Communication Disorders in Individuals with HIV/AIDS

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Introduction

The prevalence of communication disorders in individuals with Human Immunodeficiency Virus/Acquired Immuno-deficiency Syndrome (HIV/AIDS) and how it compares to the general population are unknown. Treatment advances are being made both for individuals with communication disorders and those with HIV/AIDS. Unfortunately, little work has been done for those who have HIV/AIDS _and_ a communication disorder. Communication disorders may have a significant impact on an individual as speech, language, and hearing often are critical to success in contemporary life. Approximately one in six Americans has some form of communication disorder.[1]

The natural history of HIV infection in a typical person without antiretroviral therapy from the time of HIV transmission to death is 10-11 years.[2] The initial event is the acute retroviral syndrome accompanied by a decline in CD4 cell counts. CD4 cell count decreases are due to HIV-induced cell death. Late stage disease is characterized by a CD4 count less than 200 cells/mm^{3} and development of opportunistic infections, selected tumors, wasting, and neurologic complications. However, progress treating HIV infection has decreased mortality rates and essentially made the disease a chronic condition that can be managed long term.[3]

The prevalence rate of HIV infection among adults and adolescents was estimated at 137.0 per 100,000 at the end of 2005.[4] The prevalence of AIDS also has increased steadily since 2001. The long-term effects of HIV/AIDS and its treatment on communication abilities raise many questions that have not been answered adequately.

HIV Infection and the Central Nervous System

HIV enters the central nervous system (CNS) early in the course of infection and its effect is widespread. Up to 100% of HIV-infected adults have CNS abnormalities.[5] Prolonging life in an immunosuppressed state has resulted in increased incidence of systemic pathologies, including those of the central nervous system. If the infection progresses, various CNS pathologies appear, including opportunistic infections, primary CNS lymphoma, progressive multifocal leukoencephalopathy, peripheral or sensory neuropathy, and HIV dementia.[3] Primary infection of the central nervous system occurs when there is a direct infection by HIV. Secondary CNS complications may occur due to HIV-associated systemic disorders. Secondary infection occurs when HIV infects another system in the body through an opportunistic infection, neoplasm, or systemic disorder.

Cognitive and Speech-Language Disorders

Cognitive impairment is one manifestation of the CNS complications associated with HIV/AIDS. Cognitive changes may be seen early in the course of the infection even in patients who are otherwise asymptomatic.[3,5-6] Common cognitive changes include problems with

abstract reasoning, learning difficulties, slow information processing, and retardation of the spontaneity of speech. CNS complications in patients with HIV can reflect the consequences of medical treatment. Clinicians should distinguish to the best of their knowledge between symptoms related to the HIV disease process and the side effects of antiretroviral medications.[3]

HIV dementia is seen in approximately 3% of patients.[2] Although a decrease in incidence has been reported with antiretroviral therapy, the prevalence has increased because of patients surviving longer.[7] Slowed processing speed may underlie patient complaints related to specific cognitive deficits.[6] Psychomotor slowness is associated with severity of HIV disease and occurs in the context of other HIV-related neuropsychiatric symptoms. Speech-language symptoms are related to memory loss and cognitive slowing.[2] Language difficulties actually may be a manifestation of deficits in simple reaction time rather than language function.[8]

Primary CNS lymphomas are associated with the Epstein-Barr virus.[2] The incidence is less than 6%. Several symptoms relate to speech-language abilities including confusion, memory loss, and aphasia. Progressive multifocal leukoencephalopathy occurs in 1 to 2% of AIDS patients.[2] Cognitive impairments and speech deficits related to hemiparesis are common symptoms. Further, up to 9% of AIDS patients are referred for psychiatric evaluations.[2-3] Psychiatric illness may be associated with disorganized thinking and cognitive changes.

