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Vestibular involvement in adults with HIV/AIDS

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ABSTRACT

Objective: HIV/AIDS is responsible for widespread clinical manifestations involving the head, and neck. The prevalence and nature of vestibular involvement is still largely unknown. This study, aimed to describe and compare the occurrence and nature of vestibular involvement among a group of, adults infected with HIV compared to a control group. It also aimed to compare the vestibular function, of symptomatic and asymptomatic HIV positive adults who receive antiretroviral (ARV) therapies to, subjects not receiving ARV.

Methods: A cross-sectional study was conducted on 53 adults (29 male, 24 female, aged 23–49 years, mean = 38.5, SD = 4.4) infected with HIV, compared to a control group of 38 HIV negative adults (18, male, 20 female, aged 20–49 years, mean = 36.9, SD = 8.2). A structured interview probed the subjective, perception of vestibular symptoms. Medical records were reviewed for CD4+ cell counts and the use of, ARV medication. An otologic assessment and a comprehensive vestibular assessment (bedside, assessments, vestibular evoked myogenic potentials, ocular motor and positional tests and bithermal, caloric irrigation) were conducted.

Results: Vestibular involvement occurred in 79.2% of subjects with HIV in all categories of disease, progression, compared to 18.4% in those without HIV. Vestibular involvement increased from 18.9% in CDC category 1 to 30.2% in category 2. Vestibular involvement was 30.1% in category 3. There were, vestibular involvement in 35.9% of symptomatic HIV positive subjects, and 41.5% in asymptomatic, HIV positive subjects. There was no significant difference in the occurrence of vestibular involvement, in subjects receiving ARV therapies compared to those not receiving ARV therapies ($p = .914$; chi-square, test). The odds ratio indicates that individuals with HIV have a 16.61 times higher risk of developing, vestibular involvement during their lifetime of living with the disease and that it may occur despite, being asymptomatic.

Conclusion: Vestibular involvement was significantly more common in subjects with HIV. Primary health care providers could screen HIV positive patients to ascertain if there are symptoms of vestibular involvement. If there are any, then they may consider further vestibular assessments and subsequent vestibular rehabilitation therapy.

1. Introduction

The human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) is a world-wide pandemic affecting the lives of millions of people. Despite the number of new infections and AIDS-related deaths decreasing between 2001 and 2009, the overall number of individuals living with the disease is still very high [1]. Increased life expectancy and duration of survival of those living with HIV/AIDS may, among other factors such as public health education and awareness programmes, be attributed to antiretroviral (ARV) therapy and improvements in access to health care services. The reduction in morbidity and mortality is changing HIV/AIDS from a life-threatening disease to a

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chronic illness with an increasing emphasis on quality of life issues [2].

After HIV binds with and penetrates into the CD4+ cell, it compromises the body's immune response gradually and predisposes it to opportunistic infections [3,4]. Diseases involving the head and neck area are often the first signs of an immune compromised body and may occur in as many as 40–90% of individuals with HIV/AIDS [5–9]. Common HIV/AIDS-associated head and neck pathologies include manifestations in the central nervous system (CNS), the naso-, oro- and laryngopharynx and in the inner ear, that may result in hearing loss and/or vestibular disorders [10–12].

There is growing evidence that HIV/AIDS could either directly or indirectly, through opportunistic infections or ototoxic medication, have an adverse effect on the delicate structures of the ear, causing a conductive, mixed or sensorineural hearing loss [13–19]. Auditory dysfunction has been reported to occur in between 20% and 75% of adults with HIV/AIDS [20–23]. The auditory and vestibular system is situated in the temporal bone and constitutes part of the same membranous labyrinth. It is not surprising that with auditory symptoms, which often accompany HIV/AIDS, vestibular dysfunction and associated symptoms may also occur. Vestibular symptoms may include dizziness, vertigo, disequilibrium and/or nausea and vomiting.

However, only a limited number of studies have investigated vestibular dysfunction and pathology related to HIV/AIDS, despite the shared anatomy and physiology of the auditory system [2]. Teggi and colleagues [18] suggested that vestibular symptoms are often masked by other more serious and life-threatening illnesses and disorders associated with HIV/AIDS. As a result, the nature of vestibular symptoms and the potential for manifestations of vestibular pathology resulting from HIV/AIDS have been largely neglected.

