Online Only Lectures - Management of AIDS-Related Opportunistic Infections III

Speaker: Henry Masur, MD

IDBR INFECTIOUS DISEASE BOARD REVIEW AUGUST 20-24 2022

Management of AIDS-Related Opportunistic Infections II

Henry Masur, MD
Bethesda, Maryland

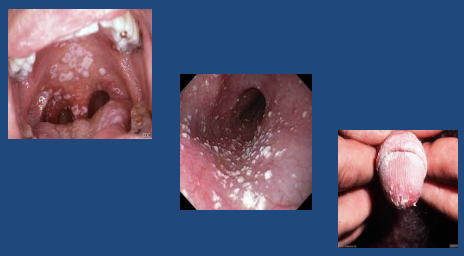
6/15/2022

IDBR INFECTIOUS DISEASE BOARD REVIEW AUGUST 20-24 2022

Disclosures of Financial Relationships with Relevant Commercial Interests

- None

Mucosal Candidiasis



Candida

- **Mucosal candidiasis is characteristic**
  - Oral, Esophageal, Rectal, Vaginal
- **Invasive candida is not AIDS related**
  - Candida in blood should raise suspicion of catheter related blood stream infection, IV substance use disorder etc
- **Fluconazole primary prophylaxis or chronic suppression**
  - NOT recommended
    - Initial or recurrent or relapse episode usually not common esp with ART and are easily treatable

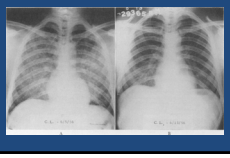
Varicella in PWH

- **Uncommon in US**
- **Important to make the diagnosis by**
  - Exposure
  - Clinical Presentation
  - PCR or DFA of skin lesion

Treatment of Varicella in PWH

- **Uncomplicated**
  - **Valacyclovir or Famciclovir x 5-7 days**

- **Complicated**
  - **IV Acyclovir x 7-10 Days**



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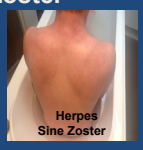
Localized and Disseminated Herpes Zoster


Dermatomal Zoster


Herpes Sine Zoster


Disseminated Zoster Or Primary Varicella


Ophthalmic Zoster

Herpes Zoster

- **Pre ART**
  - 15 fold high incidence of zoster than general population!!
- **Post ART**
  - Still increased risk even on suppressive ART
- **Localized (dermatomal)-common**
  - **Common at all CD4**
    - Frequency inversely proportional to CD4 even if VL<50
    - Recurrence is common with HIV
  - **Unmasking often observed soon after initiation of ART**

Herpes Zoster

- **Disseminated-very rare with HIV**
  - **Almost always CD4<200**

Therapy for Dermatomal Zoster

- **Acyclovir, Famciclovir, Valacyclovir**
  - **Treat within 1 week of rash onset or…. if not fully crusted**
    - (Longer "permissible window" compared to immunologic normal)
      - 48-72 hrs esp if age >50yo
      - Duration 7-10 Days
  - **Steroids NOT recommended to reduce post herpetic neuralgia**

Varicella Post Exposure Prophylaxis

Close Exposure to Varicella or Zoster

- **Varicella Seronegative HIV Patients**
  - **VariZIG (High titer plasma derived)** **OR**
    - within 96 hrs of exposure ideally but can give up to 10 days
  - **Preemptive Acyclovir** **OR**
    - starting 7-10 days post exposure X 5-7 days
  - **Varicella Vaccination within 5 days of exposure**
    - Only if CD4>200
    - Don't vaccinate within 5 months of varizig or 3 d of ACV

Prevention of Zoster

- **Recombinant VZV glycoprotein E /adjuvant AS01B (RZV-Shingrix)**
  - Age>50 years
  - Recommended regardless of CD4 count by OI Guideline
    - ACIP is neutral

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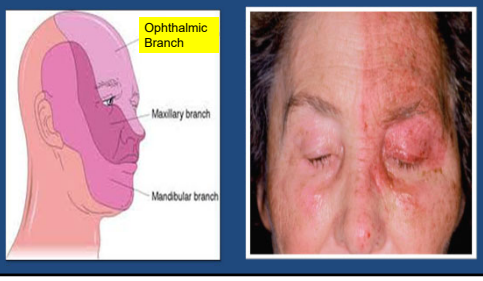
Three Zoster Syndromes You Should Recognize