Auditory System Disorders

The etiologies of auditory system disorders in adults with HIV/AIDS fall into one of three broad categories: HIV/AIDS as the primary cause, opportunistic infections associated with HIV/AIDS, and iatrogenic sources. Karposi's sarcoma, for example, is the most common neoplasm in persons with HIV/AIDS.[5] It is manifested on the pinna almost exclusively in persons with HIV/AIDS and may cause conductive hearing loss when manifested in the ear canal, eardrum, or middle ear.[9] HIV infection also may damage the cochlea, eighth nerve, or both, sometimes resulting in sensorineural hearing loss; and it also may compromise neural pathways and centers in the brain resulting in central auditory disturbance.[5,10]

Opportunistic infections due to suppressed immune systems in adults with HIV/AIDS can precipitate or exacerbate auditory disorders. These opportunistic infections include otitis media or mastoiditis in the middle ear,[11] neurosyphilis,[11-13] cyto-megalovirus,[14] cryptococcal meningitis,[11,15] non-Hodgkin's lymphoma in the oral cavity,[5] pharyngeal infections associated with hemophilia-A,[16] and several other infections of the head and neck.[10,17-18] Adults with HIV/AIDS may show head, neck and otologic symptoms from opportunistic infections, including otalgia, otorrhea, tinnitus, "muffled" hearing, aural fullness, facial nerve palsy, vertigo and central vestibular, and ocular-motor disturbance.[5,10-11,17-25]

Ototoxicity from drugs used to treat adults with HIV/AIDS is the most common iatrogenic source of auditory disorders. Tseng and colleagues[26] found that 17% of HIV/AIDS patients who received azithromycin experienced drug-related hearing problems and three-fourths of these problems resolved after azithromycin was discontinued. Kohan and colleagues[20] reported on seven patients with HIV/AIDS who had persistent sensorineural hearing losses. Three patients had been exposed repeatedly to strong ototoxic drugs (i.e., aminoglycosides), while the other four had

persistent hearing losses despite standard antibiotic treatments. Simdon and colleagues[27] reported three cases of auditory dysfunction, possibly associated with nucleoside analog reverse transcriptase inhibitors. All three patients had histories of noise-induced hearing loss and tinnitus that worsened during antiretroviral therapy. Marra and colleagues[11] also reported that hearing loss was associated with antiretroviral therapy in subjects with HIV/AIDS, particularly subjects 35 years or older.

Whatever the etiology, some middle ear infections in adults with HIV/AIDS, such as chronic otitis media, supporative otitis media, and mastoiditis, are as common as those in adults without HIV/AIDS and often respond to medical treatment as well.[10,22] Conversely, pneumocystis carinii otitis media is an opportunistic infection unique to persons with HIV disease and can cause conductive or mixed hearing losses.[5,10]

Sensorineural hearing loss, which often cannot be treated medically, is more common among adults with than those without HIV/AIDS.[10,18,20,28] The likelihood of sensorineural hearing loss among adults with HIV/AIDS varies among studies depending on the characteristics of the sample and the criteria for hearing loss. In general, sensorineural hearing losses occurred in one-third to two-thirds of the subjects. They usually occurred more at high frequencies than at low frequencies and were more severe in patients with more severe HIV infections[17] or, similarly, with greater deterioration in immunologic status[28]. Furthermore, most neuro-otological disorders in HIV/AIDS patients have a central origin; both central auditory disorders and peripheral auditory disorders are more common in advanced stages of HIV/AIDS.[21,29-30] Central auditory disorders also may be more common in adults with HIV-Associated Dementia[31], though research in this area is lacking. Finally, common risk factors for hearing loss in adults in general (e.g., excessive noise exposure or aging) can impact the prevalence and severity of auditory problems in adults with HIV/AIDS.

