IMAGING IN FUNGAL DISEASE

What does Radiology have to offer??

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Asthmatic patient on Inhaled steroids
IMAGING IN FUNGAL DISEASE

What does Radiology have to offer??
PATTERN RECOGNITION

Radiology patterns
Immuno derangements
ASPERGILLOSIS SPECTRUM

- Invasive Aspergillosis
  - Angio Invasive
  - Airway Invasive
- Semi Invasive Aspergillosis
- Acute tracheo bronchitis
- Aspergilloma
- ABPA
Invasive Aspergillosis

- Immuno compromised pts:
  - Bone marrow transplants
  - Hematogenous malignancies
  - HIV pts
  - Very high doses of steroids.
  - BUT.....
- Immunocompetent patients as well...COPD, ILD, on steroids...
Immunocompromised??
Time of Immunosupression??
Angio invasive Aspergillosis

- CXR- Non specific

During this phase Aspergillus hyphae invade the pulmonary vasculature leading to thrombosis, pulmonary hemorrhage and infarction.
2008 criteria for CT diagnosis of IA

- Dense well circumscribed lesions with or without a surrounding Ground glass halo.
- Halo sign - 61%
- Air crescent or cavity formation.
- >1 macronodules - 94%
- Consolidation - 30%
- Infarct shaped nodules - 27%
- Cavitating lesions - 20%
The halo represents the pulmonary hemorrhage, coagulative necrosis surrounding the central necrotic nodule containing aspergillus hyphae. Lesions progressively coalesce with confluent consolidation.
Aspergillus colony and surrounding area of intra alveolar hemorrhage

http://Radiographics; RSNA
Halo sign - very transient, 1-10 days
2 weeks after infection

**AIR CRESCENT SIGN**

- Patient’s immune system recovers...
- **CXR:** Air crescent sign - 50%
- Not specific for aspergillosis but very highly characteristic in proper clinical settings.
- Why does it occur & what does it represent?
Air crescent sign

It is a crescent-shaped / circumferential area of radiolucency within a parenchymal consolidation or nodular opacity.

Air crescent represents the nodular opacity with retracted infarcted lung with crescentric and circular cavitation.
By this time, hopefully the antifungals have been started...
Cavity becomes smaller, well defined, closes in avg 2wks, & in months resolves into a tiny scar.
Pt undergoing chemotherapy having neutropenia & presented with fever and dry cough for 2 wks.
Invasive aspergillosis
Sequential HRCT in neutropenic pt

An invasive tissue diagnosis may be difficult in such serious patients. Sputum cultures are positive in only in some patients and takes a long time. Imaging findings become crucial in diagnosis. CT>>CXR & crucial for critical decision making & rapid onset of treatment & followup.
All that haloes is not fungal...

- Halo sign - D/D - Other infection
- Wegner’s
- Metastatic angiosarcoma
- Focal lung injury

- Air crescent - D/D - Cavitating neoplasms
- Aspergillomas
- Infection
Chronic cavitating/necrotising pulm aspergillosis.

- Lower grades of immuno compromise
- Temporal evolution is different.
- Tissue invasion & infarction takes months unlike days /weeks in IA
Semi invasive aspergillosis

Pre existing lung diseases
COPD, Low dose steroid, Alcoholic, old infarction, Tb, DM, CVD, RT, ILD.
Aspergilloma

- Normal immunity
- Pre-existing chronic disease. - Tb & Sarcoidosis
- Asymptomatic or cough, hemoptysis.
- No tissue invasion
Combination of fungal hyphae, cell debris, mucus within cavity.

CT- Fungal strands bridgeing the fungal ball and the cavity wall
Decubitus
Fungal ball
Blood clot in pre existing cavity.
Necrotic carcinoma
Lung abscess with necrosis
Hydatid cyst
Constitutional symptoms
New progressive cavity enlargement
Increasing pleural thickening/cyst wall thickening /irregularity
Chest wall/ribcage involvement
Aspergilloma vs Wegner’s / Cavitating lung carcinoma

- Ca- Cavity is thick walled, not pre existing..
- Mass is non mobile
- No fungal strands/air filled mycelial network
- No paracystic lung opacities

ABPA & Hyper sensitive pneumonia

- Immune reaction to colonization of Aspergillus fumigatus.
- Atopic and immunocompetent.
- Pathophysiology: Bronchodilation with mucus plugs
- Central airway, Distal to lobar bronchi
- Invasion is extremely uncommon
Clinical clue

- Cough, wheeze, rhinitis, asthma, urticaria
- Pt expectorates mucus plug!!!-V specific
- CXR- transient & recurrent opacities.
HRCT findings

- Central bronchiectasis-medial 2/3rd
- Mucoid impaction- branching opacities
- Gloved finger appearance
- High attenuating mucus plug is very specific
Why is the differentiation important?
Airway damage caused by ABPA can be prevented as it is corticosteroid responsive!

