Pneumocystis pneumonia in HIV

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Outline

• Patient presentation

• Overview of PCP

• Gallery of PCP chest radiographs
Patient presentation:

HPI

• 39 y.o. male with recent HIV diagnosis presents with a two week history of fevers to 102.5°F, drenching night sweats, cough sometimes productive of clear sputum, increasing dyspnea on exertion
• Due to profound weight loss and malaise, HIV tested by primary care physician ~6 weeks prior to admission → HIV +
• Was scheduled to have appt with ID, but came in a few days early due to fevers and worsening malaise
• Patient admitted for further workup and care
Patient presentation:
PMH and SH

- HIV PMH:
  - CD4/Viral load: CD4 = 15, VL > 750,000
  - Not on HAART, no opportunistic infection prophylaxis
  - No known history of OIs, zoster, bacterial PNA
  - PPD/TB Hx: No PPD, no TB exposures
  - Hep B, C negative

- Social History:
  - Non-smoker, no IVDU
  - MSM, multiple new partners over the past year, no history of STDs
Patient presentation: physical exam & labs

- T 100.1  BP 123/62  P 90  RR 20  O₂ Sat 100% RA
  - With walking, pulse to 120s, desats to 95%

- Derm: tinea cruris
- HEENT: thrush, oral hairy leukoplakia; disc margins sharp
- Pulm: Clear to auscultation bilaterally
- Neuro: A0x3, CN II-XII intact, no peripheral neuropathy

- LDH: 305 (110 - 210)
- ABG: pH 7.46  PO₂ 85  PCO₂ 27
Patient presentation: CXR

Requisition: SOB, Pls assess for PNA, infiltrate

CXR read as normal.

However, low lung volumes make it difficult to evaluate right hilar enlargement, diffuse reticular opacities.

Note the metallic objects bilaterally.

Image from AMICAS system, MGH
Patient presentation: CXR

Lateral CXR again read as normal.

Lateral view also offers likely identification of metallic objects.
Differential diagnosis of normal CXR in AIDS

- Normal
- Pneumocystis
- M. tuberculosis
- Cryptococcus neoformans
# Respiratory illnesses by CD4 count

<table>
<thead>
<tr>
<th>CD4 cell count (cells/mm³)</th>
<th>Respiratory illnesses</th>
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| <500                       | Recurrent bacterial pneumonia  
|                            | Non-TB mycobacteria     |
| <200                       | PCP                    
|                            | Cryptococcus neoformans 
|                            | Bacterial PNA--> bacteremia/sepsis  
|                            | TB-->extrapulmonary, disseminated |
| <100                       | Staphylococcus aureus  
|                            | Pseudomonas aeruginosa   
|                            | Kaposi's sarcoma         
|                            | Toxoplasma gondii        |
| <50                        | Endemic fungi (Histoplasma capsulatum, Coccidiodes immitis)  
|                            | Nonendemic fungi (Aspergillus, Candida)  
|                            | CMV                     
|                            | MAC                     |

In HIV, opportunistic respiratory illnesses are indexed by CD4 count. Diseases become more prevalent as CD4 count declines.
Respiratory illnesses by CD4 count

Any CD4 count:
Upper resp tract infection
Obstructive airway disease
Acute bronchitis
Bacterial pneumonia
Tuberculosis
Non-Hodgkin’s lymphoma
Pulmonary embolus
Bronchogenic carcinoma

Respiratory illnesses found in HIV- and HIV+ hosts are more prevalent at all CD4 counts, again with increasing prevalence as CD4 count declines.
Helical CT with IV contrast

Multiple patchy ground glass opacities
Helical CT with IV contrast

Multiple patchy ground glass opacities

Image from AMICAS system, MGH
Helical CT with IV contrast

Multiple patchy ground glass opacities

Image from AMICAS system, MGH
Helical CT with IV contrast

Multiple patchy ground glass opacities
Helical CT with IV contrast

- Multiple patchy ground glass opacities
- 2.1cm enlarged lymph node

Image from AMICAS system, MGH
Helical CT with IV contrast

Multiple patchy ground glass opacities

Atelectasis

Image from AMICAS system, MGH
Ground glass opacities

- **Definition:** increased attenuation of the lung parenchyma without obscuring pulmonary vascular markings on CT images

