Introduction

Background

The spectrum of dermatologic conditions associated with HIV is vast. The skin is the largest and most visible organ of the body, and although the cutaneous immune system serves as the body’s first line of defense against infection, it can also present numerous pathological manifestations.[1,2,3] Nearly all individuals with HIV will develop a skin disorder at some point in their clinical course, some of which can be debilitating and disfiguring; these conditions may present diagnostic challenges for clinicians and may incur significant medical costs for evaluation and treatment.[1] The recognition and management of HIV-related cutaneous manifestations remains an important area of study for clinicians who treat persons with HIV.

Types of Lesions Based on Morphology

Skin disorders are a frequent reason for persons with HIV to seek medical care, and the dermatologic examination often provides valuable information about a patient’s immune status as well as offers clues to the diagnosis of other systemic conditions. Skin lesions may be recognized based on morphological appearance, and the most common HIV-related lesions can be categorized into the following groups:

- **Vesicular**: Herpes simplex virus, varicella zoster virus
- **Nodular**: Kaposi’s sarcoma, bacillary angiomatosis
- **Papular**: Molluscum contagiosum, eosinophilic folliculitis, warts (condyloma acuminata), scabies
- **Scaling**: Seborrheic dermatitis, psoriasis
- **Macular**: Cutaneous drug eruption, primary HIV Infection, primary and secondary syphilis infection
- **Abscess-Forming**: *Staphylococcus aureus* skin and soft tissue infections
Bacillary Angiomatosis

Introduction

* Bartonella* species cause a wide range of clinical infections including cat scratch disease, trench fever, retinitis, relapsing bacteremia, endocarditis, bacillary angiomatosis, and bacillary peliosis hepatitis.[4,5] There are twenty-four *Bartonella* species, but only *B. henselae* and *B. quintana* cause significant disease infection among individuals with HIV. Transmission of *B. henselae* occurs via cat scratches and fleas (cats are the zoonotic reservoir) whereas *B. quintana* is transmitted primarily by lice and epidemiologically linked with homelessness (humans are the presumed reservoir). Bacillary angiomatosis typically occurs only in persons with HIV who have a CD4 count less than 100 cells/mm$^3$, and *Bartonella* infection can persist as a chronic infection for years in these immunosuppressed patients. In the current HIV era, *Bartonella* infection is rare.

Clinical Manifestations

Among persons with HIV, *Bartonella* infections show a predilection for the skin, liver, and spleen.[6] With severe immunosuppression, *Bartonella* infection can cause nodular, vascular skin lesions known as bacillary angiomatosis (*Figure 1*); these patients may also experience fever, culture-negative endocarditis, osteomyelitis, and other invasive manifestations.[7,8]

Diagnosis

The diagnosis of bacillary angiomatosis is usually initially made based on clinical findings. Bacillary angiomatosis skin lesions can mimic many other conditions, including Kaposi’s sarcoma, pyogenic granuloma, fibrosarcoma, and epithelioid sarcoma.[5,9] A definitive diagnosis requires either a skin biopsy with a Warthin-Starry silver staining showing characteristic bacilli or direct detection of *Bartonella* organisms in tissue using polymerase chain reaction (PCR) techniques. Serologic testing for *Bartonella* is available, and elevated antibody levels can suggest a diagnosis. Isolating *Bartonella* species in culture is very difficult and generally requires use of special culture medium and prolonged incubation.

Treatment

The treatment of bacillary angiomatosis, without concomitant visceral, cardiac, or neurologic involvement, is usually with oral doxycycline 100 mg twice daily for 3 months.[4] The alternative is oral erythromycin, 500 mg four times daily for 3 months. More severe infections may require intravenous and/or combination therapy.[4] There is no role for primary prophylaxis, though individuals with HIV (particularly those with low CD4 counts) should weigh the risks and benefits of cat ownership.[4]
Cutaneous Drug Eruptions

Introduction

Dermatologic complications secondary to adverse effects of medication can range from mild morbilliform reactions to life-threatening Stevens-Johnson syndrome and toxic epidermal necrolysis. Overall, individuals with HIV have an increased risk of developing severe cutaneous reactions compared to the general population. The proposed mechanisms for this increased risk are multiple, including the greater medication usage in the population of persons with HIV compared to the general population, the use of high-dose trimethoprim-sulfamethoxazole therapy to treat Pneumocystis pneumonia, the presence of other infections, decreased antioxidant levels, and aberration of the hepatic cytochrome P450 system by direct viral effect.[10]

Clinical Manifestations

A wide clinical spectrum of skin rashes may be induced by antiretroviral medications, most often with nevirapine (Figure 2) and efavirenz (Figure 3).[11] These rashes include, but are not limited to, diffuse pruritic maculopapular eruption, diffuse urticaria, acute generalized erythematous pustulosis (AGEP), edema, hypersensitivity syndromes including drug rash with eosinophilia and systemic symptoms (DRESS), cutaneous leukocytoclastic vasculitis, alopecia, psoriasis, pyogenic granuloma, xerosis, mucositis, and hyperhidrosis. Certain classes of antiretrovirals are associated with particular types of reactions. Protease inhibitors, for instance, are typically associated with a diffuse rash while nevirapine and abacavir can cause hypersensitivity reactions involving both maculopapular rash and systemic symptoms. Stevens-Johnson syndrome is seen most often in patients taking multidrug regimens containing a sulfa component or nevirapine.[1]

Diagnosis

The diagnosis of a cutaneous drug reaction relies heavily on a careful, complete patient history and also on the exclusion of other likely causes for rash (e.g. infectious, immunologic, allergic, and contact). The temporal sequence of drug and reaction is crucial, and withdrawal of the drug (followed by reintroduction of the drug in the case of more mild rashes) can provide important diagnostic clues. Biopsy is helpful mostly in excluding other etiologies for the rash. Of note, one potentially confounding factor is that some individuals with HIV who initiate antiretroviral therapy experience immune reconstitution inflammatory syndrome, a paradoxical worsening of previously diagnosed and/or unrecognized infections; many of the immune reconstitution inflammatory syndrome events that involve the skin may be confused for a cutaneous drug eruption.[11]

Treatment

Clinically stable patients with mild rash and an absence of systemic symptoms can often be managed with antihistamines. More severe symptoms require discontinuation of the drug and preclude reintroduction. Clinicians should refer to the full prescribing information for each individual drug of concern, and referral to a dermatologist may be helpful for causes of unclear etiology or refractory symptoms after a medication is withdrawn.
**Eosinophilic Folliculitis**

**Introduction**

Eosinophilic folliculitis is a common skin disorder in individuals with HIV who have a CD4 count less than 250 cells/mm$^3$, but this cutaneous manifestation is uncommon in persons without HIV.[1] Although the pathogenesis of eosinophilic folliculitis remains unknown, available data suggest it likely develops as a result of a dysregulated immune response to common skin antigens or an underlying infection with *Pityrosporum ovale* or *Demodex* mites. Eosinophilic folliculitis is viewed as a marker of advancing immune suppression and sometimes is unmasked in the setting of immune reconstitution inflammatory syndrome.