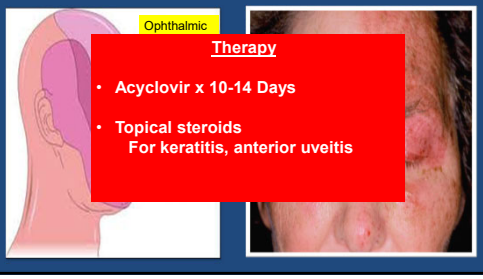
Zoster Ophthalmicus

Ophthalmic Branch CN V



Zoster Ophthalmicus

Ophthalmic Branch CN V



Therapy

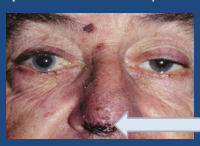
- Acyclovir x 10-14 Days
- Topical steroids
  For keratitis, anterior uveitis

Complications
HIV-Associated Zoster Ophthalmicus

- **Ocular**
  - 50% of Herpes zoster ophthalmicus
- **VII nerve palsy**
- **CNS**

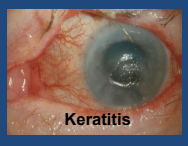
Hutchinsons Sign As Precursor to VZV Eye Disease

(Nasociliary Nerve of Ophthalmic Branch CN V)



Vesicles on the tip of the nose, or vesicles on the side of the nose

Accompanies development of ocular manifestations



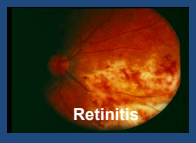
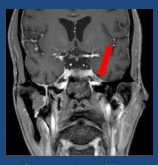


Image C. Stephen Foster, MD, Massachusetts Eye Research and Surgery Institute

Ramsay-Hunt Syndrome-Herpes Zoster Oticus

Geniculate Ganglion of Cranial Nerve VII

External Ear Vesicles and Facial Nerve Paralysis



Meningeal Compression of Trigeminal Ganglion

Rx: Valacyclovir +/- Prednisone

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Herpes Zoster Ophthalmicus
Vascular Inflammation and Occlusion/Stroke

Fugate JE, January 2020, *Practical Neurology*

Zoster Ophthalmicus Related Stroke
Carotid Intimal Involvement

- Days or months post zoster (median 4 months)
- Occasionally cutaneous lesions absent (33%)
- DX-PCR of CSF or VZV antibody production in CSF
- Rx acyclovir plus probably steroids

Herpes Simplex

- **Common Manifestations at any CD4**
  - **Usual localized cutaneous and genital lesions**
- **Dissemination**
  - **Extremely uncommon at any CD4 count**
- **Occurrences at low CD4**
  - Esophagitis
  - Retinitis
  - Dissemination
  - Chronic, extensive genital ulcers, often ACV resistant
- **Diagnosis**
  - Culture or PCR useful for cutaneous lesion
  - Culture or PCR NOT Useful for mucosal surface-may indicate shedding only

Localized Herpes Simplex

Perirectal HSV

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HIV Diseases Associated with EBV

- Oral Hairy Leukoplakia
- CNS Lymphoma (described later)
- Effusion cell lymphoma (described later)

Oral Hairy Leukoplakia EBV Associated

Question #1

Which of the following protozoa can be treated successfully with TMP-SMX?

A. Cyclospora
B. Cryptosporidia
C. Enterocytozoa
D. Encephalitozoa
E. Naegleria

Answer #1

Which of the following protozoa can be treated successfully with TMP-SMX?

A. Cyclospora
B. Cryptosporidia
C. Enterocytozoa
D. Encephalitozoa
E. Naegleria

What Are the Most Common Causes of Diarrhea in Patients with HIV Infection in US?