- May be the result of a wide variety of interstitial and alveolar diseases

- In immunocompromised, differential:
  - PCP (most common)
  - CMV, HSV, RSV bronchiolitis
Definitive diagnosis

Requires detection of organisms in respiratory specimens

Induced sputum for our patient was POSITIVE for PCP by immunofluorescence

Can obtain specimens by:
- Induced sputum
- Bronchoalveolar lavage
- Biopsy (rare: cost, risk of pneumothorax)

From http://www.md.huji.ac.il/mirror/webpath/AIDS.html
Outpatient: follow up

Slightly increased density of RLL

PICC line

Image from AMICAS system, MGH
PCP in AIDS

• AIDS defining illness, occurring most frequently in patients with CD4 < 200 cells/ml³

• Most common OI in HIV-infected patients, though decreasing incidence due to PCP prophylaxis and HAART

• Remains leading cause of death in AIDS patients; associated with not receiving or failure to comply with HAART or prophylaxis
PCP: what is it?

- *Pneumocystis jurevici* pneumonia (formerly known as *Pneumocystis carinii*)

- Originally classified as protozoa by life cycle, but fungus by rRNA, mtDNA

- First cases in humans diagnosed in premature and malnourished children in Europe during WWII

- Ubiquitous, commonly thought to be transmitted early in life by respiratory route

PCP: Clinical manifestations

- Nonproductive cough (95%), fever (79-100%), dyspnea (95%)
- Most common adventitial sounds: crackles, rales; normal chest exam in 50%
- Pulse oximetry, often showing desaturation with exercise
- Arterial blood gas: hypoxemia, hypocarbia, increased A-a gradient
- LDH > 220 (93% sensitive, but not specific)
PCP: Radiographic manifestations

- **CXR:**
  - Normal CXR found in 0-39%
  - Classic finding is diffuse perihilar infiltrates, with varying sensitivity of 61-100% and poor specificity of 70%
  - Less commonly:
    - Pneumothorax, lobar/segmental infiltrates, pneumatoceles, nodules, upper lobe infiltrates in patients receiving aerosolized pentamidine
  - Rare:
    - Pleural effusions, lymphadenopathy

- **CT:**
  - Patchy or nodular areas of ground glass opacity (GGO)
  - On HRCT, GGO has a 100% sensitivity
PCP: Therapy

- 21 days of anti-Pneumocystis treatment regimen – TMP-SMX (Oral or IV)
- Adjunct corticosteroids if ABG on room air shows PaO2 < 70 mmHg, A-a gradient > 35 mmHg
- Ongoing trial to evaluate whether to start ART with PCP tx or delay until completion of treatment
PCP CXR Gallery
Companion Patient #2: 
Classic PCP CXR

Bilateral perihilar interstitial infiltrates

From http://www.vh.org/adult/provider/radiology/ITTR/PneumocysticCarinii/PCPPA.html
Companion Patient #3: Classic PCP CXR

Bilateral perihilar interstitial infiltrates

Companion Patient #4: Atypical PCP CXR

LUL consolidation

Companion Patient #5: Atypical PCP CXR

Coarse nodular and linear densities

Companion Patient #6 and #7: Atypical PCP CXRs

Small and large pneumatoceles (cysts)

From http://pathhsw5m54.ucsf.edu/cts/unknown14/cysts.html

From PACS, BIDMC
Companion Patient #8: Atypical PCP CXR

Extensive air space consolidation
Right side pneumothorax
Multiple cystic changes

http://www.auntminnie.com/ScottWilliamsMD2/CHEST/Infect/Parasites/PCP/Images/PCP-px/cxr.jpg
Take home points

- Vast majority of PCP cases in patients with CD4 < 200 cells/ml³
- Take HAART and prophylaxis!
- Radiological findings:
  - Classic CXR: bilateral perihilar interstitial infiltrates
  - Multiple atypical CXRs, including normal
  - CT: ground glass opacities
- Should establish definitive diagnosis rather than treating empirically
- Treat with TMP-SMX; if severe, add corticosteroids
References

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