**Clinical Manifestations**

Patients with eosinophilic folliculitis present with an intensely pruritic, erythematous papular rash with pinpoint pustules or vesicles centered around hair follicles on the face, upper chest and back, and/or upper arms (almost always above the nipple line).[12] The palms and soles are spared. Laboratory testing shows elevated serum IgE levels, eosinophilia, and leukocytosis.

**Diagnosis**

The diagnosis of eosinophilic folliculitis is usually suspected based on the finding of intensely pruritic perifollicular lesions in the appropriate clinical setting, but it may be very difficult to distinguish from bacterial folliculitis and pruritic papular eruption.[12,13] Skin biopsy performed for diagnostic confirmation will show an intense perivascular and diffuse inflammatory infiltration that includes eosinophils, lymphocytes, histiocytes, mast cells, and neutrophils.

**Treatment**

Eosinophilic folliculitis ultimately improves with effective antiretroviral therapy but may initially worsen after starting antiretroviral therapy due to immune reconstitution inflammatory syndrome. Topical corticosteroids, combined with antihistamines, are also usually used in the short-term management of eosinophilic folliculitis.[14] In one study, 74% (21 of 28) patients with eosinophilic folliculitis responded to oral itraconazole (200 mg once daily initially with an increase to 300 or 400 mg daily in persons who did not respond to 200 mg once daily).[15]
Herpes Simplex Virus

Introduction

Infections with herpes simplex virus occur frequently in persons with HIV and more than 95% of individuals with HIV are seropositive for either HSV-1 or HSV-2. Recurrent HSV is a chronic infection characterized by periodic reactivation, during which shedding from orolabial and genital mucosal surfaces is increased; shedding can occur even when patients are asymptomatic, and HSV shedding also persists despite highly active antiretroviral therapy among patients coinfected with both HSV and HIV. Individuals with HIV tend to have more severe and chronic HSV lesions, and more asymptomatic shedding of HSV-2 in the genital tract when compared with persons who do not have HIV. Furthermore, HSV-2 reactivation, including asymptomatic shedding without clinically apparent lesions, can increase the rates of HIV transcription, resulting in increased HIV levels in both plasma and genital tissues.

Clinical Manifestations

Cutaneous infection with HSV-1 most often manifests with lesions of the mouth and lips and HSV-2 more commonly causes genital lesions, though HSV-1 and HSV-2 can cause lesions anywhere on the body and are indistinguishable from a clinical perspective. Further, HSV-1 has been increasingly associated with anogenital infection and in some populations, such as young men who have sex with men and young heterosexual women, HSV-1 now accounts for the majority of first-episode anogenital herpes. Regardless of the site, patients typically experience a sensory prodrome followed by evolution of the lesion(s) from papule to vesicle to crusting stage. If untreated, most patients have symptoms that persist for 5 to 10 days; anti-herpes therapy initiated at onset of the prodrome can shorten the symptomatic period or even abort the outbreak. Patients with a CD4 count less than 100 cells/mm$^3$ may have deep, extensive, and non-healing ulcers that can occur anywhere on the body, including face, ears, and genital tract. In addition, persons with HIV who have just started effective antiretroviral therapy may develop unusual ulcerative lesions as a manifestation of immune reconstitution syndrome.

Diagnosis

The diagnosis of HSV can be difficult on a clinical basis alone and lesions can mimic other infections. Diagnosis, therefore, should be pursued through laboratory testing. Herpes simplex virus DNA PCR testing is the most sensitive method for establishing the diagnosis; viral culture and antigen detection are other options. Serologic testing using an IgG based assay may be helpful for patients presenting with lesions for the first time (to confirm primary infection), and some experts recommend performing serologic testing for persons with HIV at baseline to identify prior herpes infection.

Treatment

The Adult and Adolescent Opportunistic Infection Guidelines recommend treatment of cutaneous HSV with oral valacyclovir, famciclovir, or acyclovir for 5 to 10 days; intravenous acyclovir may be required for severe mucocutaneous disease. Persons with HIV may opt for episodic treatment or for daily suppressive therapy if they experience frequent or severe outbreaks. Numerous studies have shown that suppressive therapy of HSV-2 reduces HIV-1 levels in both the plasma and genital tract and prevents HIV disease progression, thus providing further rationale for using daily suppressive therapy. Primary prophylaxis for herpes simplex is not recommended, regardless of HIV serostatus.

Suppressive Therapy
For persons with HIV who have severe recurrent HSV outbreaks or who want to decrease the frequency of outbreaks, suppressive therapy with acyclovir, valacyclovir, or famciclovir can be effective. Unfortunately, studies to date have not shown that suppressive anti-HSV therapy in persons with HIV infection will decrease the risk of transmission of either HSV or HIV to a sexual partner, despite reducing the HIV RNA levels and reducing the occurrence of genital ulcers due to HSV-2.\[30,31\]

**Acyclovir-Resistant HSV**

Between 3.5 and 7% of persons coinfected with HIV and HSV demonstrate resistance to acyclovir.\[32,33,34,35\] Acyclovir resistance is associated with advanced immunosuppression and more frequent use of anti-HSV drugs, with episodic therapy posing a greater risk than suppressive therapy. Acyclovir-resistant HIV often presents as destructive chronic ulcerative lesions (Figure 7).\[36\] Acyclovir resistance should be suspected if no clinical improvement after 7 to 10 days of appropriate treatment for HSV; if this occurs, a sample from the lesion should be sent for viral culture with drug susceptibility testing (if HSV is isolated). The activation of acyclovir depends on an initial phosphorylation step performed by viral thymidine kinase (Figure 8);\[37\] the most common mechanism of acyclovir resistance is absent or decreased production of thymidine kinase by HSV (Figure 9).\[38,39\] The preferred treatment of acyclovir-resistant HSV is intravenous foscarnet 80 to 120 mg/kg/day divided into two or three daily doses until clinical improvement.\[16,39,40\] Foscarnet inhibits viral DNA replication directly and does not require phosphorylation by viral thymidine kinase; unfortunately, foscarnet can cause significant adverse effects, including renal insufficiency and electrolyte abnormalities. Alternative therapies include topical ophthalmic trifluridine, topical or intravenous cidofovir, and topical imiquimod.\[16\]
Kaposi's Sarcoma