• Clostridioides difficile	54%
• Campylobacter	14%
• Shigella	14%
• Salmonella	7%

ASD, Sanchez, CID, 2007

Intestinal Coccidia (subclass of Apicomplexa)

Cryptosporidium
- *C. parvum:* cows
- *C. hominis:* humans

Cyclospora cayetanensis

Cystoisospora belli

- All have worldwide distribution
- All transmitted by water or food contaminated with oocysts
- Organisms invade enterocytes and are mainly small intestine
- All cause watery diarrhea that can be prolonged & severe in immunocompromised

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Cryptosporidia

- **Epidemiology**
  - **Transmitted by human or animal feces**
  - **Notorious outbreaks in municipal water supplies (Milwaukee)**
    - **Day care centers, animal contact, water parks, oysters, person to person**
  - **Small inoculum adequate for transmission**
  - **Shedding persists after sx resolve**

Cryptosporidia

- **Clinical Course**
  - **Immunocompetent**
    - **Self limited in 10-14 d (nausea, fever, diarrhea)**
    - **Occasional entry into biliary or pancreatic**
  - **Immunosuppressed (not just HIV!)**
    - **Potentially chronic**

Cryptosporidia

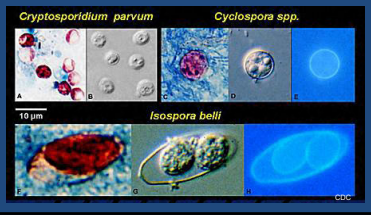
- **Microbiology**
  - Intracellular protozoan
- **Pathology**
  - Normal hosts
    - small bowel
  - Immunosuppressed
    - small and large bowel

Cryptosporidia

- **Diagnosis**
  - **Secretory diarrhea: no blood, mucous**
  - **One stool sample usually adequate**
    - **Modified acid fast, immunofluorescent, ELISA**
    - **PCR**
  - **Small > large bowel Biopsy**
- **Therapy**
  - **Nothing specific documented to be effective**
    - **Possible efficacy: Nitazoxanide, Paromomycin, Azithromycin**
  - **ART**
- **Prevention**
  - **Avoid suspect animals + contaminated water (pools, ponds) and day care**

Intestinal Coccidia Characteristics

Pathogen	Size	Stain	Treatment
Cryptosporidium	4 µm	m acid-fast	None
Cyclospora	10 µm	m acid-fast	TMP/SMX
Cystoisospora	20 µm	m acid-fast	TMP/SMX



Microsporidia

- **Fungus-Not Protozoon**
  - Intracellular
  - Confusing taxonomy
    - Encephalitozoon, Enterocytozoan, Septata….many others
- **Diseases in Immunocompetent Patients**
  - Self limiting diarrhea
  - Keratitis

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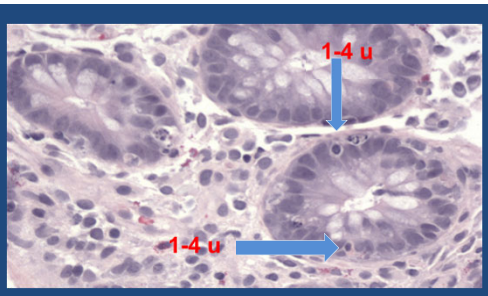
Microsporidiosis in HIV

- Enterocytozoa (mostly *E. bieneusi*)
  - Diarrhea (CD4 < 50)-90% of cases in US
    - sometimes with biliary, pancreatic duct involved
- Encephalitozoa (mostly *E. intestinalis*)
  - Diarrhea (CD4<50)-10% of cases in US
    - (*E. intestinalis* was formerly Septata intestinalis)
  - Disseminated disease with many different species
    - Encephalitis, myositis, keratoconjuctivitis, cholangitis et al

Microsporidia-Diagnosis

- Direct Culture
  - None
- Microscopy
  - PCR
  - Stains
    - H + E and many others



Small Bowel Biopsy: Enterocytozoon bieneusi spores
Location: near the luminal surface of enterocyte
(Brown-Hopp, 1000x)

Therapies for Microsporidiosis

Organism	Frequency	Therapy
• Encephalitozoon intestinalis	(10%)	Albendazole
• Entercytozoon bieneusi	(90%)	None (Nitazoxanide)

(Fumagillin-Not Available)

Bacterial Enteric Disease and HIV

- Opportunistic
  - Salmonella
  - (NOT Shigella)
  - non jejuni non coli Campylobacter
  - Helicobacter
- Also look for proctitis and STDs in certain risk groups
  - GC
  - Chlamydia
  - Syphilis