The most recent and extensive reports were group studies of adults [17,18,24,25] and children [16] infected with HIV who underwent auditory and vestibular assessments. The findings demonstrated vestibular dysfunction to be more frequent among subjects with HIV than those without HIV. Signs of both peripheral (involving the vestibular end-organs and eighth cranial nerve) and central (vestibular nuclei in the brainstem, cerebellum and oculomotor, vestibulospinal and proprioceptive pathways) vestibular dysfunction have been reported [16–18,24,25]. Vestibular dysfunction occurred across all categories of the disease with a higher prevalence in more advanced categories, particularly regarding central vestibular involvement [17,18,26]. These studies employed various tests of vestibular function, included spontaneous and positional/positioning nystagmus tests, ocular motor tests, caloric tests and posturography. Cervical vestibular evoked myogenic potentials (cVEMPs) have recently been introduced in the clinical evaluation of the saccule (vestibular end-organ) and inferior vestibular nerve. However, no study has yet utilized cVEMPs as part of a vestibular test battery in individuals with HIV to determine peripheral involvement.

One study compared the vestibular functioning of 60 HIV positive adults suffering from vestibular symptoms with 30 HIV negative adults also with vestibular symptoms [18]. This study showed a higher number of abnormal peripheral and central vestibular findings among the HIV positive group than among the HIV negative group. Another study compared vestibular functioning of HIV positive and HIV negative adults without any vestibular symptoms [24] and reported central vestibular involvement in the HIV positive group. No signs of peripheral vestibular involvement were however reported in the sample of asymptomatic subjects. Both of these studies utilized essentially the same test procedures, namely spontaneous and positional nystagmus tests, ocular motor tests and caloric tests, with the exception of the auditory brainstem response included in the latter. It is therefore not clear if HIV affects the peripheral vestibular system in asymptomatic individuals. It is also not clear if the vestibular function of symptomatic HIV positive individuals would differ from asymptomatic HIV positive individuals. No studies to date have compared the peripheral and central vestibular functioning of HIV positive individuals with and without vestibular symptoms.

There are also no studies that described peripheral and central vestibular functioning in adults with HIV receiving ARV therapies compared to those without this treatment. The current study aimed (i) to describe the occurrence and nature of vestibular involvement among a group of adults infected with HIV, compared to a control group without HIV by including cVEMPs in the vestibular test battery; (ii) to describe and compare the vestibular function of symptomatic and asymptomatic HIV positive adults; (iii) to describe and compare the vestibular function of a group of adults with HIV receiving ARV therapies to those not receiving ARV therapies.

2. Materials and methods

2.1. Ethical clearance and informed consent

The institutional review boards of the University of Pretoria and the tertiary referral hospital where subjects were registered, reviewed and approved the study before any data collection commenced. Subjects provided written informed consent for the researcher to access their medical records, to have access to their HIV status, to document the CD4+ cell count and the use of ARV therapies.

2.2. Study design

A cross-sectional comparative research design was employed. A convenience sampling method was used to recruit subjects.

2.3. Subjects

Table 1 summarizes the description of participating subjects. A total of 91 subjects participated, comprising 53 HIV positive and 38 HIV negative adults. There were no statistically significant differences in mean ages between the groups ($p = 0.26$; t-test) and therefore there was not a difference in age groups. Since age only affects the vestibular system after 55–65 years [27], the age of the subjects were below 50 in order to minimize the likelihood of age affecting the results. Age distribution was the same across the two study groups (Mann–Whitney U test). In addition, gender distribution was similar between and within the groups. HIV positive subjects were evenly distributed between the three Centre for Disease Control and Prevention (CDC) classification categories ($p > 0.05$; one-way ANOVA). Fifteen subjects were in category 1 (eight male, seven female), 20 subjects were in category 2 (eight male, 12 female) and 18 subjects were in category 3 (eight male, 10 female). Table 1 furthermore shows the ARV therapy regimes for the subjects with HIV. There were 42 subjects with HIV who used ARV therapies and 11 subjects with HIV who did not use ARV therapies at the time of entry in the study.

2.3.1. Experimental group

Subjects in the experimental group were HIV positive patients from the Infectious Disease (ID) clinic of a tertiary referral hospital in South Africa. The majority of recruited patients were HIV positive. Those who were HIV negative ($n = 1$) were assigned to the control group.

The inclusion criteria were a positive diagnosis of HIV as determined by blood serological tests; aged between 18 and 50