Introduction

Kaposi’s sarcoma is a vascular tumor caused by human herpes virus-8 (HHV-8), also known as KS-associated herpes virus (KSHV), which was identified as the etiologic agent in 1994. Kaposi’s sarcoma is an AIDS-defining condition that heralded the HIV epidemic in the early 1980s, and it has remained the most frequent HIV-associated malignancy since that time. The prevalence of Kaposi’s sarcoma has dramatically decreased with the widespread availability of effective antiretroviral therapy though the disease continues to cause substantial morbidity and mortality. Among individuals with HIV, Kaposi’s sarcoma has a peak incidence among men who have sex with men aged 25 to 59 years.

Clinical Manifestations

Kaposi’s sarcoma skin lesions have a varied presentation but tend to progress through three stages: patch, plaque, and nodular. The lesions may be discrete or confluent and tend to appear in a symmetrical distribution. The lesions can vary in color (brown, pink, red, violaceous) and in size (millimeters to several centimeters in diameter) though nearly all will be palpable and non-pruritic. The lesions may develop anywhere on the body, including the face, torso, extremities, and genital tract. Initially the lesions do not cause problems, but they may expand and cause severe local edema and lymphatic obstruction. Extracutaneous spread to mucous membrane involvement is common, and patients may also have visceral organ involvement (gastrointestinal, pulmonary, lymphatic).

Diagnosis

A definitive diagnosis of Kaposi’s sarcoma requires biopsy of the cutaneous lesion(s). Classic findings on pathology include neovascularization with aberrant proliferation of small vessels, atypical spindle-shaped cells with leukocytic infiltration, and hemosiderin-laden macrophages.

Treatment

The treatment for Kaposi’s sarcoma depends on the severity of the disease and whether there is any evidence for visceral organ disease.

- **Antiretroviral Therapy**: Suppressive antiretroviral therapy is recommended for all persons who have AIDS-related Kaposi’s sarcoma and it often causes regression of lesions without the need for additional treatment. Early studies suggested a direct anti-angiogenesis effect from protease inhibitors and led many clinicians to advocate for their use in the treatment of Kaposi’s sarcoma, but further studies have shown that the effects of antiretroviral therapy are mediated by immune restoration rather than by direct antitumor effects.
- **Treatment for Localized Disease**: When indicated, treatment for localized disease may involve radiation, intralesional chemotherapy, topical therapy, or surgical excision.
- **Cytotoxic Chemotherapy**: Systemic cytotoxic chemotherapy is reserved for treatment of severe or disseminated disease, and adding chemotherapy to antiretroviral therapy in these patients reduces disease progression compared to antiretroviral therapy alone. Since systemic chemotherapy also predisposes to secondary cancers (and the 5-year cumulative risk of a second, independent cancer is 5% in persons with Kaposi’s sarcoma), treatment beyond the initiation of antiretroviral therapy should be done in consultation with an experienced specialist.
- **Antiviral Agents**: Several antiviral agents including foscarnet, cidofovir, and ganciclovir show in vitro activity against HHV-8 but are ineffective in treating Kaposi’s lesions, likely
because they inhibit lytic rather than latent viral replication (and most HHV-8 in Kaposi’s sarcoma cells are in the latent phase).
MRSA Skin and Soft Tissue Infections

Introduction

Studies in the 1990s documented that *Staphylococcus aureus* was the most common bacterial skin pathogen affecting persons with HIV, and a more recent study found that *S. aureus* continues to be a problem for persons with HIV, with nasal carriage rates of *S. aureus* (including both methicillin-sensitive and methicillin-resistant strains) as high as 44%. Historically, methicillin-resistant staph aureus (MRSA) skin and soft tissue infections were a nosocomial problem, but in recent years they have become prevalent in the community setting, including in HIV clinics. A recent meta-analysis has demonstrated that individuals with HIV are particularly vulnerable to MRSA colonization (possibly due to underlying immune mechanisms or exposure to settings of high MRSA prevalence) with a colonization rate of nearly 7%, which is as high as the rates of colonization among patients traditionally considered at high risk for MRSA acquisition, such as those on chronic dialysis or admitted to an intensive care unit.

High rates of colonization are associated with high rates of infection: the rate of both nosocomial and community-acquired MRSA infections is 6- to 18-fold higher among persons with HIV than among persons without HIV. In addition, persons with HIV experience more serious infections with more frequent recurrences. Some studies show that the incidence peaked in 2007 and has now stabilized, but MRSA infections continue to cause a significant burden of disease among persons with HIV. Other factors, such as injection drug use and multiple sex partners, may play a role in MRSA transmission. As in the general population, the most common strain causing infection is the USA-300 strain.

Clinical Manifestations

The most frequent clinical presentation of MRSA is localized skin and soft tissue infection with a furuncle, abscess (Figure 15), or cellulitis. Skin infections may mimic bite wounds, particularly spider bites (Figure 16). Invasive infections, including pneumonia, septic pulmonary emboli, osteomyelitis, meningitis, and endocarditis, can also occur.

Diagnosis

The most accurate method for the detection of MRSA is culture of a clinical sample with use of a polymerase chain reaction probe to detect the mecA gene in a microbiologic sample growing staphylococcus, but traditional microbiology lab techniques (using oxacillin-salt agar screening plates or cefoxitin disk diffusion tests) and rapid culture techniques are also available. Antimicrobial susceptibility testing should be performed on MRSA isolates.