Salmonella and Shigella in HIV-Infected Persons

- Salmonella
  - Bacteremia more common in HIV pos than HIV neg
  - Bacteremia merits HIV test
  - Treat all infected patients to reduce likelihood of bacteremia
  - Recurrence common
  - If recurrence, long term suppression appropriate-(how long?)
- Shigella
  - Highly transmissible
  - Rarely bacteremic
  - Probably treat all diarrhea to reduce shedding, transmission
  - Rarely recurs

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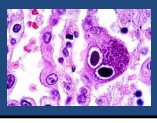
CMV Colitis



Clinical Disease Due to CMV Colitis

- Clinical Presentation
  - Anorexia, abdominal pain
  - Non specific large bowel diarrhea
    - Mild, moderate, severe
- Diagnosis
  - Colonoscopy with cytology or biopsy
  - PCR non specific
- Therapy
  - Ganciclovir, Valganciclovir, Foscarnet
  - Duration: 21-42 days IV vs oral

HIV Associated Cholangiopathy

Idiopathic and/or Related to GI Pathogen

- Biliary obstruction and liver injury in patients with Low CD4
  - Presentations
    - Papillary stenosis
    - Intrahepatic sclerosing cholangitis
    - Bile duct stricture
- Clinical Manifestations
  - Nausea and vomiting
  - Severe RUQ pain
  - Fever
  - Diarrhea and Weight Loss
  - Less jaundice than other cholangiopathies

HIV Associated Cholangiopathy

- Associations/Causes
  - Cryptosporidia
  - Microsporidia
  - CMV
- Diagnosis and Treatment
  - ERCP
  - Sphincterectomy
  - Treatment of associated pathogens
  - ART

Diffuse HIV-Related Encephalopathies

Question #2

A 32-year-old female with HIV infection VL = 100k, and a CD4 count below 10 cells/mm3has failed all available ART regimens.

Her mother brings her to clinic because of confusion for 1-2 weeks. She is afebrile, oriented x 1, and slow to respond. She has nystagmus and CN VI palsy on the right.

The MRI is shown.

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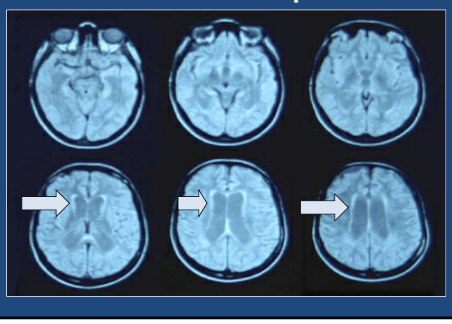
MRI Related Encephalitis



Question #2

Which PCR test would support the diagnosis that is most likely in this case?

A. JC
B. EBV
C. CMV
D. HHV6
E. HHV8

Answer #2

Which PCR test would support the diagnosis that is most likely in this case?

A. JC
B. EBV
C. CMV
D. HHV6
E. HHV8

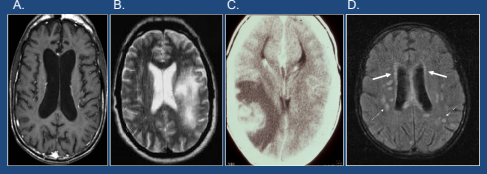
CMV Encephalitis

- **Imaging**
  - **Periventricular Enhancement**
  - **(Micronodular throughout CNS)**
- **Clinical and Laboratory Characteristics**
  - **Low CD4 (<50)**
  - **Rapid onset (days or weeks-unlike HIV)**
  - **Focal CN findings or nystagmus**
  - **CSF pleocytosis sometimes with polys**

Question #3 non ARS

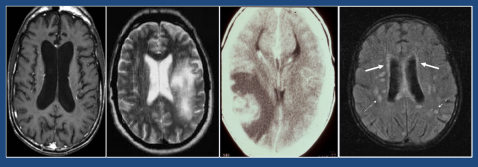
Can you tell what the following lesions are in an HIV infected patient with CD4 <50 cells and dementia of uncertain duration?

