

OCCUPATIONAL HAZARDS TO ANESTHESIOLOGIST

ESSAY

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INTRODUCTION

INTRODUCTION

Anesthesiologists spend a great time caring for patients in operating rooms. Unfortunately, the operating room environment exposes them to different hazards which may affect them and indirectly affect their patients. On top of the list of these hazards come infections which include AIDS and hepatitis as well as others. The ambient air of operating rooms with its trace gas pollution is another problem. The increased use of electric equipments with neglected precautions may impose another hazard because of the risk of fires and explosions. Radiation whether ionizing or non-ionizing exposes anesthesiologists to its dangers. Addiction and drug abuse is a definite cause of morbidity and mortality to users and indirectly to patients. In order to decrease these hazards, we should search for their nature, incidence and methods of prevention.

INFECTIONS

INFECTIONS

AIDS

Since the early 1980s, the word AIDS (acquired immunodeficiency syndrome) has come to instill fear in many health care workers. The possibility of a slow demise resulting from contact with an unseen but deadly virus that gradually destroys the immune system, promotes a multitude of opportunistic infections, and may result in progressive dementia is indeed frightening. HIV (human immunodeficiency virus), which is responsible for the syndrome, is relatively fragile as viruses go. With proper attention to cleanliness and care in performing invasive procedures the likelihood that an anesthesiologist will develop the disease in the course of patient management is low (Arnold, 1990).

Virology of HIV

The HIV is a retrovirus. The virus initiates its cycle of calumny by recognizing and binding to the CD4^(*) molecule on the helper /inducer (T4+)^(**) lymphocyte. CD4 molecules are also found, albeit at lower concentrations, on macrophages and certain elements of the central nervous system. Thus these cells can also be infected with the HIV. After recognition and binding, the virus enters the host cell, is uncoated, and the genomic RNA is transcribed into DNA. Some of this DNA is integrated into the host cell DNA; unincorporated pieces stay in the cytoplasm. Because the viral genome is integrated into that of the host, infection and infectiousness persist throughout the life of the host (**Fauci, 1988**).

Although it was initially thought that the infected T4+ cell became latent shortly after infection, it now appears that this is not generally the case.

Rather, most patients in all stages of HIV disease have circulating levels of the infectious agent present. Further, more advanced disease results in higher titers of circulating virus. Although latency may occur, it is not as common as was once thought. The new data alluded to above also suggest that as

(*) CD⁴: Cluster (of) differentiation 4. It is a group of antigens which determines type and function of the cell and type of antibody which reacts with.

(**) T4+ Thymus derived cell which has CD4. It is the helper/inducer cell.

many as 1 in 100 T4+ cells are infected in patients with AIDS. The T4+ cell is a central functionary in the immune system. It is intimately involved in the functioning of the monocyte, macrophage, cytotoxic T cell, natural killer, and B cells. A selective quantitative and qualitative depletion of this cell line can lead to severe and recurrent infections. While the infected Helper/Inducer cell eventually dies, the HIV-infected monocyte/macrophage is relatively resistant to cytolysis and, at least in the central nervous system (CNS), may be the reservoir for HIV (Ho et al., 1988 and Coombs et al., 1989).

HIV Serology

Infection with and seroconversion to HIV may be associated with a viral-like syndrome.

- a. Common symptoms include fever, sore throat, and lymphadenopathy.
- b. Less common are rash, myalgias, diarrhea, and symptoms of nervous system involvement
- c. Thrombocytopenia and leukopenia are sometimes seen.

The antibody response is directed against viral proteins encoded by different genes.

Generally, the incubation period of the virus from exposure to viral syndrome-type symptoms is about 2 weeks.

The antibody response is most frequently seen a total of 4 weeks after viral exposure. However there are studies using very sensitive molecular biological techniques that have shown the presence of HIV for a median of 18 months before seroconversion (**Wolinsky et al., 1989**).