Treatment

Primary management in the outpatient setting involves incision and drainage of the abscess, and some patients will improve with local therapy alone, particularly if all of the infected area is completely drained. The Infectious Diseases Society of America recommends addition of antibiotics with the following conditions: severe or extensive disease or rapid progression in the setting of associated cellulitis, associated comorbidities or immunosuppression, extremes of age, or in the case of difficult-to-drain abscesses or lack of response to incision and drainage. Anti-MRSA oral antibiotic therapy includes trimethoprim-sulfamethoxazole (1-2 double strength tablets twice daily), doxycycline (100 mg twice daily), clindamycin (300 to 450 mg four times daily), and linezolid (600 mg twice daily). Most experts prefer trimethoprim-sulfamethoxazole, unless the patient has a sulfa allergy. Duration of antibiotic treatment is typically 5 to 10 days but should be guided by the severity of the infection and by clinical response to therapy.
Molluscum Contagiosum

Introduction

Molluscum contagiosum, caused by the large double-stranded molluscum contagiosum virus (MCV) belonging to the *Poxviridae* family, is a common skin disorder in the general population, manifesting as pearly flesh-colored papules with central umbilication. Between 5 and 18% of persons with HIV not on antiretroviral treatment will develop molluscum contagiosum at some point, and this number is probably closer to 35% among individuals with HIV who have a CD4 count less than 200 cells/mm$^3$.\[57\] Molluscum contagiosum is often more extensive and refractory to therapy in persons with HIV, especially those with very low CD4 cell counts.

Clinical Manifestations

The lesions of molluscum contagiosum usually appear as small, discrete, waxy, flesh-colored papules averaging 3 to 5 mm in diameter, often with central umbilication (Figure 17). In immunocompetent hosts, the number of lesions is generally fewer than 20. In persons with HIV who have advanced immunosuppression, the lesions are usually numerous and characteristically involve the face (Figure 18) and genital region (Figure 19). In addition, with advanced immunosuppression the lesions may be irregular in shape, lack central umbilication, and coalesce into larger disfiguring lesions called “giant molluscum” (Figure 20). In some instances the lesions can coalesce into disfiguring wart-like papular lesions (Figure 21).\[58\]

Diagnosis

The diagnosis of molluscum contagiosum is primarily based on clinical appearance but can be confirmed with skin biopsy; histologic examination using hematoxylin and eosin staining characteristically reveals keratinocytes with eosinophilic intracytoplasmic inclusion bodies called molluscum bodies (or Henderson-Patterson bodies) (Figure 22).\[59\] If necessary, the viral material can be extruded from the ostium of the molluscum contagiosum lesion and will show brick-shaped poxvirus particles under electron microscopy.\[60\]

Treatment

Initiation of antiretroviral therapy is the mainstay of treatment for molluscum contagiosum in persons with HIV—effective sustained suppression of plasma HIV RNA levels is usually sufficient to cause regression of the lesions, although immune reconstitution inflammatory syndrome can temporarily cause a paradoxical worsening of the condition.\[61\,62\,63\,64\] If the lesions of molluscum contagiosum persist despite the use of antiretroviral therapy, localized treatments can be used, including cryotherapy, curettage, pulsed dye laser therapy, and immune modulators, such as topical imiquimod. Topical cidofovir has been effective in investigational studies but is not yet commercially available.\[58\,65\] In general, systemic antiviral and immune-modulatory treatments are more effective than ablative therapies.\[60\]
Psoriasis

Introduction

Psoriasis occurs with similar frequency in persons with or without HIV, but those with HIV are more likely to develop severe psoriasis, treatment-refractory disease, and psoriatic arthritis.[1] In addition, in persons with HIV, worsening psoriasis correlates with advancing immunosuppression. The pathogenesis of psoriasis in persons with HIV is unclear but may involve immune dysregulation, alteration of CD8:CD4 ratio, and/or viral molecular mimicry (whereby the virus “mimics” the host’s own cells and causes an inappropriate cross-reaction, thus inducing autoimmunity.

Clinical Manifestations

In the general population, persons with psoriasis commonly present with symmetrical, salmon-colored plaques with silver scales on extensor surfaces. In contrast, persons with HIV typically present with guttate, inverse, and erythrodermic psoriasis.[66] Guttate psoriasis presents as multiple, small (less than 1 cm) lesions primarily involving the trunk. Inverse psoriasis refers to plaques in the intertriginous areas. Erythrodermic psoriasis is characterized by full-body erythema and scaling (Figure 23); these patients are at high-risk of infection and electrolyte imbalance due to the widespread breakdown in the skin barrier. One of the hallmark features of psoriasis in persons with HIV is the simultaneous development of several morphological types.[67] Many individuals with HIV who have psoriasis will also have joint pain, stiffness, and effusion in the distal interphalangeal joints and spine due to psoriatic arthritis.

Diagnosis

The diagnosis of psoriasis is made based on clinical appearance and, if necessary, can be confirmed by biopsy. Classic histopathologic findings include amplified proliferation of basal keratinocytes, premature desquamation of the stratum corneum, neutrophils in the stratum corneum, and dilated capillaries in the dermis.[67]

Treatment

Treatment of psoriasis is challenging in persons with HIV infection because HIV-associated psoriasis is a T-lymphocyte mediated disease that occurs in the setting of T-lymphocyte depletion.[66] Ideally, a dermatologist should manage or provide expert consultation for persons with HIV who have severe psoriasis. Effective antiretroviral therapy often causes improvement in psoriasis and may be sufficient to treat the psoriasis, particularly in mild cases.[68] Additional therapy depends on the severity of the psoriasis, which is typically gauged by the total body surface area involved.[66] Options for additional therapy include topical steroids, Vitamin D3 analogues, ultraviolet light therapy, oral retinoids, cyclosporine, methotrexate, or tumor-necrosis factor (TNF)-alpha agonists. Cyclosporine, methotrexate and TNF-alpha therapies can all increase the risk of infections so these agents should be reserved for severe disease and require careful monitoring.[66] Multiple novel therapeutics have shown promise as psoriasis treatment, including monoclonal antibodies against different interleukins, as well as an oral phosphodiesterase-4 inhibitor. These novel therapies, however, have not yet been adequately studied in persons with HIV.
Scabies

