A cavitary lesion in a patient with HIV/AIDS

Ana-Claire Meyer
Harvard Medical School, Year III

Gillian Lieberman, MD
Our Patient SM: A little history…

• S.M. is a 57 year old man with known HIV infection. Last CD4 count was 3.
• He presents c/o of R ankle pain, but upon further questioning he has had a little SOB, a chronic mild non-productive cough, and a low grade fever.
• A CXR was ordered
Our Patient SM:
A cavitary lesion on frontal CXR

This is a frontal chest radiograph notable primarily for a cavitary lesion approximately 2.5cm in diameter in the left upper lung field.

Image from PACS, BIDMC
Our Patient SM: Axial CT with contrast

Here you can again see the thick walled cavitary lesion in the left upper lobe. Just adjacent to it are two smaller eccentrically placed cavities, and a patchy area of nodular consolidation. Two small nodular opacities are seen here in the inferior portion of the left upper lobe.
Our Patient SM:
Sagittal and coronal reconstructions

On sagittal and coronal reconstructions the cavity and some smaller nodular opacities are again seen.
Our Patient SM:
He also has small airway disease...

This is an example of the “tree in bud” pattern, suggesting endobronchial spread of disease
What is a cavitary lesion?

A cavitary lesion is a gas containing space within the lung, surrounded by a wall greater than 1mm thick, often with an irregular contour.

(if wall is less than 1mm thick we call it a bullae)

Cavitary lesions can be any size and can be filled with gas, fluid, or debris.
How do we describe cavitary lesions?

- Wall thickness
- Inner Lining
  - irregular/nodular, shaggy, smooth
- Contents
  - gas, liquid, mobile intracavitary mass
- Multiplicity
  - solitary or multiple
What is a Pseudocavitation?

A pseudocavitation is a cavity of **FAT** density, not air density.

Pseudocavitary lesions can be granulomas or cancer.
Ddx cavitary lesion

- Fungal Infection
- Mycobacterial Infection
- Primary or Metastatic CA
  - especially squamous cell cancers of the lung
- Wegener’s Granulomatosis
But our patient is immunocompromised...
Pulmonary Host Defenses

- Mechanical Defenses
  - cough, mucociliary escalator
- Phagocytic Defenses
  - neutrophils
- Humoral Immunity
  - B-cells!
- Cellular Immunity
  - T-cells!
Impaired mechanical defenses

• Impaired cough
  – Narcotics
  – Stroke
  – Impaired consciousness
  – s/p surgery
  – Neuromuscular disease

• Impaired mucociliary function
  – Primary ciliary dyskinesia
  – Cystic Fibrosis
  – Asthma
  – Chronic bronchitis
  – Other infection
  – Smoking

Leads to:

• Bacterial pneumonias (esp gram neg and anaerobics)
• If bronchiectasis, P. aeruginosa infection.
Impaired phagocytic defenses

• Inherited disorders
  – Chronic granulomatous disease
  – Chediak-Higashi syndrome
  – Leukocyte adhesion deficiency

• Acquired defects
  – Neutropenia
    • e.g. chemotherapy

Leads to:

• Infection with catalase positive organisms
  – Staph aureus

• Enteric gram negative rods

• Aspergillus
Impaired humoral defenses

• Inherited disorders
  – Congenital X linked hypogammaglobulinemia
  – IgA, IgG subclass deficiencies

• Acquired defects
  – Corticosteroids
  – Multiple Myeloma
  – Chronic Lymphocytic Leukemia
  – Nephrotic syndrome

Leads to:
• Recurrent sinopulmonary infections with encapsulated bacteria
  – H. influenza
  – S. pneumoniae
  – S. aureus
Impaired cellular defenses

• Inherited disorders
  – SCID
  – DiGeorge syndrome
  – Wiskott Aldrich syndrome
  – Ataxia-teleangectasia

• Acquired defects
  – Hodgkin’s Disease
  – Medications
    • Corticosteroids
    • Cyclosporine
  – HIV/AIDS

Leads to:

• All diseases listed under humoral immunity
• Opportunistic infections
• Weird neoplasms
Adults and children estimated to be living with HIV/AIDS as of end 2000

- **West Africa**: 25.3 million
- **Southern and South-East Asia**: 5.8 million
- **Eastern Europe and Central Asia**: 700,000
- **Eastern Asia and Pacific**: 640,000
- **South-Western and Middle East**: 400,000
- **Caribbean**: 390,000
- **Western Europe**: 540,000
- **North America**: 920,000
- **Latin America**: 1.4 million
- **Australia and New Zealand**: 15,000

**Total**: 36.1 million

Courtesy of http://www.UNAIDS.org
Back to our patient SM:

• Given his radiographic findings, induced sputum cultures, BAL and trans bronchial biopsy were performed.
• During his hospital stay, he spiked a fever to 101.7F, but was otherwise well.
An oversimplified differential:
for the patient with HIV/AIDS presenting with pulmonary symptoms

• **Infection**
  – Bacterial (including zoonotics)
  – Viral (esp CMV)
  – Fungal (including PCP)
  – Mycobacteria (TB and atypicals)

• **Neoplasm**
  – Kaposi’s Sarcoma
  – Lymphoma
  – Primary lung CA

• **Other**
  – Interstitial Pneumonitis
But wait! What is the CD4 count?