A. B. C. D.



Question #3 non ARS

A. HIV Dementia B. PML C. Toxo D. CMV



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Question #4

- A 35-year-old male with long standing HIV, untreated, is brought to the ER for a seizure. His CD4 has been < 20 cells.
- The patient admits that he has had a slowly progressive left lower extremity weakness, and his performance at his accounting firm has deteriorated in the past few months.
- MRI findings of a right parietal white matter lesion with no atrophy or ventricular dilation.
- CSF shows wbc 20 (100% lymphs), protein 60

Question #4

- Which of the following CSF PCR tests would be the most useful?

A. Jakob Creutzfeldt virus
B. HIV
C. EBV
D. BK virus
E. JC virus

Answer #4

- Which of the following CSF PCR tests would be the most useful?

A. Jakob Creutzfeldt virus
B. HIV
C. EBV
D. BK virus
E. JC virus

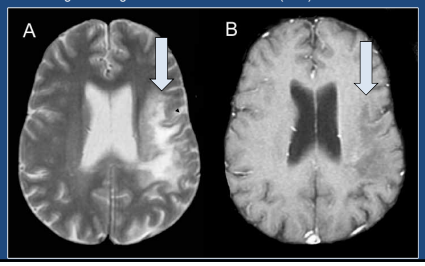
HIV Encephalopathies

Feature	PML	HIVE	CMV
Onset	Subacute	Subacute	Acute
CD4	<100	<100	<50
Dementia	+	+	+
Motor deficit	+	+	+/-
Sensory deficit	+	-	-
MRI			
Location	Asymmetric	Symm	Symm
Cortical atrophy	-	+	-
Micronodular	-	-	+
Periventricular	-	-	+
CSF PCR	JC + 70%	Not helpful	CMV+

Progressive Multifocal Leukoencephalopathy

A. T2-weighted image = increased signal in the left hemisphere

B. T1-weighted image = decreased attenuation (dark).



Progressive Multifocal Leukoencephalopathy (PML) (JC Virus Encephalitis)

- Polyomavirus (JC)
  - Transmission probably by respiratory route human to human
    - >80% adults infected by JC by antibody testing
  - Only known disease is PML
    - Most cases in patients with well defined immunodeficiency

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PML Can Be Associated with Immunosuppressive Diseases Other than HIV

- **Transplants**
- **Cancers**
  - Esp Fludarabine
- **Monoclonal Antibodies**
  - Rituximab
  - Efalizumab-T cell blocker for psoriasis > 3 yrs (withdrawn)
  - Natalizumab
    - (Adhesion molecule inhibitor for Multiple Sclerosis or Crohn's-within 18 months)
- **High Dose Corticosteroids**

Progressive Multifocal Leukoencephalopathy (PML or JC Virus Encephalitis)

- **Disease of White Matter >> Gray Matter**
  - **Slowly progressive**
  - **Non enhancing (80%)**
  - **Multiple focal defects rather than diffuse encephalopathy**
  - **No fever or headache**
  - **Optic nerves and spinal cord usually spared**
  - **Seizures 20%**
    - **(when lesions abut gray matter)**

Progressive Multifocal Leukoencephalopathy

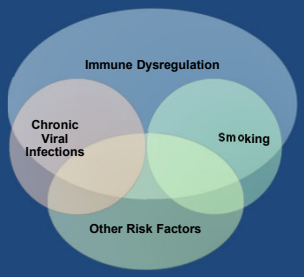
- **CSF:**
  - Cells + protein may be elevated
  - PCR for JC+ in 70-90% of biopsy proven patients
    - Specificity not 100%: interpret with clinical scenario
- **Differential Diagnosis**
  - Multiple Sclerosis
- **Plasma PCR**
  - Correlates with immunosuppression rather than being diagnostic for PML

Progressive Multifocal Leukoencephalopathy

- **Prognosis without ART**
  - **50% die in 2-4 months**
- **Therapy for PML**
  - **ART or reduction in immunosuppression for non HIV**
  - **Check point Inhibitors: nivolumab and pembrolizumab**
  - **Virus specific T cells**
- **Therapy for Inflammatory PML**
  - **IRIS post ART or withdrawal of Natalizumab: Steroids**

HIV and Cancer

HIV and Cancer



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Question #5

What virus is associated with HIV-related multicentric Castleman disease?

