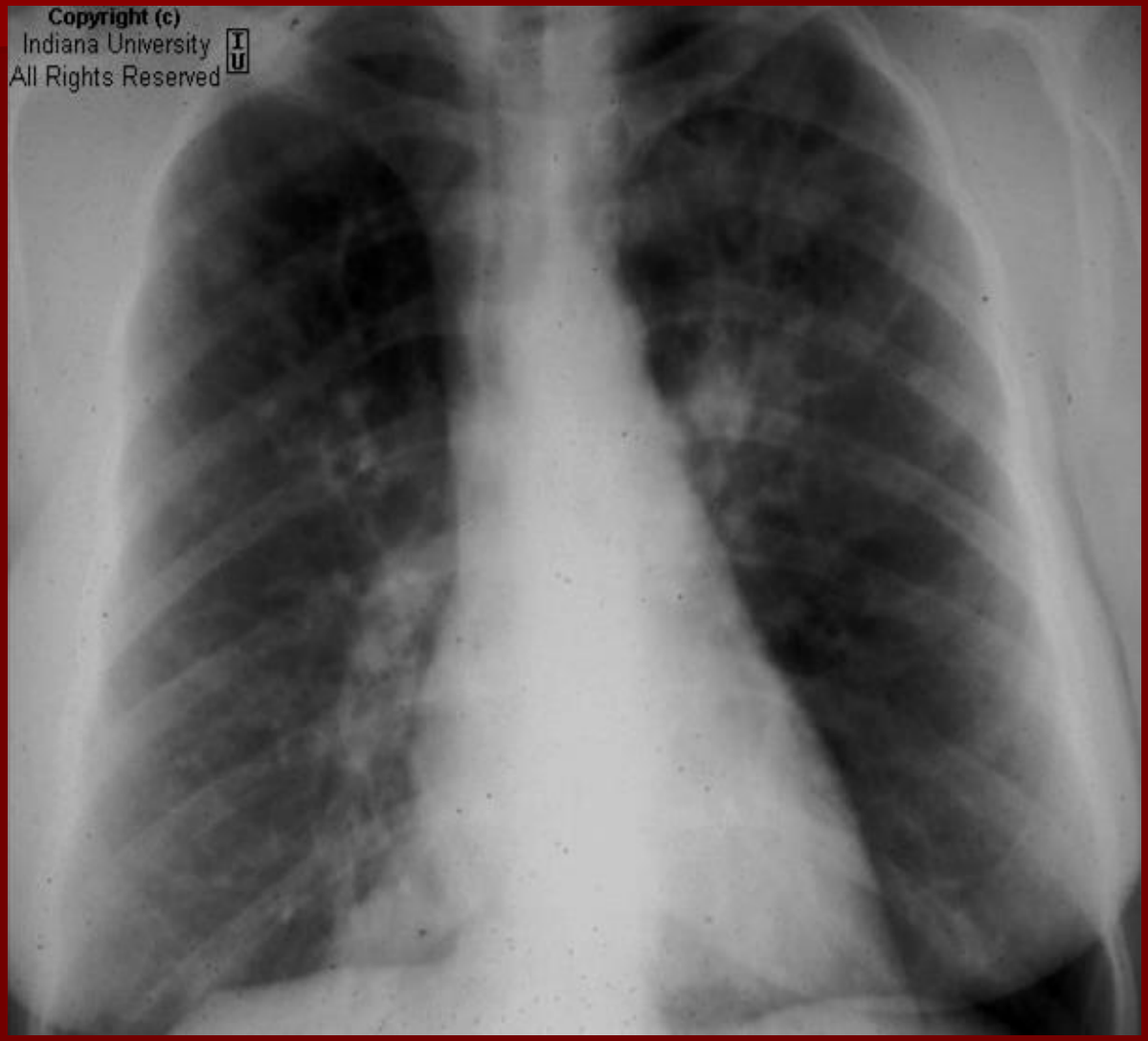
CT

- Fleeting pulmonary alveolar opacities: common
- Centrilobular nodules representing dilated and opacified bronchioles
- bronchiectasis
  - central, upper lobe saccular bronchiectasis involving segmental and subsegmental bronchi is characteristic
  - mucoid impaction results in a bronchocoele, the finger in glove sign
  - this may give a Y, V or toothpaste-like like configuration
  - high attenuation (calcification) in impacted mucus in ~30%
  - bronchial wall thickening: common
- Chronic disease may progress to pulmonary fibrosis, predominantly in the upper lobe
- cavitation: 10%