- **CD4 > 500** (mild impairment)
  - at risk for virulent bacterial infections
    - encapsulated bacterial pneumonia, TB
- **CD4 = 200-500**
  - non infectious diseases
    - non Hodgkin’s lymphoma, primary lung CA
- **CD4 < 200** (clinical definition of AIDS)
  - PCP, disseminated TB, Kaposi’s sarcoma
- **CD4 < 100**
  - CMV, atypical mycobacteria, fungi
The CXR in a patient with HIV/AIDS…

Differential Diagnosis of a Normal CXR in a patient with HIV/AIDS:

- Pneumocystis Carinii
- Mycobacteria (TB or atypical)
- Disseminated Fungal pneumonia
Patient 2: Bacterial Infections

- More than 1/3 of patients with HIV/AIDS will develop severe bacterial pneumonia during the course of their illness.
- Especially by encapsulated bacteria (S. pneumoniae, H. influenzae) but also a variety of more exotic organisms
- Single or multiple regions of segmental or lobar consolidation
- Atypical radiographic presentation in 50% of patients
- Progresses rapidly, frequent cavitation and abscess formation

Patient 3: Viral Infections

- CMV infection is present in 90% of cases of advanced HIV disease (CD4<100)
- It is the cause of death in only 15% of cases
- CMV pneumonitis is often confused with PCP as it presents with diffuse ground glass or patchy airspace opacities

Patient 4: Fungal infections

- Rare until severe immunosuppression (CD4 <100)
- usually presents as nodular infiltrates, +/- effusions, +/- adenopathy, +/- cavitation
- 50% have Normal CXR
- Most common pathogens:
  - Aspergillus
  - Cryptococcus

Aspergillus niger extracted from lung tissue, fruiting structure and conidia, Calcifluor white stain.

Courtesy of www.clinical-mycology.com
Patient 5:
Another cavitary lesion on CXR

Here you can see a crescent representing a possible cavitary lesion.
Patient 5:
Axial CT- Invasive Aspergillosis

Impressive thin walled cavitations in the right lobe of the lung, and an equally impressive 2.5cm thick walled cavitation in the left lobe.

Also, some debris within the cavitation as well as some adjacent pleural thickening.
Patient 5:
Follow up one year later.
S/p partial lobectomy of the left lung.
Pneumocystis Carinii

- Widespread use of TMP-SMX and aerosolized pentamidine prophylaxis has decreased incidence
- Fever, nonproductive cough, dyspnea, constitutional symptoms over weeks to months
  - occasionally acute fulminant respiratory failure
- Normal CXR in 2-39% of cases
Patient 6: Radiographic presentation of PCP

Classic presentation:
• CXR: bilateral perihilar or diffuse infiltrates
• Hi res CT: geographic patchy or diffuse ground glass opacity

Upper lobe distribution occasionally seen.

Originally said to found primarily in patients using aerosolized pentamidine prophylaxis.


Patient 7: Is it? Why yes, it is another cavitary lesion!

Two large cavitary lesions in the left lung field.
Patient 7: Axial CT with contrast of Cystic PCP

Multiple large cavitations of varied sizes and wall thicknesses. Also present is a left sided pneumothorax.
Patient 7:
Coronal and Sagittal reconstructions of cystic PCP

Extensive involvement of the left lung as well as numerous cavities in the right upper lobe.
Patient 8: Tuberculosis

• 200-500 times the incidence in pts with HIV as in gen population

• Increased risk in Latinos, IDU’s, African-American, the homeless

• 14% have normal CXR

• If CD4 > 200 - looks like “reactivation TB”
  – upper lobe infiltrates, cavities, nodular bronchogenic spread

Patient 9: Tuberculosis

• If CD4 < 200 - “primary TB”
  – focal pulmonary consolidation with ipsilateral bulky lymphadenopathy

• Extrapulmonary disease is extremely common
  – found in 70% patients with CD4 < 100
  – found in 44% patients with CD4 > 300

• Miliary disease found in 50% of patients with extrapulmonary TB

Patient 10: Atypical Mycobacteria

- **M. avium intracellulare**
  - Most common
  - CD4 < 50
  - Usually as part of disseminated infection

- **M. kansasii**
  - Occasionally seen

Patient 11: Kaposi’s Sarcoma

- Affects 25% of patients with AIDS usually when CD4 <100; primarily homosexual or bisexual males
- 50% have pulmonary involvement; usually seen only after appearance of skin lesions!!!
- thickening along bronchovascular bundles spreading from perihilar region to periphery
- flame shaped lesions
- 75% involve central airways
- 30-89% have pleural effusions

Patient 12: Interstitial Pneumonitis

- Polyclonal lymphoproliferative disorder characterized by infiltration of lymphocytes, histiocytes and plasma cells.
- Primarily seen in pediatric AIDS patients and other immunocompromised patients.
- In adults with AIDS, follows a chronic, indolent course.

Back to our patient SM...

- **Sputum gram stain/Cx**: moderate growth oropharyngeal flora and budding yeast (likely reflecting mild oral candidiasis).
- Sputum AFB smear NEG, Cx pending
- **BAL**: sparse growth Staph aureus; Fungal, Legionella, PCP IFA neg, AFB smear neg, Cx pdg, Nocardia pdg.
- **Tissue biopsy and culture** showed no PMNs, no bacteria or fungus, AFB smear neg, Cx pending
- PPD neg, Toxoplasma neg, CMV Ab pos (likely reflecting previous infection)
- However, pt received several days of levofloxacin before procedure! Pt completed a 10 day course of levo for presumed community acquired pneumonia and was discharged.
The exact diagnosis for the cavitary lesion in our patient SM remains a mystery…
Whew!

A normal CXR in a patient with HIV/AIDS is not “normal.”
Don’t be afraid to get a Chest CT!!

One disease may have many different radiographic presentations in a patient with HIV/AIDS!!

The same diseases may present differently in patients with HIV/AIDS than they do in immunocompetent patients.

Common things are common!


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