A. CMV
B. HSV
C. HHV 6
D. HHV 7
E. HHV 8

Answer #5

What virus is associated with HIV-related multicentric Castleman disease?

A. CMV
B. HSV
C. HHV 6
D. HHV 7
E. HHV 8

Most Cancers Overrepresented Among Patients with HIV are Related to a Virus

AIDS-Defining	Virus
• Kaposi's Sarcoma	HHV-8
• Non-Hodgkin's Lymphoma	EBV
• Invasive Cervical Carcinoma	HPV
Non-AIDS Defining	
• Multicentric Castleman	HHV-8
• Primary Effusion Cell Lymphoma	HHV-8, EBV
• Anal Cancer	HPV
• Hodgkin's Disease	EBV
• Leiomyosarcoma (pediatric)	EBV
• Squamous Carcinoma (oral)	HPV
• Merkel cell Carcinoma	MCV
• Hepatoma	HBV, HCV

Human Herpes Virus 8 (HHV 8)

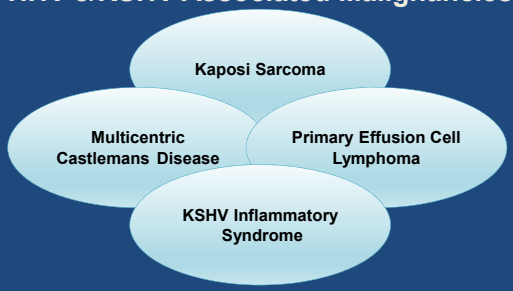
(KSHV-8)-Also Reviewed in Herpes Virus Lecture

- Important
  - Kaposi sarcoma
  - Castleman disease
  - Primary Effusion cell lymphoma
  - Kaposi sarcoma inflammatory syndrome
- Seroprevalence
  - Men who have sex with men: 13-20%
    - IVDU-no clear association
- Testing with PCR or Antibody
  - Not widely done or useful routinely
- Transmission
  - Saliva >> sex

Human Herpes Virus 8 (HHV 8)

- **Role of HHV 8 PCR**
  - None clinically
- **Anti HHV 8 Antiviral Therapy**
  - **No role**
    - **Susceptible to Ganciclovir, Foscarnet, Cidofovir**

HHV-8/KSHV Associated Malignancies



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Kaposi Sarcoma

- Angioproliferative tumor
- Four major subtypes
  - Classic:
    - Indolent cutaneous proliferative disease (mainly affecting extremities)
  - Endemic
    - Equatorial and sub-Saharan Africa
  - Organ transplant associated
    - After transplant
  - Epidemic
    - AIDS-related

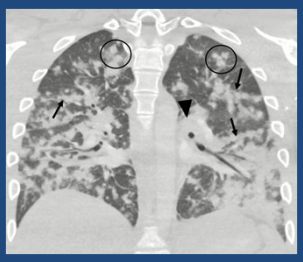
Yarchoan and Uldrick. NEJM. 2018. 378:1029-1041

Kaposi Sarcoma

Kaposi Sarcoma

Lymphedema Due to Kaposi Sarcoma

Pulmonary KS



- Not all have skin lesions
- Nodules and alveolar filling
- Hemoptysis
- Bloody pleural effusion
- Endobronchial Lesions

Clin Infect Dis 2018: 66: 232

Kaposi Sarcoma

- Diagnosis
  - Biopsy
    - Immunohistochemical staining with antibodies recognizing HHV-8-encoded latency-associated nuclear antigen (LANA)
    - Polymerase chain reaction (PCR) to identify HHV-8 sequences within tumor tissue

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Kaposi Sarcoma Therapy

- Antiretroviral Therapy
  - KS often regresses with ART alone
  - Look for IRIS (unmasking or paradoxical worsening)
- Antiherpes drugs have minimal efficacy
- Chemotherapy
- Local excision or radiation