Audiological Testing

Although HIV/AIDS can manifest problems at all levels of the auditory system, a limited variety of audiologic tests have been used to measure auditory function in the HIV/AIDS population. Clearly, the most common measure has been auditory evoked potentials, an EEG type of test in which the presence of brainwaves are recorded to predominantly non-speech sounds. Although a small number of researchers have recorded evoked responses from the upper brainstem, thalamus, and cortex,[32-33] most have used auditory brainstem response (ABR) testing which measures neural responses mainly from the eighth nerve and lower and mid brainstem.[10,25,31,34-43] The emphasis on ABR testing may arise from its ability to detect early clinical and sub-clinical pathologic changes in the eighth nerve and brainstem of adults with HIV/AIDS.[34-36,43] Larson[5] advocated that the evaluation of hearing loss in the patient with AIDS should be approached as an eighth nerve neuropathy. She suggested that audiologists complete a test battery including pure tone testing, speech audiometry, tympanometry, acoustic reflex testing, and ABR testing.

Larson's proposed auditory test battery is more extensive than most researchers have used in studies of audition in patients with HIV/AIDS.[5] Nevertheless, by focusing on measuring eighth nerve neuropathology, Larson's battery may not be comprehensive enough to track the variety of auditory problems encountered with HIV/AIDS in adults. Her battery did not include any measures of social-emotional manifestations

of hearing loss, which may be even more prominent when it accompanies HIV/AIDS. One popular valid measure of social and emotional problems that has been used with adults without HIV/AIDS is the Hearing Handicap Inventory for Adults.[44] If Larson proposed her battery today, moreover, it likely would include otoacoustic emissions testing. This is an electro-acoustic measure of the cochlea's outer hair cell function which can be compromised by ototoxic drugs.[45]

The most prominent omissions in Larson's battery are behavioral auditory tests of central auditory processing. Recent professional guidelines of the American-Speech-Language-Hearing Association[46] mandate that behavioral measures are essential for diagnosing central auditory processing disorders; conversely, they cannot be diagnosed by electrophysiological measures alone.

The most widely researched behavioral test battery of central auditory processing disorders *in adults* was developed over several decades by an audiologist, James Jerger, and his colleagues.[47-55] It employs performance-intensity functions for both monosyllabic words, performance-intensity functions for scrambled sentences presented to the same ear in noise (i.e., Synthetic Sentence Identification for ipsilateral competing messages or SSI-ICM), and scrambled sentences presented simultaneously in both ears (i.e., dichotic sentence identification or DSI). This battery can differentiate auditory disorders between the cochlea, eighth nerve, brainstem, and temporal lobe. This battery contains the essential elements in any successful central auditory test battery, efficient and effective controls over cochlear sensitivity loss, absolute speech recognition ability, and non-auditory influences.[54]

The SSI-ICM and DSI have been used to diagnose central auditory processing disorders in subjects with varying degrees of brain damage.[56] To our knowledge, however, a case study of an adult with AIDS and organic brain disease was the only study of these measures in a subject with HIV/AIDS.[30] The patient showed abnormally reduced scores on in both ears on the SSI-ICM.

As radiographic technology, such as magnetic resonance imaging, has improved over the past two decades, many audiology facilities serving adults no longer routinely use relatively expensive ABR testing for diagnosing space-occupying lesions. Conversely, nearly all audiology clinics in the United States have personnel, equipment, and materials to complete pure tone testing, speech audiometry, tympanometry, acoustic reflex testing, otoacoustic emissions testing, and the Hearing Handicap Inventory for Adults. In other words, nearly all audiologists have the capability to evaluate, in about two hours, both peripheral and central auditory function of adults with HIV/AIDS. Such a feasible, yet comprehensive, test battery may become more vital for tracking auditory problems of adults with HIV/AIDS as they live longer and grow in numbers. No researchers, however, have studied such a comprehensive test battery in HIV/AIDS patients systematically.

Summary

Speech, language, and hearing disorders are not uncommon in individuals with HIV/AIDS. Little research, however, has explored the relationship and impact between HIV/AIDS and communication abilities. Several factors related to HIV/AIDS influence communication abilities. These factors include CNS abnormalities related to the infection, opportunistic infection, and treatment effects. Clinicians should distinguish to the best of their knowledge between symptoms

related to the HIV disease process and the side effects of antiretroviral medications. Assessments of communication disorders should be obtained as necessary to provide quality care to individuals with HIV/AIDS and to maintain the quality of life that effective communication provides.

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