Introduction

Scabies is caused by an ectoparasite, *Sarcoptes scabiei* (Figure 24). Transmission typically requires prolonged skin-to-skin contact with the exception of crusted (Norwegian) scabies, which is a severe and highly contagious form of infection that can be transmitted through an airborne route in nosocomial settings to other patients and health workers.[69,70,71] Crusted scabies is associated with severe immunosuppression, such as AIDS, and also seen in patients with debilitation and malnourishment; these patients may be more susceptible to the more severe crusted form of scabies as a result of deficient host immunity as well as a decreased scratching reflex (since scratching is actually an effective way to reduce the number of mites). There are case reports of crusted scabies presenting as a manifestation of immune reconstitution inflammatory syndrome in persons with HIV.[72]

Clinical Manifestations

Scabies infections cause intense pruritus. The initial skin lesions are small erythematous papules that can evolve into vesicles or bullae though the more hallmark clinical finding is a thin, short, wavy burrow; scabies lesions have a predilection for certain areas of the body, such as the interdigital space of the fingers, the flexor aspects of the wrist, the axilla, the lateral and plantar aspects of the feet, and the external genitalia, buttocks, and thighs.[73] Papules may be seen in the genital region. Crusted (Norwegian) scabies typically manifests as plaques that develop a prominent scale with crusts and fissures, resembling psoriasis (Figure 25); when crusted scabies involves the scalp it can mimic severe scalp seborrheic dermatitis (Figure 26).[74] Secondary bacterial infection is common due to skin excoriations.

Diagnosis

A presumptive clinical diagnosis can be made in patients who present with intense itching (especially at night), a burrow at a typical site, and household or sexual contact with another individual with scabies. Skin scrapings can yield specimens that show mites and eggs (Figure 27); occasionally skin biopsy may be required in atypical presentations; a skin biopsy will typically not yield evidence of mites but will show a nonspecific, delayed hypersensitivity reaction.[73] With crusted scabies, abundant mites are present and easily identified with a skin scraping.

Treatment

- **Scabies:** Patients with scabies and their close household and sexual contacts should be treated at the same time, regardless of symptoms. The most effective therapy is topical permethrin 5% cream (usually only a single application is required).[75,76] Another treatment option is oral ivermectin 200 mcg/kg orally as a single dose and repeated again 10 to 14 days later; oral ivermectin may be used in persons who do not respond to topical therapy, or may be considered for first-line therapy in patients with generalized eczema or who are unable to comply to topical therapy.[73,76,77] Lindane lotion or cream is an alternative regimen, but its use is limited by neurotoxicity and it cannot be used in pregnancy.[76] The rash and pruritus caused by scabies can persist for up to 2 weeks after treatment.

- **Crusted Scabies:** There have been no controlled trials for the treatment of crusted scabies, but the Centers for Disease Control and Prevention (CDC) recommends combined treatment with a topical scabicide plus oral ivermectin 200 mcg/kg given on days 1, 2, 8, 9, 15, and possibly on days 22 and 29; individuals with HIV who have crusted scabies should be managed in conjunction with expert consultation.[76]

- **Nonpharmacologic Measures:** Regardless of pharmacotherapy, patients with crusted
scabies should wash bed linens and clothing in hot water (ideally with a scabicide lotion) or place them into a hermetically sealed bag for several days.[74]
Seborrheic Dermatitis

Introduction

Seborrheic dermatitis is a common clinical skin manifestation that affects 34 to 83% of persons with HIV infection, as opposed to 1 to 3% of the general population.[1] This condition is both more frequent and more severe in patients with advanced immunosuppression.[78] Seborrheic dermatitis in persons with HIV is likely due to a dysregulated immune response to fungal skin pathogens, such as Malassezia species.

Clinical Manifestations

Seborrheic dermatitis develops on the scalp, nasolabial fold, eyebrows, ears, face, and upper chest, manifesting as flaky, scaling, erythematous patches or plaques (Figure 28).[79] Often the lesions have a greasy appearance and have a white or yellowish scale on the surface (Figure 29). Patients with HIV and advanced immunosuppression may have more diffuse involvement, sometimes affecting the scalp and extremities. Because seborrheic dermatitis has been linked to depression in T-cell function, worsening seborrheic dermatitis can be used as a marker of HIV disease progression.[1]

Diagnosis

The diagnosis of seborrheic dermatitis is primarily based on typical clinical findings and, if necessary, can be confirmed with biopsy. Histopathologic findings may include widespread parakeratosis, spotty keratinocytic necrosis, leukoexocytosis, and a superficial perivascular infiltrate of plasma cells and neutrophils; these sections also show expression of certain heat-shock proteins, which does not occur among individuals without HIV.[1]

Treatment

Antifungal drugs, including ketoconazole, itraconazole, and terbinafine, are the mainstay of treatment, and can be delivered in shampoos, creams, or oral medications. Intermittent use of antifungals can maintain remission, and topical corticosteroids may be useful in the short-term to control erythema and itching.[80] Patients on effective antiretroviral therapy often have major improvement or regression of seborrheic dermatitis.[81]
Varicella-Zoster Virus

Introduction

Primary varicella infection (chickenpox) is uncommon in adults with HIV due to immunity acquired through childhood infection. In contrast, adults with HIV have an increased risk for varicella-zoster virus reactivation disease (herpes zoster, also known as shingles). The incidence of zoster among adults with HIV is approximately 15-fold higher than among age-matched immunocompetent adults, and the risk is highest in patients with a CD4 count less than 200 cells/mm$^3$.[82] Individuals with HIV may have additional increased risk of developing herpes zoster in the first 4 months after starting effective antiretroviral therapy, likely as a result of immune reconstitution.[83] In contrast, long-term use of suppressive antiretroviral therapy reduces the risk of developing zoster in persons with HIV.[84] The presence of zoster infection in an individual younger than age 50 years should prompt HIV testing, particularly if the zoster is multi-dermatomal zoster.

Clinical Manifestations

Herpes zoster is characterized by a prodrome of dysesthesias for several days before the onset of cutaneous lesions. The lesions appear as a cluster of vesicles on an erythematous base (Figure 30), and they may coalesce into larger bullae. Zoster characteristically follows a dermatomal distribution, most commonly affecting skin of the thorax (Figure 31). Complications of dermatomal zoster include scarring, bacterial superinfection of the lesions (Figure 32), severe necrotic zoster (Figure 33), and postherpetic neuralgia, which is manifested as severe skin pain in the same distribution as the original lesions but occurring after resolution of the lesions. Immunosuppression from HIV infection is associated with a two-fold increase in the risk of developing post-herpetic neuralgia when compared to persons without HIV.[85] Trigeminal nerve involvement, also referred to as herpes zoster ophthalmicus, can potentially lead to a multitude of eye-related complications. Individuals with HIV, particularly those with advanced immunosuppression, are at increased risk of disseminated herpes zoster infection, including ocular, central nervous system, or visceral organ involvement.