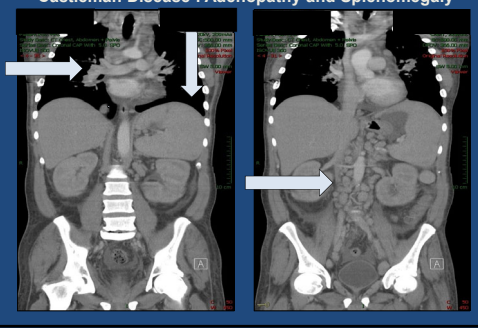
Kaposi Sarcoma

- Local Therapies
  - Intralesional vinblastine
  - Topical cis retinoic acid
  - Radiation Therapy
- Systemic Therapies
  - Pomalidomide
  - Liposomal doxorubicin (doxil)
  - Paclitaxel

Multicentric Castleman Disease

- Not Only HIV
  - Occurs with other immunosuppressive disorders
- Presentation similar to lymphoma, endemic fungi, TB
  - Occurs at any CD4 count
  - Fever, weight loss, lymphadenopathy, hepatosplenomegaly
  - Cytopenias, Hypergammaglobulinemia
  - Kaposi sarcoma may emerge especially if rituximab or steroids used

Castleman Disease : Adenopathy and Splenomegaly



Multicentric Castleman Disease

- Diagnosis
  - Biopsy of lymph node or bone marrow
  - HHV-8 levels correlate with disease activity
- Therapy
  - ART
  - Some combination of—(not testable)
    - Rituximab, Prednisone, Liposomal Doxorubicin, Anti IL6 (sarilumab), AZT + ValGCV

Body Cavity Lymphoma
(Primary Effusion Lymphoma)

- Uncommon but testable
  - 4% of AIDS Associated Lymphomas
  - Any CD4 counts
  - HHV-8 and EBV associated
- B cell malignancy but no B or T markers
  - CD45+
- Presentation
  - Pleural/pericardial/peritoneal effusion
    - local disease
  - Masses unusual but organ infiltration occurs

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Body Cavity Lymphoma (Primary Effusion Lymphoma)

- Diagnosis
  - Effusion cytology
    - nuclear HHV8 by immunohistochemistry
- Therapy and prognosis
  - Unclear

KSHV Inflammatory Cytokine Syndrome

- Can present as sepsis
  - Fever, hypotension, hypoxia
  - Pulmonary, GI, CNS manifestations
  - Similar to Castlemans but no adenopathy or splenomegaly
- Pathogenesis
  - Elevated levels of IL 6 and IL 10
  - Elevated levels of HHV-8
- Treatment
  - Unclear: Rituximab, anti-IL-6

EBV Associated Lymphomas

Diffuse Large B Cell Lymphoma in HIV

- Typically present with
  - advanced stage and "B symptoms"
- EBV associated
- Outcomes
  - comparable to non-HIV patients
- CNS disease frequent

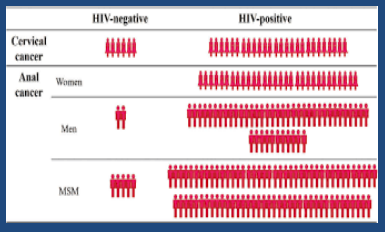
HHV6 and HHV7 in Patients with HIV

Always the Wrong Answer on Exam for HIV

- HHV6 in Immunocompetent Children
  - Transmitted by saliva to 70-90% US population
  - Causes Roseola (Sixth Disease), febrile seizures, encephalitis
- HHV-6 and HIV NOT IMPORTANT
  - Several cases of fever, pneumonitis, encephalitis
  - Rx: Foscarnet active against both A and B strains
- HHV7
  - Clinical: Uncertain importance if HIV + or neg
  - Rx: Foscarnet, cidofovir >> ACV, GCV

HPV Related Squamous Cell Carcinomas

HIV Related



Oral Squamous Cell Cancinomas Also Over-represented Among PWH

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HPV Related Tumors

- **Prevention**
  - **Same as non HIV population**
    - **Condom for preventing transmission and penile cancer**
    - **Circumcision**
    - **Vaccine**
      - **9 valent vaccine to all males and females 9-26 yo regardless of HIV status**
  - **Cervical screening for HPV with Pap test for women 21-29 yo**
    - **Co testing for HPV not recommended**
  - **Anal screening "recommended by some experts"**
  - **Oral screening not proven beneficial and not recommended**
  - **Antiretroviral Therapy**
- **Treatment**
  - Probably beyond scope of ID boards

What Else Could Be On The Exam?