Helpful CT signs:
- Varicose/cystic bronchiectasis >90% ABPA
- High density mucoid impaction -20%ABPA
- Small airway abnormality-ABPA
ABPA

High density mucoid impaction-20%
Pathognomonic of ABPA
More severe ABPA
More recurrence rate
AIDS defining illness
- Now established to be a fungal infection
- Earlier called PCP
- Common OI in HIV pts
- CDC count <200, esp <100 cells/ul
Clinical presentation-HIV pt

- HIV pt with dry cough & dyspnoea
  - In an HIV Pt, when we see dyspnoea in advance & disproportionate with CXR finding

THINK OF PCP!!!
Role of CXR in PJP

- 1/3rd cases normal CXR
- Nonspecific findings
- Perihilar /Midzone/Lower zone B/L interstitial or GG infiltrate.
- Rapidly progress to the entire lung-3days
- 2 weeks to clear
- Serial CXR’s important!
HRCT findings
Extensive GGO- UZ
Peripheral sparing -41%

Accumulation of I/alveolar fibrin, debris & organisms
Hallmark GGA, geographical/ mosaic distribution.

- HRCT crucial in immuno compromised pts.
- HRCT is virtually diagnostic of PCP!!
- Sufficient to start empirical treatment.
35 yr HIV pt presenting with a non productive cough, CDC - 100 cells/ul
Pulmonary cysts - varying size & shape

Spontaneous pneumothorax
HEAD & NECK
Fungal Sinusitis

**Invasive**
- Presence of *fungal hyphae* within mucosa/ bone/ blood vessels of the paranasal sinuses

**Invasive**
- Acute
- Chronic

**Noninvasive**
- Allergic Fungal Sinusitis
- Fungus Ball (fungus mycetoma)
Acute Invasive Fungal Sinusitis

- Most lethal, Mortality 50-80%
- Immuno compromised patients
- Poorly controlled Diabetics, neutropenic pts (chemotheraphy /BM/organ transplants/HIV)
- Angioinvasion /hematogenous dissemination
- Rapidly progresses/ fulminant destruction
Acute Invasive Fungal Sinusitis CT

U/L ethmoid involvement
Bone destruction
Intraorbital spread
Proptosis
Sphenoid sinus, I/cranial & I/orbital extension
Leptomeningeal enhancement
Cavernous sinus thrombosis
Sylvian fissure & infratemporal fossa
Lt maxillary sinus-U/L
Extensive involvement of surrounding spaces
Chronic Invasive Fungal Sinusitis

Immunocompetent patients. Progression over months - years

MRI - Dark on T2 - Fungal mycelia
Allergic Fungal Sinusitis

- Younger immunocompetent pts, chr sinusitis
- H/O atopy/allergic rhinitis /asthma
- B/L or multiple pan sinusitis/nasal polyps
Concentric lamellated - alternating hyper & hypodensity H/density - inspissated secretions & fungal elements. Hypodensity - cysts, mucosal disease, granulation tissue.
Moderately high T1 signal
Low T2 signal with expanded sinus can be seen in allergic fungal sinusitis
Fungus Ball

- Older immunocompetent pts, F>M
- Chronic pressure or nasal discharge
- Cacosmia (perception of foul odor when no odor exists)
Cerebral aspergillosis
GASTROINTESTINAL TRACT
Esophageal Candidiasis

- Immunocompromised
- Uncontrolled Diabetes
- Inhaled steroids
- Immunosuppressive therapy
Barium swallow

- Irregular shaggy or foamy appearance
- Ulcers and pseudoplaques
- Snake skin like appearance
- May perforate/stricture.
- Pt can have oral thrush
References

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Namaste
I BOW TO THE GOD IN YOU