Diagnosis

The diagnosis of herpes zoster is usually based on a characteristic clinical presentation, but if needed the diagnosis can be confirmed by obtaining a swab of a fresh (noncrusted) lesion and testing with polymerase chain reaction, direct fluorescent antibody (DFA), or culture.[82] To collect the sample for DFA testing, unroof the lesion and scrape the base, since this optimizes collection of more cellular material. Although viral culture has been the gold standard for diagnosis, there is increasing evidence that it performs suboptimally compared to more modern molecular techniques.[26] If the lesions are already crusted, PCR testing provides the highest yield.[82]

Treatment

The preferred treatment for herpes zoster in persons with HIV is oral therapy with either valacyclovir or famciclovir; oral acyclovir is considered an alternative (Table 2).[82] The five times a day dosing required for acyclovir is a particularly difficult regimen from a practical standpoint.[82] Ideally, treatment should be initiated within 72 hours of symptom onset, though there is evidence that treatment beyond this window may still be effective in immunocompromised adults.[86] Corticosteroids are sometimes recommended as an adjuvant therapy for immunocompetent adults, but due to a lack of data and a theoretical risk of causing immunosuppression, corticosteroids should not be used as a component of therapy for treatment of zoster in persons with HIV. Intravenous foscarnet (100 mg/kg twice daily) for 14 to 21 days can be used in the rare instances of acyclovir-resistant varicella zoster infection.[87] Pain control is an important aspect of treating active varicella and zoster infections, and treatment may involve a combination of opiates, gabapentin, tricyclic antidepressants, and topical capsaicin.
Prevention

- **Varicella Vaccine**: For adults with HIV who do not have documented immunity to varicella-zoster virus, the 2018 Advisory Committee on Immunization Practices (ACIP) guidelines recommend administering two doses of the live attenuated varicella vaccine, at least 4 to 8 weeks apart; this vaccine is contraindicated in persons with HIV who have a CD4 count below 200 cells/mm$^3$.[88]

- **Zoster Vaccine**: For persons without HIV, the ACIP recommends using two doses of the recombinant zoster vaccine (RZV) in persons age 50 years and older.[89] The zoster live vaccine (ZVL) is the alternative to the ZVL, but note this vaccine is a live-virus vaccine with 14-fold higher titers of varicella-zoster virus compared to the varicella vaccine and thus should never be given to persons who lack immunity to varicella-zoster virus.[89] As of September 2, 2019, there were conflicting 2019 ACIP recommendations regarding zoster vaccine for persons with HIV—the published 2019 Recommended Adult Immunization by Medical Condition and Other Indications recommends RZV for persons with HIV 50 years of age and older, regardless of CD4 count, but the online 2019 version indicates no recommendation (for or against) RZV in persons with HIV (at all CD4 cell counts).[88,89] Similarly, the 2019 ACIP published and on-line recommendations are conflicting for ZVL. For both the published and on-line 2019 ACIP recommendations, ZVL is contraindicated for persons with HIV if they have a CD4 count less than 200 cells/mm$^3$, but for persons with HIV who have a CD4 count of at least 200 cells/mm$^3$ and are 60 years of age or older, the published version recommends ZVL whereas the online version indicates no recommendation (for or against).[88,89]

- **Postexposure Prophylaxis**: In the event that an individual is nonimmune to varicella and experiences a significant exposure to either active varicella or zoster, varicella-zoster immune globulin (VZIG) should be administered within 96 hours.[90] Unfortunately, access to VZIG is limited; if it is unavailable, then it is reasonable to administer valacyclovir (1 gram three times daily) on post-exposure days 3 to 22.[82,91] There are no recommendations to administer chronic suppressive anti-herpes medications to prevent zoster.
**Warts (Anogenital)**

**Introduction**

Anogenital warts, also called condyloma acuminata, are the most common viral sexually transmitted infection and the most common wart to observe in persons with HIV. These warts are caused by the ubiquitous human papilloma viruses (HPV), which are small double-stranded DNA viruses that can be categorized into cutaneous and mucosal groups. Most sexually active adults will acquire HPV infection at some point in their lives, and in most cases the virus is cleared spontaneously. More than 100 types of the human papilloma virus (HPV) have been identified, and a subset (e.g. HPV 16 and 18) has oncogenic potential. Nononcogenic subtypes 6 and 11 cause most anogenital warts. Individuals with HIV are more likely to develop HPV-related warts and anal cancer, especially men who have sex with men. Accordingly, screening programs with anal Pap smears should be considered if resources are available for referral and treatment.[92] Among individuals with HIV, lesions may also be more recalcitrant to therapy due to deficient cell-mediated immunity. Although effective antiretroviral therapy has not been proven to reduce the risk of developing anogenital warts, higher CD4 counts and lower HIV RNA levels seem to independently reduce the risk of acquiring warts.[93]

**Clinical Manifestations**

Typical condyloma acuminata are flesh-colored and can range from smooth, flattened lesions to verrucous papules. Most patients are asymptomatic, but some with extensive or multiple lesions may complain of pain, burning, or pruritus.

**Diagnosis**

The diagnosis of condyloma acuminata is typically made by visual inspection. The diagnosis of genital warts can be confirmed by biopsy.

**Treatment**

Recommended treatment options for external anogenital warts include chemical or physical destruction, immunologic therapy, and surgical therapy. Regardless of the treatment method, recurrence rates are high, especially in the first three months after treatment.[92] As outlined in the 2015 STD Treatment Guidelines, the general approach to the treatment of anogenital warts is the same for persons with or without HIV; these recommended options include patient-applied and provider-administered treatments.[92]

**2015 STD Treatment Guidelines: Anogenital Warts**

**Table 3. Treatment of External Anogenital Warts**

External anogenital warts include penis, groin, scrotum, vulva, perineum, external anus, and perianus*

Recommended for PATIENT-APPLIED Therapy
Podofilox 0.5% solution or gel

**Podofilox 0.5% solution or gel**

Tradename: Condylox

Apply podofilox solution (using a cotton swab) or podofilox gel (using a finger) to anogenital warts twice a day for 3 days, followed by 4 days of no therapy. Repeat the cycle, as necessary, for up to four cycles.