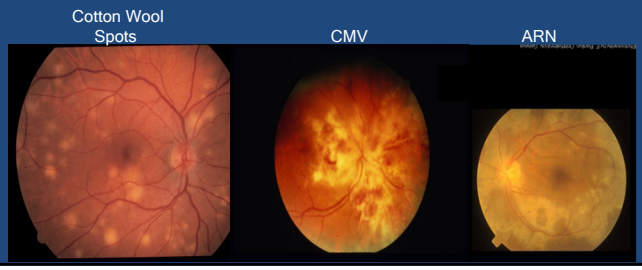
Some Topics That Could Be Easy to Make Into Questions

- **Ophthalmology**
  - Retinitis due to pathogens other than CMV
  - Retinal lesions that are not retinitis
- **Hematology**
  - Acute anemia due to Parvovirus
- **Tick bites**

Herpes Zoster Associated Retinitis

- **Acute Retinal Necrosis: Immunocompetent or HIV/CD4>100**
  - Cutaneous zoster may or may not occur
  - VZV >>HSV, CMV
  - Presents peripherally with pain, floaters
  - WBC in vitreous +/- aqueous
  - Unilateral but can become bilateral if untreated
  - Retinal detachments common
  - Acyclovir followed by valacyclovir +/- intravitreal ganciclovir
- **Peripheral Outer Retinal Necrosis: HIV/ Immunosuppressed (CD4<50)**
  - Multifocal with little inflammation
    - VZV >>HSV, CMV
    - Often involves optic nerve
    - Associated with retinal detachment, blindness
    - Therapy rarely successful
    - GCV +/- Fos IV plus intravitreal ganciclovir

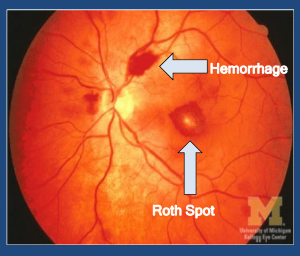
Will You Be Able to Tell These Apart?



Other Lesions That Might Fool You

- **Retinal disease related to another issue**
  - IV drug use
  - Blood stream infection due to IV catheter

Bacterial Endocarditis
Unrelated to HIV—Related to IVDU or Other Factors



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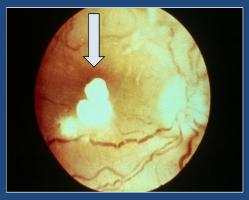
This Might Be Seen In Patient with AIDS
But…Related to IVDU or CLABSI
Candida Chorioretinitis and Endophalmitis



Chorioretinitis (early)
- Diagnose empirically
- No Vitreous Haze
- Systemic Rx alone

Endophthalmitis (late)
- Diagnose with vitreal tap
- Central Vitreal Fluff Ball
- Vitreal Haze
- Rx: Systemic Rx, Intravitreal Ampho, Vitrectomy

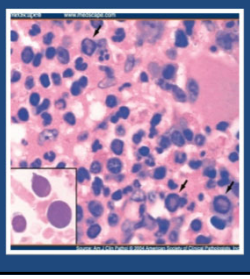
Parvovirus Can Cause Severe Anemia in Patients with HIV Infection

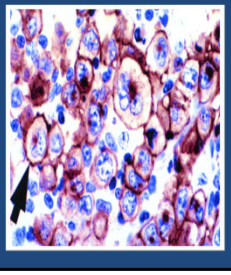
Symptoms	**Weakness over weeks-months**
Hemoglobin	**2.5 - 6.5 g/dl**
Reticulocytes	**Low**
Erythropoietin	**> 500 units (80%)**
Marrow	**Hypocellular**
CD4 Count	**Variable**
B19 Serology	**Variable (40% +)**
B19 PCR	**Positive (Gold Standard)**
	Sensitive but can be positive for months
Therapy: IVIG	**Usually Successful**

Parvovirus in HIV Infected Patient

Inclusion Bodies

Pronormoblasts





Ticks and HIV with "Septic Shock"

- **Exam question**
  - HIV patient presents with fever and shock or hemolysis
  - Clues: outdoor exposure, geography, peripheral smear
- **Tick borne diseases that are more severe in HIV**
  - *Ehrlichia*
  - Anaplasma
  - Babesia

The End