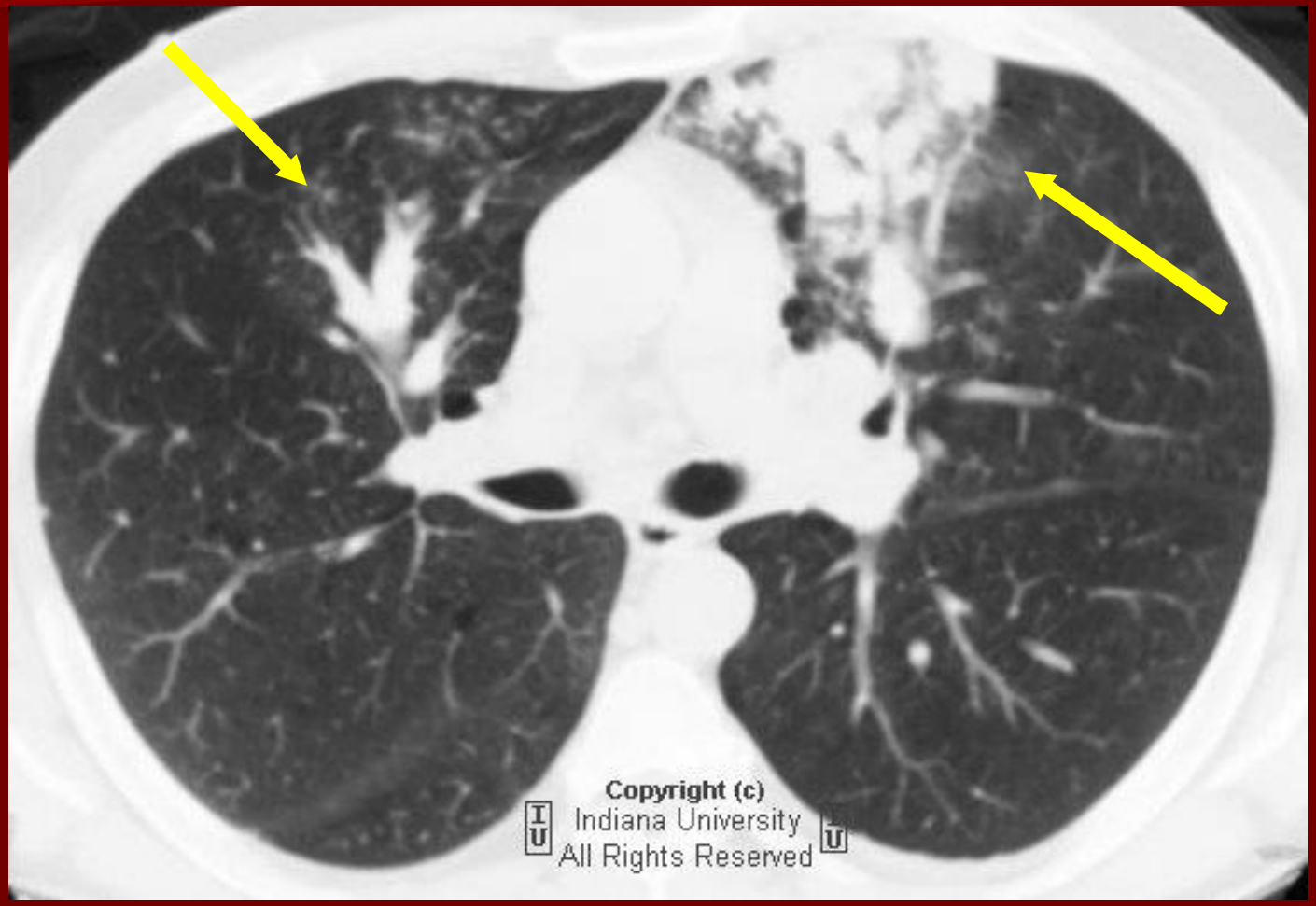
Allergic bronchopulmonary aspergillosis (ABPA)

- Can be classified as an eosinophilic lung disease
- Almost only encountered in patients with longstanding asthma, and only occasionally in patients with cystic fibrosis
- In general, patients are young and are diagnosed before the age of 40 years

Allergic bronchopulmonary aspergillosis



Allergic bronchopulmonary aspergillosis



Aspergilloma

- Although the term **mycetoma** is frequently used to describe these fungal balls, it is an incorrect term to use
- Occur in patients with normal immunity but structurally abnormal lungs

Aspergilloma

- Pulmonary tuberculosis:
  - most common, accounting for 25-80% of cases depending on the prevalence of tuberculosis in the population
- Sarcoidosis
- Bronchiectasis from any cause
- Other pulmonary cavities
  - bronchogenic cyst [4]
  - pulmonary sequestration
  - PJP associated pneumatocoeles

Mycetoma