Selection from among the several studies to be used as screening or confirmatory tests is somewhat controversial. When the antibody response to primary HIV infection was evaluated in 20 gay males using the various antibody assays enzyme-linked immunosorbent assay (ELISA), indirect immunofluorescence assay (IFA), radioimmunoprecipitation assay (RIPA) and the western blot technique (WB), it was found that all assays tested positive for antibody within 2 months of onset of illness. However the RIPA and WB assay were more sensitive in that all serum samples obtained at 2 weeks and after onset of symptoms tested positive for antibody. Although the ELISA has a specificity of approximately 99.8% (0.2% of uninfected specimens were falsely positive) and a sensitivity of at least 97% (false-negative results of about 3%), a confirmatory test is mandatory unless there is obvious HIV-related disease.

a. In high-risk behavior individuals, a strongly reactive ELISA has a positive predictive value of about 99%. In individuals with low-risk behavior, the positive predictive value

is only about 87% for a strongly reactive specimen, and less than 5% for a specimen that is only weakly or moderately reactive. The importance of a confirmatory study is self-evident.

b. The WB is the confirmatory test most commonly used. While convenient, there is still the possibility of false-positive and false-negative results if interpretive standards are not vigorously adhered to.

c. The predictive value of any of these studies is greater when a careful history is taken. When a test for HIV is to be performed, the clinician must have carefully and nonjudgmentally noted from the patient whether he/she engages in high-risk behavior such as intravenous drug abuse or sexual contact with an intravenous drug abuser, a prostitute, or a gay/bisexual man.

d. Newer studies still confined to the research laboratory include the polymerase chain reaction (PCR), which can identify viral DNA integrated into the host genome, and the serum p24(*) antigen (viral core) concentration which appears to correlate with progression of infection. The PCR seems to be

(*) P24 antigen. It is polypeptide antigen 24,000 daltons while the dalton is the unit of measurement of aminoacids sequence of polypeptide chain length.

much more sensitive than p24 antigen determination (Imagawa et al., 1989).

HIV-Induced Immune Dysfunction

The signal abnormality in the AIDS patient that leads to immunological dysfunction is the functional and quantitative loss of the helper/inducer subset of T-lymphocytes, the T4+ lymphocyte.

The T4+ cell is involved, either directly or indirectly in the induction of most immunologic responses (Fig 1). Thus, even a functional defect in the T4+ subset of lymphocytes could lead to a global immunologic defect as a result of loss of inductive signals to various limbs of the immune system.

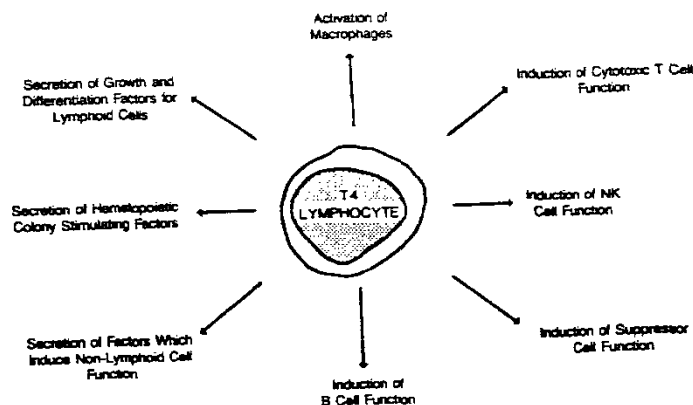


Figure 1 Critical role of the T4 lymphocyte in the human immune response. The T4 cell is responsible directly or indirectly for the induction of a wide array of functions of multiple limbs of the immune response as well as certain nonlymphoid cell functions. This is effected for the most part by the secretion of a variety of soluble factors that have trophic or inductive effects (or both) on the cells in question (From Fauci, 1988).

The Centers for Disease Control (CDC) in Georgia U.S.A. have reviewed the epidemiology and methods of protection of health workers (HW) against AIDS in their review in 1990 as follows:

Epidemiology

1. Adults

As of January 1990, 121, 645 cases of AIDS had been reported in the United States. Sixty-four percent (72,587) of those patients have died. The total AIDS cases for 1989 were 33,345. This represents an increase of approximately 10% over the total cases reported to the CDC in 1988 (30,593). Each week, there are 200 to 600 cases of AIDS reported to the CDC. These AIDS cases were predominantly reported from the following groups (Table 1).

- a. Gay/bisexual men-55.8%
- b. Intravenous drug abusers (IVDA) (Heterosexual) 22.6%
- c. Heterosexual Transmission (no intravenous drug use) 4.4%