Respiratory Symptoms in HIV+ Patients: A Radiologist’s Approach

MaryCatherine Arbour, Harvard Medical School Year III
Gillian Lieberman, MD
Pulmonary Manifestations of HIV

• Neoplasms
  Lung CA
  Lymphoma
  Kaposi’s sarcoma

• Proliferative infiltrating disorders
  Lymphocytic Interstitial Pneumonia
  Non-specific Interstitial Pneumonitis

• Infections
Radiographic Evaluation of Respiratory Symptoms

- CXR is the first line diagnostic for HIV+ patient with respiratory symptoms.
- CT offers modest improvement over CXR & greater negative predictive value. Most useful for: complications, e.g. abscess, empyema, staging malignancies, symptomatic patients w NL or equivocal CXR
- Other modalities have limited role
Integrated Approach to Interpretation of Imaging Studies of HIV-positive Patients

- Radiographic pattern recognition
- Clinical presentation
- Risk factor-associated pulmonary complications:
  - IVDU & septic emboli, recurrent *S aureus* pneumonia,
  - lung abscess, TB
  - Male homosexual contact & Kaposi’s sarcoma
  - Sexual contact & CMV
- Current drug therapy (HAART, TMP-SMX)
- Level of immune compromise = CD4 count***
Natural History of HIV Infection: CD4 Count & Opportunistic Infections

[Graph showing the relationship between CD4 count (cells/ml) and months/years. Key points include:
- 800 CD4: Lymphadenopathy, Thrombocytopenia
- 600 CD4: Bacterial skin infections, Herpes simplex, zoster
- 500 CD4: Oral, skin fungal infections
- 400 CD4: Kaposi’s sarcoma
- 300 CD4: Hairy leukoplakia, Tuberculosis
- 200 CD4: PCP, Cryptococcus, Toxoplasmosis
- 100 CD4: CMV, Lymphoma, MAC

http://www.wellesley.edu/Chemistry/Chem101/hiv/cd4fig.gif]
Patient 1: 3 days acute onset fever, productive cough.

Diagnosis? Pyogenic Pneumonia. *S pneumoniae* v. *H influenzae*
Patient 2. 4 days dyspnea, fever, productive cough.

Diagnosis? Airway disease. *Bronchiectasis.* (Bronchitis, Bronchiolitis)

```
Wall thickening. Symmetrical lower lobe reticulonodular pattern.
```

```
“Tree-in-Bud”:
Y & V-shaped centrilobular opacities
```
Patient 3. 3 weeks cough, night sweats, weight loss.

Parenchymal opacities with cavitation of apical lobe

Diagnosis?  *M. tuberculosis*  Pattern of reactivation TB
Example 4. 3 weeks cough, night sweats, weight loss.

Patient 4

Patient 5

Consolidation and lymph node enlargement with low-density centers & peripheral contrast enhancement

Diagnosis?  *M. tuberculosis*  Pattern of primary TB
Example 5. 3 weeks cough, night sweats, weight loss.

Patient 6

Patient 7

Diagnosis? *M. tuberculosis*  Pattern of miliary TB

Patients 3-7. 3 weeks cough, night sweats, weight loss.

- Reactivation TB
- Primary TB
  - CD4 > 500
  - 200 < CD4 < 500
- Miliary TB
  - CD4 < 200

In patients with risk factors for HIV infection who have not been HIV tested, some respiratory infections should raise a question of seropositivity in the clinician’s mind:
- Rapidly progressing pyogenic pneumonia with abscesses or bacteremia
- Primary TB pattern on CXR in a patient with history of BCG vaccination or in areas where TB is endemic.
Patients 8-13 are all cases of opportunistic infections in people with CD4 counts below 200 cells/ml. Even in patients who have not had serologic HIV testing, other clinical manifestations can be suggestive of seropositivity, such as shingles, wasting, skin infections, gastroenteritis and dementia. These patients may present with mild to severe symptoms and often have negative chest films. Diagnosis benefits from an integrated approach which incorporates level of immune compromise, drug regimen and risk factors for infection, in addition to clinical presentation and radiologic pattern recognition.
Patient 8. 1 month insidious onset fever, dry cough, dyspnea.

Normal CXR (40%)

Ground glass attenuation, central & perihilar intra-alveolar exudates.

Courtesy Dr. Boiselle
Patient 9. 1 month insidious onset fever, dry cough, dyspnea.

Diagnosis? *Pneumocystis Carinii (PCP)*
Patient 10. 1 month insidious onset fever, dry cough, dyspnea.

Diagnosis?

- CD4<100
- Infected by sexual contact
- Retinitis, diarrhea
- Fever, sore throat, LAD.

Cytomegalovirus (CMV)

Normal CXR

or

Ground-glass opacities & alveolar consolidation, like PCP.

Differentiate by nodules, masses, small airways disease.
Patient 11. 1 month insidious onset fever, dry cough, dyspnea.

Normal CXR

or

Non-specific reticular or reticulo-nodular pattern with focal consolidations, lymphadenopathy and possible pleural effusion.

Diagnosis? CD4<100 Meningoencephalitis

Cryptococcus neoformans

Reticulo-nodular pattern with focal consolidations, lymphadenopathy and pleural effusion.

Cavitary disease with upper lobe alveolar consolidation and nodules with halo of ground glass.

Diagnosis? 
CD4<50
Neutropenic secondary to gancyclovir or zidovudine therapy

Aspergillus

Normal CXR (20%)

or

Multifocal patchy consolidation with ill-defined nodules and cavities. Lymphadenopathy.

Diagnosis?  CD4<50

Initiation of HAART leads to enlarged lymph nodes + fever

Reversal Syndrome:
Immune-mediated response to previously subclinical infection

M. avium-intracellulare
Conclusions

• CXR is first line diagnostic for HIV+ patient with respiratory symptoms
• In patients with risk factors for HIV infection who have not been HIV tested, some respiratory infections should raise a question of seropositivity for the clinician:
  - Rapidly progressing pyogenic pneumonia with abscesses or bacteremia
  - Primary TB pattern on CXR in a patient with history of BCG vaccination or in areas where TB is endemic.
• At CD4<200, CXR may be negative in PCP (40%), TB (20%) or MAI (20%).
  - CT can aid diagnosis in symptomatic patients with negative CXR.
  - If CT is not available, integrating other criteria can help focus a differential:
    known CD4 count
    concomitant symptoms in another system
    medications and secondary neutropenia
    risk factor for infection
• When in doubt, remember, in HIV+ patients with respiratory symptoms:
  - pyogenic pulmonary infections are most common,
  - PCP is most lethal.
References

- Boiselle PM. CD-ROM.
- http://myweb.lsbu.ac.uk/~dirt/museum/simon/68-235-gse2.jpg
- www.medinfo.ufl.edu/cme/grounds/forsmark/images/cf21.gif
- www.state.hi.us/health/resource/comm_dis/tb/images/xray.jpg
- www.wellesley.edu/Chemistry/Chem101/hiv/cd4fig.gif
Acknowledgements

- Phillip Boiselle, MD
- Fabio Komlos, MD
- Larry Barbaras our Webmaster
- Gillian Lieberman, MD
- Pamela Lepkowski
- Joshua Rempell, L. Renata Thronson