The total wart area treated should not exceed 10 cm$^2$, and the total volume of podofilox should be limited to 0.5 mL per day.

Recommended for PATIENT-APPLIED Therapy

Imiquimod 3.75% cream

**Imiquimod 3.75% cream**

Tradename: Zyclara

Apply the 3.75% cream once at bedtime, every night consecutively for 16 weeks. The treatment area should be washed with soap and water 6-10 hours after the application.

Note: Imiquimod might weaken condoms and vaginal diaphragms.

Recommended for PATIENT-APPLIED Therapy

Imiquimod 5% cream

**Imiquimod 5% cream**

Tradename: Aldara

Apply the 5% cream once at bedtime, three times a week for up to 16 weeks. The treatment area should be washed with soap and water 6-10 hours after the application.

Note: Imiquimod might weaken condoms and vaginal diaphragms.
Recommended for PATIENT-APPLIED Therapy

**Sinecatechins 15% ointment**

Tradename: Veregen

Apply three times daily (0.5 cm strand of ointment to each wart) using a finger to ensure coverage with a thin layer of ointment until complete clearance of warts is achieved. This product should not be continued for longer than 16 weeks. Do not wash off after use.

Note: Sinecatechins might weaken condoms and vaginal diaphragms.

Recommended for PROVIDER-ADMINISTERED Therapy

**Cryotherapy with liquid nitrogen or cryoprobe**

Local anesthesia (topical or injected) might facilitate therapy if warts are present in many areas or if the area of warts is large.

Health care providers must be trained on the proper use of this therapy because over- and under-treatment can result in complications or low efficacy.

Recommended for PROVIDER-ADMINISTERED Therapy

**Surgical removal either by tangential scissor excision, tangential shave**

After local anesthesia is applied, anogenital warts can be physically destroyed by electrocautery, in which case no additional hemostasis is required. Alternatively, the warts can be removed either by tangential excision with a pair of fine scissors or a scalpel, by carbon dioxide (CO2) laser, or by
Surgical therapy has the advantage of eliminating most warts at a single visit, although recurrence can occur. Surgical removal requires substantial clinical training, additional equipment, and sometimes a longer office visit.

**Recommended for PROVIDER-ADMINISTERED Therapy**

Trichloroacetic acid (TCA) or Bichloroacetic acid (BCA) 80-90% solution

The 9-valent HPV vaccine (9vHPV) is now the only HPV vaccine manufactured in the United States and it has been approved by the FDA for use in males and females for ages 9 through 45 years.[94] This vaccine contains HPV 6 and 11, which together cause approximately 90% of anogenital warts. In addition, the 9vHPV vaccine protects against the dominant anogenital cancer strains HPV 16 and 18, as well as 5 other subtypes that cause a minority of HPV anogenital cancers. The vaccines are most effective when given prior to an individual’s sexual debut, but the most recent ACIP Adult Immunization Schedule recommends vaccination for females and males with HIV aged of 9 through 26 years, with a recommendation to use shared clinical decision-
making for persons 27 through 45 years of age.[95]
Summary Points

- Persons with HIV have a significantly elevated risk of developing severe cutaneous reactions compared to the general population. Stevens-Johnson syndrome is seen most often in patients taking multi-drug regimens containing a sulfa component or nevirapine.
- Eosinophilic folliculitis causes an intensely pruritic, erythematous papular rash (almost always above the nipple line) with pinpoint pustules or vesicles. Eosinophilic folliculitis ultimately improves with effective antiretroviral therapy but often initially worsens due to immune reconstitution inflammatory syndrome.
- Herpes simplex virus infections are common among individuals with HIV and can be treated effectively with acyclovir, valacyclovir, or famciclovir. Suppressive antiviral therapy of HSV plays an important role in reducing HIV-1 levels, reducing the rate of HIV disease progression, and reducing the frequency of outbreaks of HSV-2 genital ulcers, but it has not been found to reduce the risk of transmission of either HIV or HSV to sexual partners.
- The prevalence of Kaposi’s sarcoma has decreased with the widespread availability of effective antiretroviral therapy, yet Kaposi’s sarcoma remains the most frequent HIV-associated malignancy. Effective antiretroviral therapy often causes regression of Kaposi’s sarcoma lesions without additional therapy.
- The rate of both nosocomial and community-acquired MRSA infections is 6- to 18-fold higher among individuals with HIV than among persons without HIV, and individuals with HIV experience more serious MRSA infections with more frequent recurrences.
- Crusted (or Norwegian) scabies is a severe form of parasitic infection that can be seen in persons with HIV, and it requires combined topical and oral therapy as well as treatment of close contacts and aggressive washing of linens and clothing to prevent forward fomite transmission.
- Scaling rashes, including seborrheic dermatitis and psoriasis, are likely due to a dysregulated immune system and often have atypical clinical presentations in persons with HIV.
- Individuals with HIV infection have a significantly increased risk of developing herpes zoster. All zoster infections warrant therapy with acyclovir, valacyclovir, or famciclovir. The RZV vaccine does not contain live varicella-zoster virus and is an attractive option for persons with HIV who are 50 years of age and older.
- Individuals with HIV are more likely to develop HPV-related warts and anal cancer, especially men who have sex with men. Persons with HIV should receive the 9vHPV vaccine. The 9vHPV vaccine is recommended for females and males aged 9 through 26 years. Use of 9vHPV for persons age 27 through 45 years should be based on shared clinical decision making between the clinician and the client.
Citations


89. Advisory Committee on Immunization Practices (ACIP). Recommended Immunization Schedule for Adults Aged 19 Years or Older by Medical Conditions and Other Indications, United States, 2019. [ACIP] -


References


Figures

Figure 1 Nodular Bacillary Angiomatosis Lesion in Right Antecubital Fossa

Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
Figure 6 Multiple Herpes Simplex Virus Infection Lesions on Scrotum

Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
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Illustration by David H. Spach, MD
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Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
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Photograph credit: David H. Spach, MD
Figure 16 MRSA Lesion of Left Hand Resembling Spider Bite

Photograph credit: David H. Spach, MD
Figure 17 Molluscum Contagiosum Lesions

Note the characteristic central umbilication of the lesions.

