Cardiovascular manifestations of HIV

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– 36.7 million people worldwide are living with HIV *(2015-WHO)*
– Longer survival due to HAART (Highly active anti-retroviral therapy)
– HIV has now become a chronic illness
– Chronic inflammatory state of HIV leads to accelerated aging
– Increased non-AIDS comorbidities of HIV, HAART and aging
HIV- Cardiovascular

• Cardiac involvement in HIV- 25- 75 % (d'Amati G et al. Ann N Y Acad Sci 2001;95, Lewis W. Prog Cardiovasc Dis 1989;32)

• Broad spectrum of cardiovascular manifestations

• With improved survival and chronic inflammatory state, cardiac manifestations are more prevalent
## HIV- Cardiovascular manifestations

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<td>Pulmonary hypertension</td>
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<td>Immune</td>
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Imaging modalities

ECHO
- Widely available
- Good temporal resolution
- Functional evaluation
- Small field of view
- Operator dependent

CT
- Excellent spatial resolution
- Wide field of view
- Vascular wall abnormalities
- Radiation exposure
- Contrast nephrotoxicity

MR
- Good temporal and spatial resolution
- Tissue characterization
- Multiplanar imaging
- Long scanning time
- Gd limited in renal failure

PET
- Provide metabolic information
- Complementary to CT and MRI
- Hybrid PET/CT
- Limited availability
- Lower spatial resolution

Hybrid PET/CT
- PET/MR

Functional evaluation
- Multiplanar imaging
- Tissue characterization
- Radiation exposure
- Long scanning time
Pericardial Effusion

- Most common cardiovascular complication of HIV
- Infection (*Staphylococcus, TB*); Neoplasm (e.g. Lymphoma)
- Serous > fibrinous effusion
- Spontaneous resolution in 42% (Decker et al. Chest 1994;105)
- Higher 6-month mortality (62%) in effusion than those without (7%) (Decker et al. Chest 1994;105)
Pericarditis

• Inflammation of the pericardial layers may be seen in HIV CT/MRI
• **Acute phase:** Pericardial thickening, fluid and enhancement
• **Chronic inflammatory:** Pericardial thickening, enhancement, may be mild fluid
• **Chronic fibrosing:** Thick pericardium; Calcifications may be present; No effusion/enhancement.
• **Constrictive physiology:** Ventricular filling impairment
  – Diastolic septal bounce; abrupt cessation of diastolic filling; tethering; cone-shaped ventricles
  – Exaggerated inspiratory septal flattening/bowing in diastole
Myocarditis

- 1/3rd of patients with HIV have myocarditis in autopsy
- Toxoplasma, TB, Cryptococcus most common
- MRI Lake Louis criteria (2 of 3 to establish diagnosis)
  - **Edema**: T2WI myocardium/skeletal muscle signal ratio >1.9
  - **Hyperemia**: Pre and post contrast T1WI myocardium/skeletal muscle Global relative enhancement (GRE) ratio >4.0 (Normal <2.5)
  - **Necrosis**: Delayed hyper-enhancement, subepicardium or mid-wall
Heart failure

- Higher risk of heart failure in HIV (2-fold)
- More common among HIV-infected males
- Direct myocardial effect, autoimmunity, chronic inflammation, CAD, HAART side effects
- Significant cause of non-AIDS morbidity, mortality
Dilated Cardiomyopathy

• Seen in late stage of HIV/AIDS
• Prevalence-8 to 30% (Flum DR et al. Chest 1995;107, Prendergast B. Heart 2003)
• **Path**- LV- eccentric hypertrophy/ thinning
• **CXR**- cephalization of pulmonary vascular distribution, pulmonary edema and pleural effusion
• **Imaging** : Dilated ventricles, systolic dysfunction, wall motion abnormalities, LGE
Endocarditis

• Seen in 10-17 % of autopsy (Lewis W. Prog Cardiovasc Dis 1989;32)
• Infective or Nonbacterial thrombotic endocarditis
• Higher in IV drug abusers
• Multi-valvular disease is common; Tricuspid valve is most common
• Embolization- pulmonary or systemic
Cardiac Neoplasms

- Kaposi sarcoma, NHL are common cardiac neoplasms in HIV
- Kaposi sarcoma- low grade neoplasm
- As part of disseminated disease
- Epicardium, pericardium most frequently affected
- Coronary artery infiltration and myocardial involvement
- Pericardial hemorrhage and tamponade
Lymphoma

• Second most common cardiac neoplasm in HIV
• May be the first manifestation of AIDS
• High grade B-cell tumors or small non-cleaved cell lymphomas
• Right atrium commonest chamber involved
• CT: Iso or hypoattenuating (relative to myocardium); heterogenous enhancement
• MRI: Iso or hypointense on T1, iso or hyperintense on T2; heterogenous enhancement
• Pericardial effusion in 50 % (Chiles C et al. Radiogr 2001;21)
Coronary artery disease

- Prevalence and mortality are increased with HIV
- Accelerated atherosclerosis in coronary arteries
- Path-atheromatous and fibrous eccentric plaques, chronic inflammation, smooth muscle proliferation, elastic fibers
- Higher prevalence of high-risk features with plaques
- Diffuse involvement without intervening healthy segments
Coronary artery disease

Curved planar image of LAD: Calcific plaque with moderate stenosis in the proximal LAD

Curved planar image of LAD: Non calcific (purple) and calcific (yellow) plaques in the LAD
Vasculitis

- Infective- Salmonella, staphylococcus aureus, mycobacterium tuberculosis
- Henoch-Schonlein purpura, polyarteritis nodosa, drug-induced
- Single or multiple vessels
- Aneurysmal or occlusive
- Accelerated atherosclerosis may also result in aortic aneurysm
Pulmonary Arterial Hypertension

- 25-fold higher incidence than general population (Seoane L et al. South Med J 2001)
- Features similar to primary PAH (plexogenic pulmonary arteriopathy)
- Dilated central pulmonary arteries
- Tapered peripheral vessels (pruning)
- Cardiomegaly- Dilated right chambers; RV hypertrophy
- Septal bowing/flattening
- Tricuspid regurgitation, pulmonary regurgitation
- Poor prognosis; right heart dysfunction, cardiogenic shock and sudden death.
Thromboembolism

- Higher prevalence of coagulation abnormalities
- Lower extremity thrombus; pulmonary embolism
- Association with smoking in 77 %
Summary

- Cardiovascular manifestations of HIV include infection, inflammation and neoplasm
- Higher cardiovascular risk, despite reduction of AIDS-related cardiomyopathy
- Atherosclerosis has become a common problem in HIV patients
- Imaging plays an important role in the diagnosis and management of these patients