Photograph credit: David H. Spach, MD
Figure 18 Papular Molluscum Contagiosum Lesions on Face

Photograph credit: David H. Spach, MD
Figure 19 Multiple Molluscum Lesions on Shaft of Penis

Photograph credit: David H. Spach, MD
Figure 20 Giant Molluscum Contagiosum Lesion on Face

This patient has a giant molluscum lesion and multiple smaller lesions.

Photograph credit: David H. Spach, MD
Figure 21 Extensive Molluscum Contagiosum Lesions on Face

Photograph credit: David H. Spach, MD
Figure 22 Histologic Appearance of Molluscum Contagiosum

This hematoxylin and eosin stained skin biopsy taken from a patient with AIDS and molluscum shows lobules of keratinocytes that contain numerous large eosinophilic intracytoplasmic inclusion bodies (Henderson-Patterson, or molluscum bodies) [arrows]. Magnification x20.

Figure 23 Extensive Erythrodermic Psoriasis on Chest and Upper Arms

This photograph was taken approximately 1 week after treatment for psoriasis was initiated and scaling of the lesions had resolved at this point of treatment.

Photograph credit: David H. Spach, MD
Figure 24 Sarcoptes scabiei Mite Viewed by Scanning Electron Microscopy

This scanning electron microscopy shows a scabies mite (*Sarcoptes scabiei* var. *hominis*) in a specimen obtained from the scraping of a woman's hand.

Source: Stoffle NN, Cohen PR. Images in clinical medicine. Sarcoptes scabiei infestation. N Engl J Med. 2004;350:e20. This image is reproduced with permission from the Massachusetts Medical Society. Copyright © 2004 Massachusetts Medical Society. All rights reserved.
Figure 25 Crusted Scabies in a Man with Advanced Immunosuppression

This image of a patient with AIDS and a CD4 count less than 100 cells/mm$^3$ shows a diffuse erythematous rash, with plaque-like lesions in the shoulder region.

Photograph credit: David H. Spach, MD
Figure 26 Crusted Scabies in the Scalp of a Patient with Advanced Immunosuppression

Photograph credit: David H. Spach, MD
Figure 27 Scabies Mite and Eggs

Microscopy slide of skin scraping from patient with crusted scabies showing a scabies mite and multiple scabies eggs.

Source: modified from Spach DH, Fritsche TR. Images in Clinical Medicine. N Engl J Med 1994;331:777 This image is reproduced with permission from the Massachusetts Medical Society. Copyright © 1994 Massachusetts Medical Society. All rights reserved.
Figure 28 Seborrheic Dermatitis of Right Ear: Side and Rear Views

Photograph credit: David H. Spach, MD
Figure 29 Seborrheic Dermatitis on Face with Marked Scaling

Photograph credit: David H. Spach, MD
Figure 30 Cluster of Herpes Zoster Lesions

Note the cluster of vesicular lesions that have a surrounding erythematous base.

Photograph credit: David H. Spach, MD
Figure 31 Cluster of Zoster Lesions on Chest

Photograph credit: David H. Spach, MD
Figure 32 Zoster on Face with Secondary Bacterial Infection

Photograph credit: David H. Spach, MD
Figure 33 Necrotic Zoster on Thigh

Photograph credit: David H. Spach, MD
### Table 1. Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV

#### Recommendations for Treating Herpes Simplex Virus (HSV) Infections

<table>
<thead>
<tr>
<th>Treating Initial or Recurrent Genital Lesions (Duration: 5-10 Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Valacyclovir 1 g PO BID (AI), or</td>
</tr>
<tr>
<td>- Famciclovir 500 mg PO BID (AI), or</td>
</tr>
<tr>
<td>- Acyclovir 400 mg PO TID (AI)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treating Severe Mucocutaneous HSV Infections (AIII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Initial therapy acyclovir 5 mg/kg IV q8hr</td>
</tr>
<tr>
<td>- After lesions begin to regress, change to oral therapy as above.</td>
</tr>
<tr>
<td>- Continue treatment until lesions have completely healed.</td>
</tr>
</tbody>
</table>

#### Chronic Suppressive Therapy

**Indications:**
- For patients with severe recurrences (AI), or
- Patients who want to minimize the frequency of recurrences (AI), or
- To reduce the risk of GUD in patients with CD4 cell counts <250 cells/mm³ who are starting ART (BI)

**Regimen:**
- Valacyclovir 500 mg PO BID (AI), or
- Famciclovir 500 mg PO BID (AI), or
- Acyclovir 400 mg PO BID (AI)

Evaluate ongoing need for suppressive therapy annually.

Rating of Recommendations: A = Strong; B = Moderate; C = Optional

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials, observational cohort studies with long-term clinical outcomes, relative bioavailability/bioequivalence studies, or regimen comparisons from randomized switch studies; III = Expert opinion

Source:
- Panel on Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the prevention and treatment of opportunistic infections in adults and adolescents with HIV: recommendations from the Centers for Disease Control and Prevention, the National Institutes of Health, and the HIV Medicine Association of the Infectious Diseases Society of America. Herpes simplex virus. Last updated: September 17, 2015. [AIDSinfo]
Table 2. Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV

Recommendations for Treatment of Herpes Zoster (Shingles)

**Acute Localized Dermatomal (Duration: 7 to 10 Days; consider longer duration if lesions resolve slowly)**

**Preferred Therapy:**
- Valacyclovir 1,000 mg PO three times daily (AII), or
- Famciclovir 500 mg PO three times daily (AII), or

**Alternative Therapy:**
- Acyclovir 800 mg PO 5 times daily (BII)

**Extensive Cutaneous Lesions or Visceral Involvement**

- Acyclovir 10–15 mg/kg IV q8h until clinical improvement is evident (AII), or
- Switch to oral therapy (valacyclovir 1,000 mg three time daily,, famciclovir 500 mg three times daily, or acyclovir 800 mg five times daily)—to complete a 10 to 14 day course, when formation of new lesions has ceased and signs and symptoms of visceral varicella-zoster virus infection are improving (BIII)

Rating of Recommendations: A = Strong; B = Moderate; C = Optional

Rating of Evidence: I = Data from randomized controlled trials; II = Data from well-designed nonrandomized trials, observational cohort studies with long-term clinical outcomes, relative bioavailability/bioequivalence studies, or regimen comparisons from randomized switch studies; III = Expert opinion

Source:
